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ABOUT
SN-ARESS

SN-- Academic Research and Education Scientific Society (ARESS) is non-profitable techno-social organization registered under the MP Society Registration Act 1973, India. It is established in the memory of Late Shri Satya Narayan Ji Rawat an engineer and motivator. ARESS is situated in the city of Lakes Bhopal. Society is established in 2022 with the aim to enhance research oriented environment and teaching pedigree in the field of Science and Technology among Students, Academicians, Researchers, and Educationists in all disciplines. Society positively works to help all technologists, promote young scientists and research oriented teaching methodologies, giving recognition to the all kind of scientific researches. Society believes to enhance the standards of education by knowledge sharing and content development. We are promoting problem oriented hands on technological approach of teaching in the education.

ABOUT CONFERENCE

The purpose of the 1st International Conference on Recent Engineering Advancements and Computing Technologies IC REACT-2023 is to create a common platform for Industrialists, Academicians, Research Scholars, and Students to communicate and share new research contributions and techniques. The goal of IC REACT 2023 is to investigate intelligent computing solutions in all engineering disciplines and the sustainable technologies. The conference also looks into improvements in next-generation mechanical modelling and simulations & including renewable energy solutions. The ARESS sponsors and organises the conference, which is hosted by the VIDHYAPEETH INSTITUTE OF SCIENCE AND TECHNOLOGY (VIST) Bhopal, India.

MESSAGE FROM
Chairmans Desk

Dr. Sunita Jain (VC)

On behalf of Vidhyapeeth Group of Institutes (VGI), I extend a very warm welcome to all the delegates and participants for the **1st International Conference on Recent Engineering Advancements and Computing Technologies (IC REACT 2023)**. The VGI Group has borne the mantle of excellence, committed to ensuring the students their own space to learn, grow and broaden their horizon of knowledge by indulging in diverse spheres of learning. Our focus is to develop technocrats who could tackle the challenges of industry by continuously updating their knowledge and always keeping close contact with the state-of-art technologies. We emphasize on building technocrats of tomorrow & I would like to reinforce that our endeavor is to keep a balance between the education and culture. We inculcate what the industrial sector requires.

We are also grateful to all the authors who trusted the conference with their work. Special thanks to the Keynote Speakers and all the panelists for sharing their views on current research topics.

Last but not the least; we would also like to thank the teaching, technical staff, the office staff, the organizers and the students for their contribution in successfully organizing and managing this event. I believe, by working together in an environment of trust and support, we would be able to achieve more success in the years to come

Jai Hind.

K.N. SUHANE
Chairman, VGI, Bhopal

Dr Paresh Rawat
President ARESS

President ARESS Desk

SN-- Academic Research and Education Scientific Society (ARESS) Society believes to enhance the standards of education by knowledge sharing and content development. We are promoting problem oriented hands on technological approach of teaching in the education The **1st** International Conference on Recent Engineering Advancements and Computing Technologies (IC REACT 2023) aimed to provide common platform to Industrialists, Academicians Research scholars, and Students to share and disseminate recent research contributions and methodologies. ICREACT focuses to explore intelligent computing solutions including classification and learning. Conference also explores advancements in next generation wireless communication solution and sustainable renewable technologies.

As President ARESS it gives me immense pleasure to share that conference will provide multidisciplinary interaction among the participants. The knowledge shared by our expert key note speakers will enlighten the delegates and participants to explore research in respective fields. The two days of interaction will explore many open issues and challenges for researchers to explore in near future. I recommend all participants to carefully listen and actively participate to disseminate the knowledge and enrich the society towards quality education.

Overall conference will surely motivate the research scholars and students to contribute for the sustainable development of the society. I congratulate all participants and also I appreciate the experts of every individual who make this conference successful.

(Dr Paresh Rawat)
President ARESS
Chairman
1st International Conference IC REACT 2023

Dr Rajeev Atya
Director VIST

Directors Message

Greetings from

Vidhyapeeth Institute Of Science And Technology (VIST)

The theme of the **1st** International Conference on Recent Engineering Advancements and Computing Technologies (IC REACT 2023) on 29th-30th Sept, 2023, envisages how scientists can play a leadership role in the country to promote and realize the vision of healthy and developed India by advancing towards the technological excellence centered around the countries overall development..

I hope that the participants and delegates from various professions will discuss a variety of problems relating to industry, regulation, academia, as well as community in an effort to evolve collective wisdom for establishing newer techniques as well as trends in the country in the relevant fields and for the betterment of mankind.

I am sure that this conference would achieve its objective by providing a suitable platform for knowledge sharing and getting acquainted with latest developments in the engineering Advancements and Computing Technologies. I welcome all Researchers and Engineers to Participate

I appreciate the effort of the all faculty team and staff of VIST to make the conference a success. We ensure the full decimation of knowledge among the youth of state and country.

Dr Rajeev Arya
Director VIST

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1st International Conference On Recent Engineering Advancements & Computing Technologies (IC REACT 2023) 29th & 30th Sep. 2023

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Overview of the Video Stabilization Methodology and Processing: A Case Study

Sourabh Pandey, Prashant Kumar Jain, Prabhat Patel
RGPV University Bhopal
Email: pandey.sourabh1@gmail.com 1, prashantj@rgpv.ac.in , 2 prabhatp@rgpv.ac.in 3

Abstract: Paper aimed to demonstrate the basic video stabilization methodologies.. The first paper describes the basic design steps. The various kind of motions classification is described. The most sever reasons of motion in video frames are addressed. Then the detail farm acquisition and the compensation process are described. The proposed methodology for the VS is preseted and then the overview of each block is given sequentially including motion estimation, motion compensation and video completion. Overall paper preseted the overview of the video stabilization. And finally case study of motion compensation is presented. The results of full frame generation with proposed methodology are discussed qualitatively.

Key words: video stabilization, motion compensation, video completion, frame acquisition, pyramid construction. Motion estimation

1. Introduction

The primary goals of this essay are to outline fundamental design principles and offer a case study of the VS system approach. Paper first identified and categorized several motion kinds that are pre-set in the video sequences, as well as the source of those motions' creation. Both highly organized systematic flaws and numerous random noises can be heard in the videos produced by handheld cameras or camcorders. While the latter is generally brought on by occlusion, shadows, and independently moving foreground objects, the former is mostly produced by sensor noises, air turbulence, and lossy compression. Apart from these during the video capturing time, the temporal variation in the image luminance are caused by several factors, viz. camera motion, rigid object motion, non-rigid deformation, and illumination changes. In several situations, it can be assumed that the background scene is rigid, and temporal variation in the image sequence is only due to camera and objects motion

Video stabilization technique is required to remove the undesired camera motions, which are commonly present in video taken from hand held cameras. Existing algorithms are either complex or have limited performance for slow motion hand held videos. The goal of this research is to propose a new full frame video stabilization approach for hand held mobile videos; by removing the undesired inter frame motion with reduced computational complexity.

Sourabh Pandey: Research scholar RGPV Univ. Bhopal interest is Video Stabilization email pandey.sourabh1@gmail.com
Dr Ptashat Kumar Jain: Prof and Exam controller RGPV Univ. Bhopal research intrest in Signal Processign
Email: , prashantj@rgpv.ac.in
Dr. Prabhat Patel: Prof. Dupt, Registrar RGPV Univ. Bhopal having research interest in signal processing
Email , prabhatp@rgpv.ac.in

The task of the video stabilization can be achieved in three steps by estimating the global transform parameters called motion estimation, by smoothing the motion parameters called motion compensation, and finally warping the frames as in Figure.1 below. Various methods were designed for video stabilization which can be distinguished by the algorithms used at each of these stages.

A. Problem Identification

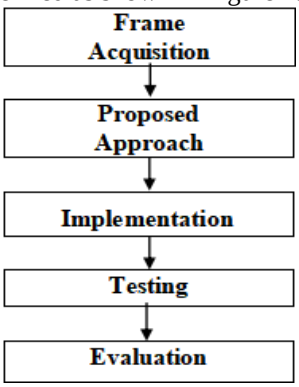
The video captured by hand-held mobile devices is choppy and has the issue of unwanted X and Y movements. The captured sequences of video typically suffer from blurriness since low cost, a high resolution smartphone camera cameras/camcorders have a significantly higher expose time. The video series contains sporadic instances of blurriness. To create the stabilized video, it is therefore desired to identify the blurry frames, de-blur them, and then remove unwanted motions. The majority of earlier techniques for video stabilization had significant accumulating errors and missing image portions. Therefore, it is necessary to develop a full frame VS systems technique that can maintain the scene's color and content.

B. Contribution of Work

This paper has preseted the overview and case study of VS system. The systematic methodologies have been proposed for the VS system design. Every stage has been explained using mathematically modeling. The concept is aimed to produce the full frame VS system. The results of the full frame VS using the FIR motion smoothening are presented. For the full frame VS system.

2. Research Methodology

In order to achieve the efficient video stabilization and to fulfill all research objectives a systematic research methodology is defined as shown in Figure 1.



sFigure 1 Proposed research methodology for VS system design

In the next sections of this chapter the mentioned research methodology is briefly discussed. After identifying the research problem the performance reviewed existing techniques are analyzed. Implement the proposed methodologies and then the proposed method is tested upon the videos with different type of motion and scene environments. Finally the performance is evaluated based on the various standard performance evaluation parameters viz. Inter transformation fidelity (ITF), missing image areas, mean square error and Signal to noise ratio.

3. Motion Types and Classification

There are various sources of undesired motions present in the hand held videos, which can be broadly classified as mentioned in the Figure. 2.

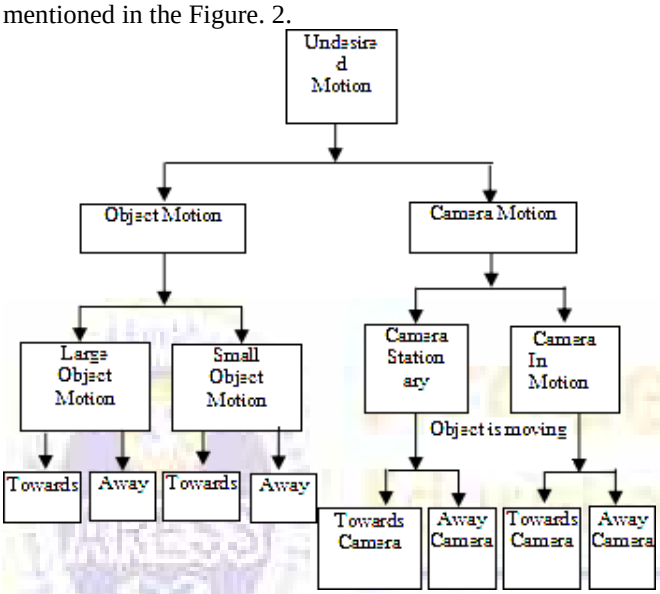


Figure 2 Different kind of the motions and classification

Generally the motion in the video can be due to either camera motion or due to moving object in the scene. The amount of motion due to moving object depends upon the:

- Size of moving object: Whether large object or small object in the scene.
- Speed of the object: Whether fast moving object with the speed greater than 10 m /s or slow moving objects with the speed less than 2 m /s in the scene.
- Motion direction: Whether the object is moving towards the camera or object is moving away from camera.

When camera is stationary than;

- The inter frame error or estimation error depends upon the object motion only and if the position of stationary camera changes then it may be consider as the scene change.
- Generally for stationary camera motion is slow and smooth thus effect of blurring in the video is also less.

When camera is moving during scene capturing time than;

- Due to hand movements the captured video is a shaky video. The effect of shakiness becomes more sever with fast moving object in the scene.
- With the speed of the camera the effect of the blurriness also increases.
- When camera is moving with slowly than the blurriness is presented due to object in the scene.

4. Video Stabilization System

The basic VS system has motion estimation (ME), motion smoothening (MS), and motion compensation (MC). This paper has preseted the overview of the various stages of VS also the basic results of the motion smoothening. The VS system analyzes the video's subsequent frames before running a number of actions over them. The most time-consuming and challenging aspect of VS systems is motion estimation because of the extensive use of image processing processes. Motion estimate produces an inter-frame global motion that includes both wanted and unintended motions in addition to the purposeful motions. Since motion estimation is the first step in the video stabilization process, its effectiveness is crucial. Following motion estimation, the motion correction block uses motion smoothing techniques to distinguish between intended and accidental motions. Aligning the frames with regard to the expected jitter is the frame correction step. There are methods for motion correction and image warping in this block.

4.1 Frame Acquisition

The video frames are acquired in real time using the image acquisition tool box of the MATLAB. Video read function and getsnapshot are used for acquiring the one frame at a time for processing and stabilizing ate inter frame motions.

4.2 Motion Vector Estimation:

In different models, the motion estimator behaves differently. We typically minimize the sum of square discrepancies (SSD) as well the sums of absolute differences (SAD) among the current frame I along with the motion-corrected previous frame I' to obtain the parameters.

$$SSD = \sum_{x,y \epsilon R} (I(x,y) - I'(x',y'))^2 \quad (1)$$

$$SAD = \sum_{x,y \epsilon R} I(x,y) - I'(x',y') \; (2)$$

However, the SSD minimization step is a common part of the estimate procedure. Intensity constancy, like in the example of Laplacian pyramid images, is the fundamental premise underlying SSD minimization. In order for estimating the motion vector components by reducing the error difference equation, there are several different approaches.

4.3 Pyramid Construction:

A potent and straightforward method of portraying images at various resolutions is the use of image pyramids. It is a pyramid-shaped collection of photos with progressively lower resolutions. High-resolution versions of the image being processed are shown at the base of the pyramid, while low-resolution approximations are shown at higher levels.

The original image is used as level zero of a pyramid when building image pyramids. Moving local 2*2 windows from the previous level results in the creation of the subsequent level, which down samples using an average filter to average the covered four pixels in the previous level and replaces them with one pixel in the subsequent level. Repeating this down sampling procedure until the necessary number of levels is reached.

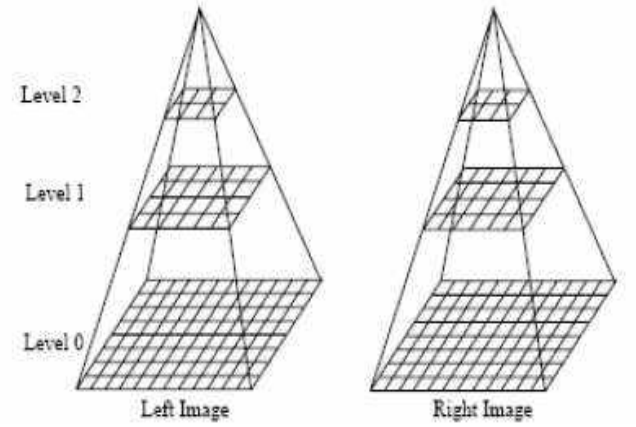


Figure 3 process of the video framed pyramid Construction

As shown in Figure 3, the initial picture pyramid is built in hierarchical estimation, and motion has been projected at each level. In order to create the corrected image, parameters are finally twisted together.

4.3 Motion Smoothening

The impulse response of the filter is convolved using the original input signal in order to build a FIR filter. Many researchers [3, 5, and 6] have utilized these filters in the past for smoothing motion in image/video sequencing. The information included in a restricted amount of recent and upcoming global motion vectors is used by the filter. The data vector x is smoothed by FIR filters, which have the numerator and the coefficient matrices a and b, respectively.

4.4 Motion Compensation

In order to provide a corrected video sequence, the proposed video stabilization algorithm uses Gaussian kernel smoothing to remove purposeful camera motion. The image warping is used for the compensating the motion in VS process.

4.4.1 Image Warping

The camera motion, flexible object motion, non-rigid deformation, and variations in illumination are some other elements that contribute to the temporal variation in the image brightness during the video capture period. It is possible in some circumstances to assume that the backdrop scene is rigid and that the only causes of the temporal variation in the image sequence are the movement of the camera and the objects.

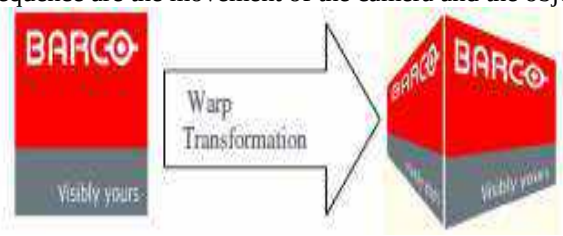


Figure 4 process of frame Image/frame Warping

The stabilization technique uses this method to transfer a new incoming frame once more to the location of the preceding frame. The frames are warped via interpolation.

In the proposed method an L=3 level Gaussian pyramid is built for each frame, $f(x,y,t)$ and $f(x,y,t-1)$ shown in Figure 5. The frame at the next higher level L 1 is warped using the motion estimated at pyramid level L until the finest level of the pyramid is reached (the full resolution frame at L = 1). By warping by employing bicubic interpolation as well as resolving successively at each pyramid level, substantial motions are calculated at the coarse level. The original frame should be warped using an estimated affine matrix A along with the smoothen global translation vector if the estimated motion each pyramid level L is m1, m2, m3, m4, m5, and m6.

$\overline{T}$ given by $A = \begin{bmatrix} m_1 & m_2 \\ m_3 & m_4 \end{bmatrix}$ and $\overline{T} = \begin{pmatrix} 2^{L-1}m5 \\ 2^{L-1}m6 \end{pmatrix}$ (3)

After working at each level of the pyramid, the original frame will have to be repeatedly warped according to the motion estimated at each pyramid level. Two affine matrices A_1 and A_2 and corresponding translation vectors T_1 and T_1 are combined as follows

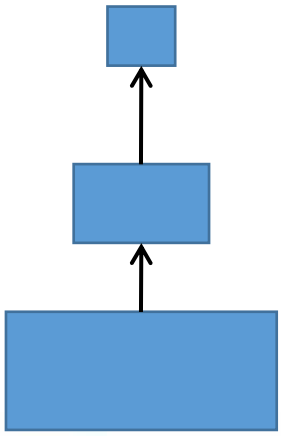


Figure 5 processes of pyramid formation and wrapping

$$A = A_1 A_2 \text{ and } T = A_2 T_1 + T_2 \quad (29)$$

Which is equivalent to applying A1 and T1 followed by A2 and T2.

4.6 Gaussian Kernel Filtering

In order to provide a corrected video sequence, the suggested video stabilization solution uses GKF for eliminating intentional camera motion. Due to their ease of usage, Gaussian kernel filters (GKF))are frequently employed to eliminate undesirable oscillations from video sequences. Gaussian filters are made to minimize the rise and fall times while providing no overshoot to a step function input. Similar to how the mean filter blurs an image, Gaussian smoothing has the same effect. The Gaussian's standard deviation determines the degree of smoothing. The neighborhood of each pixel is output by the Gaussian as a "weighted average," with the average leaning more heavily toward the value for the central pixels. However, the output of a mean filter is the uniformly the weighted mean of the area surrounding each pixel. As a result, a Gaussian delivers softer smoothing and better maintains edges than a comparable

4.5. Video Completion

The motion compensation still causes, some missing edge areas of the initial input frame and only the central part of frame has been stabilized. These areas correspond to zones identified as vertical and horizontal margins. The methods of filling missing image areas are called as video completion methods. There are various ([11, 12]) video completion methods proposed in past to generate full frame videos.

If one solves the problem of completion by trimming the video [1], to obtain the common frame area in all frames, the finally stabilized image will be only a subpart of the initial frame size and some part of information on the frame boundary will be missing in stabilized video. And if we reconstruct the image by accumulating neighboring frames to

fill up the missing areas, the mismatch between frames produces visible artifacts. In the proposed VS approach a seamless stitching of missing image areas was achieved using edge completion method which combines the features of mosaicking and in painting both

5. Case Study of VS

The results of our current work are as follows are shown in the Figure 6. Result comparison for various smoothening methods for stabilize Highway video 2 are shown and the performance is compared based on the different filters for motion smoothening the Deshaker is commercially used filter available on web and the temporal mean filter is frequency used in literature. The every 25^{th} frame is shown of the stabilization of heavy and fast object motion.

*7. **Conclusions and Future scope***

The purpose of this paper was to present the fundamental video stabilizing techniques. The first paper outlines the fundamental steps in design. It describes the numerous classifications of motions. Addressed are the severest causes of motion in video frames. The procedure for acquiring detail frames and compensating for them is then detailed. After setting out the suggested approach for the VS, a brief summary of each block, including motion estimate, motion correction, and video completion, is provided. The overview of video stabilization was predetermined by the overall study. The motion compensation case study is then provided. The outcomes of full frame generation using the suggested methods are qualitatively discussed.

Future scope

To achieve the flawless stitching of the photos in the missing image sections, however, additional work in image completion was necessary. In the future, the fill frame video sequence can be created using the window's average motion vector.

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(a) Input video frames (25^{th}, 50^{th}, 75^{th} and 100^{th})

b) Stabilization with FIR filter method [77]

c) Stabilized result with temporal mean filtering method

d) Stabilized with Deshaker method [35]

a) Stabilized result with proposed FIR smoothening method

Figure 6.39 Result comparison for various smoothening methods for stabilize Highway video 2

FUSION OF LOW CONTRAST IMAGE FOR COLOR IMAGE ENHACMENT

Santosh Kumar Jha, Prashant Kumar Jain. Prabhat Patel
RGPV Bhopal
santoshjhajnct@gmail.com . pjain@rgpv.ac.in ; ppatel@rgpv.ac.in

Abstract- Low-cost digital cameras typically capture photos that differ from the actual scene's colour and brightness in terms of brightness and colour. Poor-contrast images e caused by a variety of issues, including uneven lighting, over or underexposure of some regions, and unintentional camera user motions. Consequently, approaches for enhancing contrast are necessary to further improve the visual appeal of colour images. The implementation of the wavelet based image Fusion approach is proposed to enhance the image quality in this paper. Initially the contrast difference image is locally generated from the input image using the DC coefficients augmentation approach within the compressed DCT domains. In the second pass scaled contrast image is fused with image under test using the pixel level fusion rules. The absolute average deviation difference is one of the measures used to compare performance alongside SNR and entropy. On a variety of real colour photographs from varied environments, the approaches are tested.

Key words: Image enhancement, Image Fusion, Wavelet Transform, Discrete Cosine Transform, DC coefficient Scaling, Entropy, SNR, Mean Brightness.

I INTRODUCTION

By mixing images with various exposures or contrast levels, image fusion might be employed for enhancing the poor contrast. There are several ways to accomplish this goal, the most common approaches are represented in the Figure 1. The most common method of fusion is the multi focus image fusion [1, and 2]. The methods of the Feature based image fusion as reviewed in [3 and 4]. A multi modal Image fusion approach [5] is most common in the Medical imaging case where image captured from Multi-modality are fused together. There are many and the most used image fusion approach is using transform domain techniques [6, 7, and 8]. It is since huge numbers of transformation s are available to improve the image quality. There are certain hybrid approaches also which usuallycombines DCT and DWT. The earlier the method of DC coefficient scaling was proposed [9,10] but it may have sensitive to over brightness enhancement or suffer from the blocking effect due to DCT too.

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Santosh Kumar Jha: research scholar RGPV Bhopal
santoshjhajnct@gmail.com
Prashant Kumar Jain: Prof. RGPV Bhopal
pjain@rgpv.ac.in
Prabhat Patel: Prof. RGPV Bhopal
ppatel@rgpv.ac.in

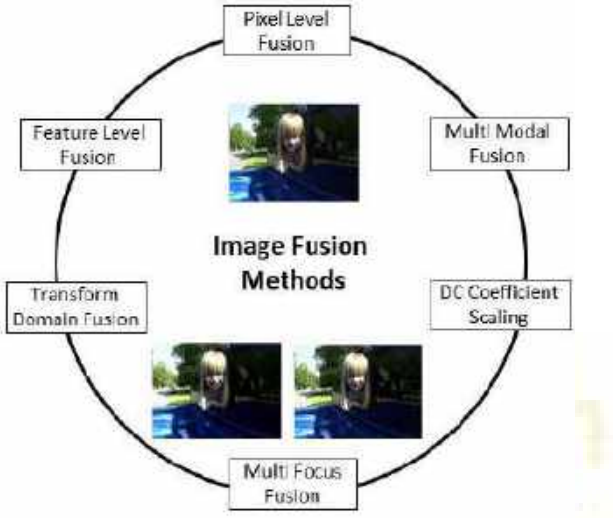

Figure 1 Classification of the Image Fusion Methods

Thus it is required to highly improve the performance of these methods. In recent times various optimizations have been incorporated for contrast improvement process too.This paper has proposed to use the combo of the image fusion and the DC coefficient augmentation approach for single image enhancing. Approach is capable of improving the contrast preserving brightness and removing blocking effects too. For true colour images, this study contrasted the conventional DC coefficient scaling approach in the Y-Cb-Cr colour space to the DC coefficient scaling in the CIE-Lab colour space.

The particular application determines the best fusion technique. Pixel-level fusion, for instance, is frequently employed for straightforward contrast enhancement responsibilities, but feature-level fusing or transformation based fusing can also be utilized for more challenging applications. A potent technique that may constitute used for increasing the visibility of features in photographs is image fusion during contrast enhancement. It is a flexible approach that may be applied to a wide range of applications, including machine vision, remote sensing, and medical imaging. In the rest of the paper after introducing the concept in the section 2 various existing research are reviewed in the field of contrast enhancement also based on the various used color spaces. In section 3basic wavelet based image fusion approach s described. The proposed methodology of the hybrid transformation domain fusion approach is preseted in the section 4. The method using the DC coefficient scaling is also described in the section.

Section 5preseted the result of proposed fusion based contrast enhancement and the parametric study to justify the efficiency. Section 6 finally presets the conclusions and scope of future.

II LITERATURE REVIEW

Several approaches for picture improvement are proposed in the literature, including methods based on the image histogram, regional focused enhancement, and transform field methods. There is lot of fusion based methods most common is multi focused fusion. He L et al [1] proposed fusion of images utilized for many fields viz. transportation, medical, and surveillance As a solution to fusion problem this paper proposes an effective multi-focus picture fusion method.

Çakıroğlu, F et al [2] have compared various optimizations as Swarm Optimization (PSO), Bee Colony (ABC), and Jellyfish Search (JSA) they proposed to combine physics-based techniques, the ABC and JSA methods. Furthermore, algorithms according to meta-heuristics are more versatile in general than traditional fusing procedures. Kaur et al [3] discusses numerous fusion techniques on different levels, along with their benefits and drawbacks, as well as many geographic and transform-based techniques with quality measures and their uses in many fields. They have reviewed finished with a number of future possibilities regarding different fusion of images uses.Li L et al [4] proposes a unique shear let transform regional energy with limited representation multi-focus picture fusion technique. The shear let transform is used to decompose the source pictures into disadvantaged and high-energy sub-bands. The high-energy segments are fused via local energy while the LL bands are merged by patchy depiction. Performance is tested on the Lytro the data set, which contains 20 pairings of images, is employed.

Saleh et al [5] have proposed multi model fusion (MMIF) approach for images. Image fusion if medical image is processed including computerized tomography (CT), positron emissions tomography (PET), magnetic resonance based imaging (MRI), the 6 broad categories of images in spatial domain, The 3 MMIF layers are pixel, in order feature, and judgment. Ch.Hima Bindu et al [6] used the artificially trained neural networks (ANN) and Deep Learning (DL) based sensor fusion for the self-driving cars, for FR, and identifying cancer using neuro-imaging specimens,. The optimization algorithms are used under consideration, the rate of learning and its adaptation. All of these techniques and approaches are sound and acceptable, but the necessary design lacks a solid foundation.

Dr. D Mohana Geetha et al [7] proposed combining of images for determining the cause and treatment of illness using medical image refinement. Many of the clinical modality images are combined using fusion as MRI, PET, CT, and single-photon release determined tomography (SPECT), Vaishali Kamble et al [8] investigated and proposed a reliable approach for identifying children that includes Deep Learning algorithms, intelligent machines classification approaches, and DCT features. The mid- and high-energy bands of the DCT factor are used to derive the handmade signature traits. The Gaussian Nave Base (GNB) classifier is the best machine learning method of classification for determining the proportion of matches between training and evaluation images. The transferrable way of learning is also used to extract deeper attributes for calculating the recognition score. The two models are fused at the rating level to improve prediction precision and durability.

Jayanta M et al [9] long back proposed method for colour improvement straightforward but more efficient than many of the before mentioned current methods. The examination of the colour An spatial domain colour enhancement strategy tare compared with the proposed DC coefficient scaling approach as designed in compressed DCT dooming. Approach seems to offer extremely good improvement is used to contrast the outcomes of all prior methods with the particular approach that is being suggested. Prateek S. Sengar et al [10] letter have replaced DCT with DWT to enhance the images. The factors approach [CES-DCT] and it is discovered that the CES method is less complicated but more efficient than many of those earlier recommended improvement strategies. The Consumer Electronics Show (CES) technique is new because it addresses the colour parts, whereas other techniques just addressed the luminance element. The CES-DWT improves both local as well as global contrast while maintaining colour constancy by utilizing the benefits of the wave transformation. Shutao Li et al [11] -have study thorough analysis of contemporary pixel-level picture fusion techniques. The current fusion evaluations are then compiled. The obstacles in pixel-level combination uses are then examined for four primary programmers, including satellite imagery for medical diagnostics, monitoring, imaging, and hurdles. Finally, this research comes to the conclusion that even though several picture fusion techniques have been put forth, there are still a number of potential future avenues for diverse fusion of images implementations. Irene Fondon et al [12] provides a technique for enhancing and accelerating CNN instruction for healthcare imaging processing tasks by proactively choosing classified incorrectly positive training data. Heuristically selected samples for training are based on categorization using the CNN's most recent state. By training a CNN both with and without the use of the selective sampling strategy (SeS and NSeS), we assessed and contrasted our suggested approach.

Agung W. Setiawan et al [13] discovered that the G channel transmits more significant data than the others in RGB colour retinal vision. The authors study this ocular image characteristic in order to develop a more effective picture coding system. There are three coding methods used: balanced R way, G way, and B channel code. They have propose the contrast limiting equalization of the histogram (CLAHE) approach7is proposed in the spatial domain for the color image enhancing. Many fusion approaches have been offered in the past, but it is still proposed to preserve the brightness. Primarily in this work the image fusion based approach is expected to implement with the goal of the contrast enactment.

3. Wavelet based fusion:

This method entails wavelet domain transformation of the input images. The coefficients of wavelets are subsequently merged using a variety of techniques, including weighted averaging or maximal selections. To create the final image, the resulting wavelet coefficients are transformed again into the spatial domain of the image. There are three major steps of the Wavelet based fusion 1) decompose the image to sub bands. 2) apply the suitable fusion rules to fuse the coefficients, 3) finally again reconstruct image back using inverse transform.

4. Proposed Fusion based Enhancement

The proposed block diagram of the hybrid transform based fusion approach is shown in the Figure 2.

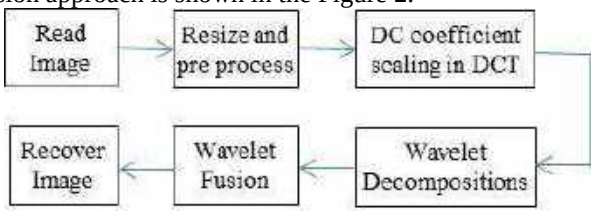

Figure 2 Proposed Block diagram of the Hybrid Fusion approach.

The image is first resized to 3:2 sizes and then LAB colour space is converted and L component is exposed to DCT. The DC coefficient of DCT is augmented for enhancing the contrast. Then to enhance the entropy of the image the wavelet based fusion is proposed in second phase. The two level of DWT decomposition is proposed and then LL coefficients of both input images are fused using the pixel level averaging.

5 Results and Discussions

This section preseted the some of the proposed results of the fusion based enhancement approach. The input mages used for the study and analysis are shown in the Figure 3.

a) Player image ,b) image 1

b) Lg-image16 , d) satellite image

Figure 3 Input color image data used in study

a) Input Lg-image16 b) L component image

b) DC coefficient enhanced f) Fused image results

Figure 4 Results of the contract enhancement using image fusionfor Lg-image16

Results of the fused color contrast enhancing for images are shown in the Figure 4.

a) Input player image b) L component image

a) DC coefficient enhanced f) Fused image results

Figure 5 Results of the contract enhancement using image fusion for player image with non-uniform illumination

Table 1 Entropy analysis results

Image	With DC adjustment	With proposed Fusion
Lg-image 16	3.0631	7.1487
Player	3.9095	7.3034
Satellite image	3.0259	7.5510

Table 2 mean brightness results

Image	With DC adjustment	With proposed Fusion
Lg-image 16	55.2437	65.1346
Player	73.1323	70.1846
Satellite image	96.867	92.0616

The result of the parametric evaluation is preseted in the Table 1 and Table 2 respectively for the Entropy and the Mean Brightness.

6. Conclusions and Future Scope

Low-cost digital cameras frequently take pictures that aren't the same hue and brightness as the situation actually is. Uneven lighting, over- or underexposure of some areas, and inadvertent camera user motions are just a few of the factors that contribute to low contrast photos. As a result, methods for increasing contrast are required to further enhance the aesthetic appeal of colour images.

In this research, it is suggested to adopt the wavelet-based image fusion approach to improve image quality. Initially, the compressed DCT domains of the DC coefficients augmentation methodology are used to locally construct the contrast difference image from the input image. Using pixel level fusion rules, the scaled contrast image is fused to the image being tested in the second run.

It is found that fused image is capable of preserving brightness and improving contrast with higher SNR range.

In Future the optimization methods might be used for improving the contrast efficiency. Also the adaptive contrast enhancement is required to implement in future.

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Error Performance Analysis of LMS and RLS Adaptive Filters Parametric Study

Vaibhav verma1 , Prof. Amit Chouhan2 , Prof. Arvind Gupta3
1. M.Tech (Embedded system & VLSI) Scholar, VIST, Bhopal
2. Asst. Prof. Dept. of Electrical & Electronics Engg., VIST, Bhopal
3. Asso. Prof. Dept. of Electrical & Electronics Engg., VIST, Bhopal
Vaibhav.verma0702@gmail.com1 , amit.chauhan0755@gmail.com2 , arvindguptaies@gmail.com3

***Abstract*—The adaptive filter design is the still essential field of research. Since the acquired modulated data is suffered from AWGN additive noise while transmitted. Thus with the sophisticated receivers hardware's it is essential to design the adaptive filters at the front end. Filtering is intended to eliminate the AWFN noise. Investigating adaptive filter algorithms viz Least Mean Square LMS, normalized LMS (NLMS), and Recursion based Least Square RLS algorithms is the goal of the paper. The sinusoidal signals are randomly generated with large sample size. The noisy and desired signal data are produced as delayed filter response. The performance is evaluated based on the measured mean square error using mentioned filter methods. The design parameters are varied foo achieving optimum noise filtering. The NLMS method offers minimum error performance.**

***Keywords*—Adaptive Filter, Neural Network, BPNN, ADALINE, Amplitude Modulation, AWGN Noise, Filter Design.**

1. Introduction

There are various cases in real-time signal processing systems when a desired and usable signal is destroyed by noise. Noise includes random noise, white noise with an uneven frequency distribution, and frequency-dependent noise. The term "noise" refers to any type of disturbance, whether induced by stimuli, the environment, or components of sensors and circuits, and does not only refer to thermal or flicker noise [1]. Noisy data can come from a variety of internal and external sources. This study's goal is to examine how adaptive filtering algorithms work and how well they function when used to cancel noise within an absence for an exemplary signal. The technique of extrapolating a desirable signal [2] based on noisy measurement is known as noise cancellations. If the qualities of the signal along with noise are not known. A flexible filter is required as circumstances changes the throughout time and performance [3]. The basic communication system representation along with the adaptive filter is shown in the Figure 1.

Vaibhav verma 1 M. Tech. (Embedded system & VLSI) VIST, Bhopal
Vaibhav.verma0702@gmail.com1
Prof. Amit Chouhan Prof. Electrical & Electronics Engg., VIST, Bhopal
amit.chauhan0755@gmail.com2
Prof. Arvind Gupta Prof. Electrical & Electronics Engg., VIST, Bhopal
arvindguptaies@gmail.com

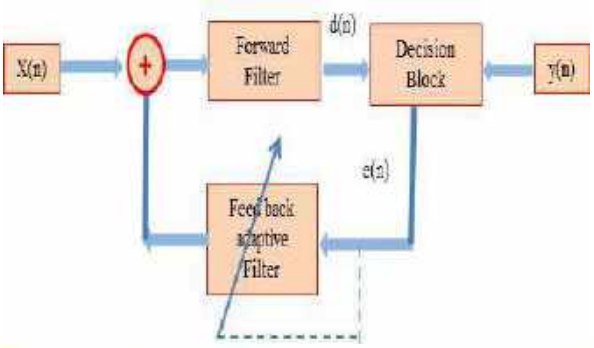


Figure: 1 An adaptive Filter Diagram Design

The basic adaptive filter system requires x(n) as the input sequences. And is passed to the forward FIR filter to generate the desired signals d(n) the actual predicted output sequences y(n) are produced using the decision block/ Then iteratively the weight of the filter are updated in feedback loop. To enable to discover the best filter, various adaptive filters approaches are being carried out and assessed in regards to noise cancellation accuracy. The LMS]1, 3 ,4 and 14] and Normalized LMS [8, 12 and 15] including the RLS [5, 7 and 10] algorithms are required further studies. As indicated in Figure 1, an adaptive filter method requires a referred to as coefficient update across the feedback oath. It is accomplished by using a weight update equation to compute new filter coefficients every each sample. The essence coefficient updating equation is as follows;

$$W^{n+1} = W^n + del\ W \quad (1)$$

Where W^{n+1} is new weight and $del\ W\ s\ step\ size$.

The efficient operation of the system is also evaluated by modifying the system's variables for adaption including filtering order, for performance improvement.. The various filter design parameters required for designing and MATLAB simulation are mentioned in the Table 1.

Table 1 Filter Design Parameters

Parameter	Description	Range
N	Number of Total Samples	10000
R	Average ensembles at 100 Ittr.	100
O	Order of filter function	12
S= del W	Step size LMS	0.02
B	Normalized Step NLMS	0.25
Delta	RLS coefficient scale	0.001
Lambda	Weight exponential factor	1
n_0	sample delay	25
Wi	Initial weight	0.001

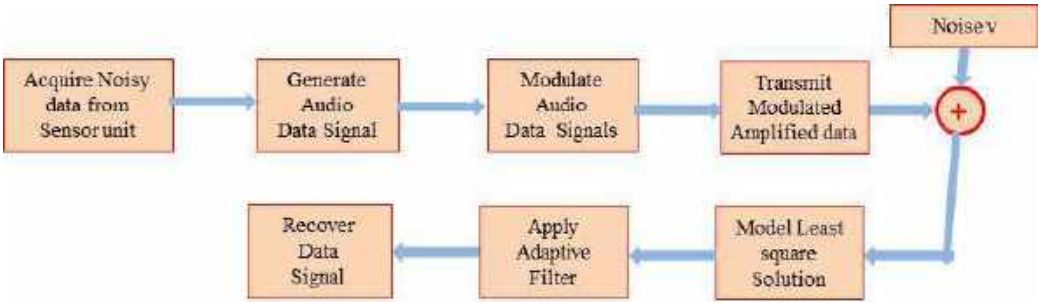


Figure 2 Basic communication system diagram using adaptive LMS filter

2. **Communication System With Filter**

The basic communication system block representation using the adaptive filter at front end is shown in Figure 2. It is evident that the filtering problem is initially modeled, and then weight adoption is done utilizing LMS-based assessment techniques. It can be observed that noise is essentially aided to the actual signal at acquisition time and transmission time both. Thus filter is used at the front end of the receivers. The first step is the simulation of the amplitude modulated speech signal. The input signal of voice is mathematically represented by sinusoidal eq. as

$$d = sin([1:N] * 0.05 * pi) \quad (2)$$

The noisy Gaussian data v as shown in Figure 2 is randomly generated with the variance capacity of 0.25.

$$v1 = fil\,(v)\ @\ [1, -0.8] \quad (3)$$

The desired input signal x is reproduced by accumulating noise and data as

$$x = d + v1 \quad (4)$$

Now the filtering problem is to find the optimal solution to eliminate the noise from the data.

3. Review of Related Works

Shubhra Dixit and colleagues [1] has presented a contemporary as well as historical study on adaptive filter approaches based on dynamical noise cancellation systems. Because signal characteristics in many noise suppression programs can vary rather quickly, adaptive algorithms which converge quickly are required. Fundamentals and most recent developments to boost resolution and minimize computational complexity for future implementation of techniques like LMS as well as RLS, which are critical in noise reduction, are reviewed. The goal of this work is to investigate numerous noise suppressing LMS algorithms and provide the reader with a synopsis of related research. Sudhanshu Ranjan- Dwibedi et al. [2] set out to create the delayed LMS (DLMS) as well as adaptive digital LMS (LMS) for typical noise removal applications. To minimize noise, a particular sound can be obtained with LMS algorithms in MATLAB. They compare various ways on the framework of a sound wave provided by MATLAB running. Although high-speed transmission of sound is possible, the signal becomes loud when noise is introduced. We were unable to distinguish the initial sound from the background noise. The noise level associated with a noisy signal could be lowered using this method without affecting the signal's properties. Based on the data shown, the LMS algorithm outperforms the DLMS as well as TVLMS algorithms in actual work using MATLAB.

Amjad J. Huaidi and colleagues have presented an innovative modifications approach for FIR with IIR digital filters in framework of system identification. Fundamental LMS method is hybridized by using the GA (Genetic Algorithms) to develop the new unified learning process known as LMS-GA. Fundamental purpose of proposed learning tool was to avoid local minima, which are a common problem in normal LMS algorithms and their variations, and to move closer to the global minimum by identifying optimum weights vector quantities when only projected data are given. When the typical LMS algorithm gets trapped in a local minimum, suggested LMS-GA technique uses GA to refresh the filter coefficients while exploring new regions in the search space

S. Saranraj at al [4] .proposed that best suitable technique for changing the weights is to use Least Means Square (LMS) procedures. The LMS alters the weights through a small amount to reduce the likelihood of errors. LMS adaptive filtering for critical path attainment is presented to reduce adaption latency. Pipelines must be implemented in order to reduce adaptation latency. However, after it has passed the required sample period, the standard LMS adjustable filter is rendered unusable. A proportionate-type normalized LMS filter has been proposed in order to change the weights to an extent that lowers error and to create a low-cost equalizer for ASIC fulfillments.

B. K. Das with colleagues [5] presented the first as well as second order resolution assessment of the sparseness aware l0-RLS adaptable filter is reported in there paper. The average and mean square deviation for the adaptive filter parameter vector are given as steady state values as theorems. Andreas Gebhard et al [6] have designed the duplex takeover. They stated that due to standard limited duplexer stop bands segregation, frequency division duplexing (FDD) transmitters receive a leakage (TxL) signal. Whenever paired with the receive mixer's second-order fluctuation, this TxL signal may trigger baseband (BB) second-order intermodulation distortion (IMD2) having a bandwidth that's double that of the transmit signal. Because of this nonlinear IMD2 interference, stream-to-interferences with-noise proportion of the desired receive signal may be drastically deteriorated in basic conversion receivers. This contribution proposes a nonlinear Wiener modeled recursive-least-squares (RLS) kind adaptive filter for cancelling IMD2 interference in digital BB. The

channel-select and DC-notch filters included in the provided IMD2 replica also provide receiver front-end filtering.

. Alexandru-George Rusu et al in the [7] have researched to present a discussion on several memory less as well as memory structures from a bilinear perspective. Using the Kronecker product decomposition concept, we design the multi linear RLS method after memory structures. In an echo cancellation setting, a number of models covering both long-length responses to impulses and the reverberating effect were conducted. Weizhi Wang and colleagues [8] have proposed to design a limited partial update based NLMS method recommended in wireless communication systems since it overcomes the slow speed of converging of the LMS algorithm with the high computing complexities involved in the NLMS algorithm. This approach just modifies a subset of the filter's coefficients during each modification, rather than all of them. Complexity of traditional dynamic filter algorithms has been significantly decreased. In this work, NLMS algorithm receives only a partial update, and its superiority is proved by comparing it with both the LMS methodology and NLMS technique using simulator validation.

Danilo Comminiello et al [9] have primarily proposed a technique which was linear in the parameters (LIP) linear filters that leverage functional link expansions. To improve the effectiveness of this type of functional link adaptive filters (FLAFs), we propose low-complexity expansions as well as frequency-domain adaptation of the values of the parameter. They additionally describe the partitioned-block frequency-domain FLAF, a component of this family of algorithms that is especially well suited to online nonlinear modeling problems. Danilo contrast two different frequency-domain FLAFs that use different expansions to find the best performance-to-computability trade-off. The research outcomes had showed that, even under the adverse dynamic situations and even with limited processing resources, the given algorithms can be regarded as a cost-effective and efficient solution to earn online applications such as the

Deepanjali Jain [10] has adapted suppression of noise research throughout the past and present using adaptable filter algorithms are reviewed in this work. Parametric noise cancellation, a large topic of communication investigation, is used to reduce speech signal noise. Because received signals vary rapidly in many applications, it is critical to use adaptable algorithms which converge quickly. The adaptive (LMS) algorithms employed in there paper for eliminating noise in voice signals provide effective performance at a relatively inexpensive computing cost. Pankaj Vyas et al. [11] defined a designing technique for adaptive filter foe modulated signals. Architectures of the NN based network model employed ADALINE and BPNN based neural network algorithms. They have specified the estimate error and mean square error effectiveness as well as declared that BPNN is the best

Q. Noman et al. [12] have widely used dynamically filtering techniques for tackling a wide range of challenges in digital communication systems. The parameters of the ANC-NLMS algorithm include the filter length (Lj) parameter, which is calculated in a 2n number sequence of 2, 4, 8, 16,... 2048, with the step size (n), which is chosen at random using variable n (VSS) optimization. The approach is initially put through a series of experiments to discover the optimal n range of 11 Lj values for the specific situation. Adaptive strategies based on the mathematical concept and processing difficulty for the mean-square-error cost functioning, such as (LMS) and therefore normalized version (NLMS), have been the most widely employed in communication system so far.

J. Chhikara and colleagues [13] had constructed an FPGA routing mechanism on the shared memory of a multi-processor employing the Galois API, an application feature that allows possible parallels. The router employs path finder, which is the cornerstone of the vast majority commercial industrial FPGA routers. To decrease the amount to reversion that might occur as a result of erroneous theory, we route nets sequentially whilst overlapping an extension phase for each net. Jia-Haw Lee et al [14] have presented the good study of basic noise cancellation mechanism, depending on Minimum Mean Square offering (LMS) technique, is explored and improved with an updated filter. To simulate noise reduction, the LMS dynamic filter approach is utilized. The LMS adaptive filtering methodology takes two inputs: the engine's noise signal and a noise-tainted speech signal. The filtering of signal can be compared with the initial noise-free voice signal to emphasize the extent of attenuation in the noise message.

Hamidia M et al [15] used ultrasonic echo cancellation systems based on adaptive screening; we offer an enhanced variable step-size normalized least mean square (VSS-NLMS) algorithm in this study. For a non-stationary input, the stable-state error of the NLMS method with a fixed step-size (FSS-NLMS) is very high. This mistake can be minimized by using algorithms with dynamic step-size (VSS). G. Sunil Kumar et al [16] in there study discusses recent and previous studies on dynamic noise cancellation system-based adaptive filter techniques. The use of adaptive techniques that resolve quickly is necessary since the signal properties in many noise cancelling systems could change very quickly

Over all it is still required to compare the effectiveness of linear and recursive filtering for adoption quality.

4. Proposed Methodology

The current paper describes a LMS based signal improvement and filtering system based on adaptive noise cancellation. In a communication system, sinusoidal voice signals are transmitted across a channel. the paper proposed to evaluate the noise cancelation problem using three filters as LMS, RLS and NLMS. The dta and the noisy signals are generated using the Eq (2), (3) and (4). Then systematic methodology is used for modeling the variable step and weight updating method for all three filters.

5. Results and Evaluations

Examples of our adaptive filtering findings for sinusoidal voice signal modeling and filtering are shown in this section. The initial sinusoidal voice data is used for generating the desired and noisy data using the FIR filter as shown in eq (3) desired input and the AWGN noisy data are shown in the Figure 3.

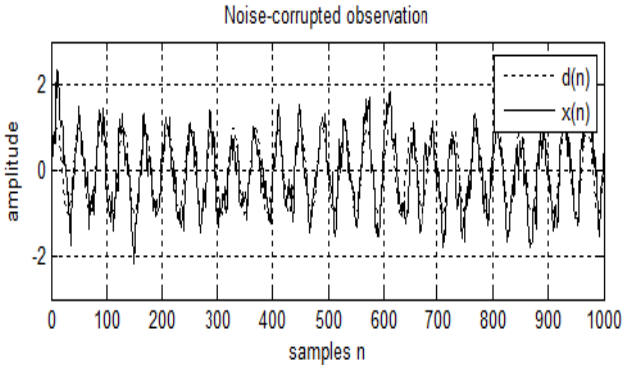
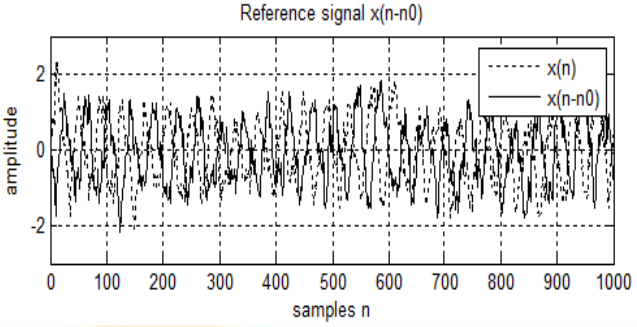


Figure 5 Simulation of the true data and noisy data

Figure has demonstrated the observation based on the noise at variance of 0.2

The reference signal is generated as the delayed version of input data at a window of 25 sample delay as shown in the Figure 4.



The results comparison of the LMS, NLMS and RLS filters are given in the Figure 5. Below.

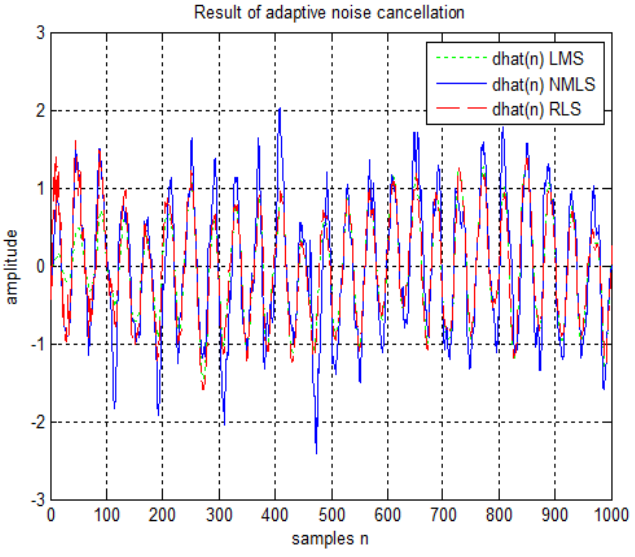


Figure 5 results comparison of qualitative assessment of the various filters filtering outcomes.

As it is difficult to assess the performance of filtering qualitatively therefore in this paper the performance is evaluated based on the MSE error calculated for three felted data.

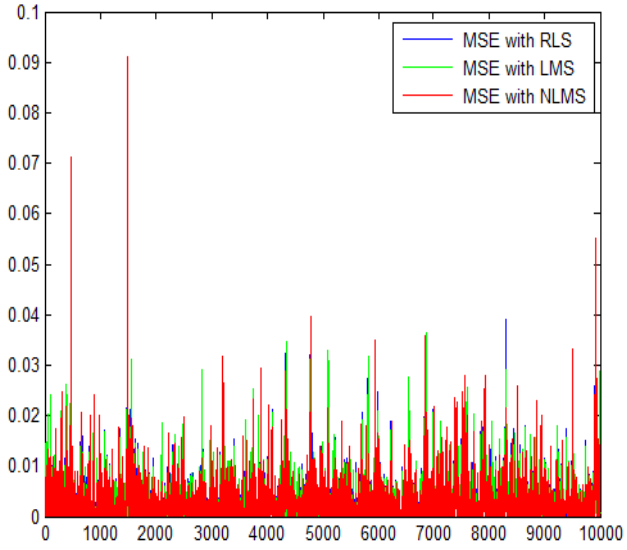


Figure 6comparsion of the mean square erro valuated for RLS, LMS, and NLMS method. .

It is observed that the NLMX method offers the minimum MSE performance and out performs among all.

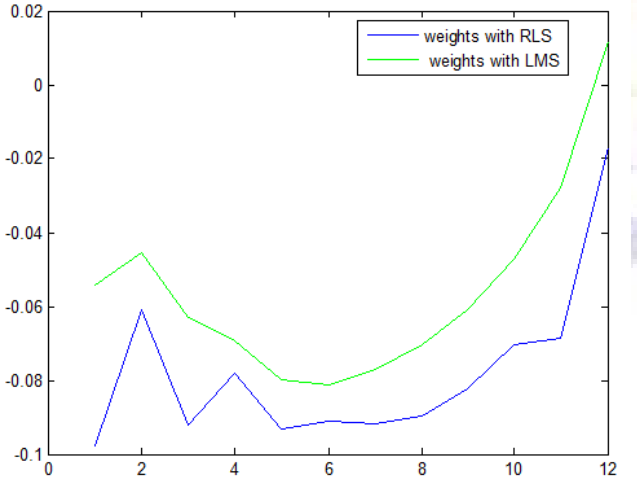


Figure 7 weights comparison for RLS and LMS approach.

6. Conclusions and Future Works

The purpose of the study is to investigate adaptive filter techniques such as Least Mean Square LMS, normalized LMS (NLMS), and Recursion based Least Square RLS algorithms. The sinusoidal waveforms are generated at random with a large sample size. As a delayed filter response, the noisy and desirable signal data are created. The performance is evaluated using the given filter methods based on the measured mean square error. The design parameters are changed to get the best noise filtering. The NLMS approach has a low error performance.

In future the filter may be tested for various filter orders and with different desired signals generation.

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Adaptive Filter design using Adeline Neural Network for Modulated Signal De-noising

Amar Singh1 , Prof. Abhishek Sahu2 , Prof. Arvind Gupta3
1. M. Tech. (Embedded system & VLSI) Scholar, VIST, Bhopal
2. Asst. Prof. Dept. of Electrical & Electronics Engg., VIST, Bhopal
3. Asso. Prof. Dept. of Electrical & Electronics Engg., VIST, Bhopal
Amarsinghnoida@gmail.com1 , mr.abhisheksahu88@gmail.com2, arvindguptaies@gmail.com

***Abstract*—The adaptive filter design is the still essential field of research. Since the acquired modulated data is suffered from AWGN additive noise while transmitted. Thus with the sophisticated receivers hardware's it is essential to design the adaptive filters at the front end. Filtering is intended to eliminate the AWFN noise. The paper is aimed to design the adaptive neural filter using Adeline and the BPNN based neural filter designs. The learning rates and weighing factor are varied to determine the best optimal solution based on the steepest decent search using both NN models. The modulated amplitude signals are simulated as the system of multichannel modulation. The noisy data is randomly generated to aid with the modulated signal. The noise eradication is achieved by using the BPNN and the ADALINE multi perceptron neural networks models based adaptive filters. The performance and results are based on expected error evaluation and proved BPNN superiority.**

***Keywords*—Adaptive Filter, Neural Network, BPNN, ADALINE, Amplitude Modulation, AWGN Noise, Filter Design.**

3. Introduction

Any modern sensor suffers from a range of noises caused by random changes and predetermined distortions or shading. When we refer to an adaptive filter, it means one which is self-designing in the sense that it operates using a recursive algorithm. This allows the filter to function effectively even when full understanding of the essential signal attributes is not available. Filters can be categorized as the linear and non-linear. If a filter filters, it is considered to be linear. The linear distribution of the measurements applied to a filter input determines the smoothed or forecasted quantity at the filter's octant. The filter is non-=linear in all other cases.

. The current work proposes an adaptive noise cancellation technique-based neural network (NN) signal enhancement system. In a communication system, multi tone modulated signals are frequently being sent across a channel. In the current study, clean speech signals are simulated as multi tone and are exposed to additive weight random Gaussian noise (AWGN).

Amar Singh1 M. Tech. (Embedded system & VLSI) VIST, Bhopal
Amarsinghnoida@gmail.com
Prof. Abhishek Sahu Prof. Electrical & Electronics Engg., VIST, Bhopal
mr.abhisheksahu88@gmail.com
Prof. Arvind Gupta Prof. Electrical & Electronics Engg., VIST, Bhopal
arvindguptaies@gmail.com

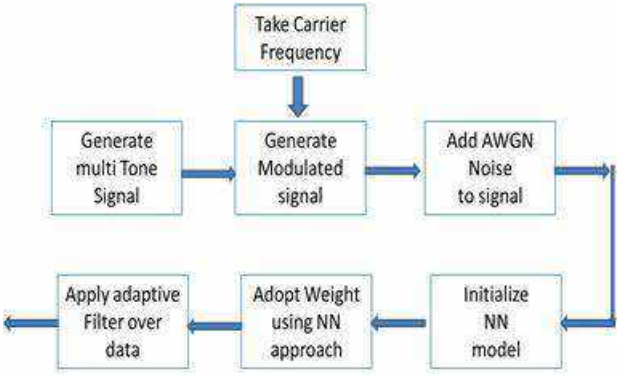

Figure: 1 System block Diagram for adaptive Filter Design

The noisy signals are then subjected to noise cancellation utilizing the BACK PROPAGATION (BP) and ADALINE based NN modeling. The effectiveness of the ADALINE and BPNN approach are compared, and the findings' functionality and evaluation are predicated using estimated error.

By adjusting the system's learning parameters, and filtering order, for example, the effectiveness of the system is also evaluated. The basic design methodology diagram of the system is shown in the Figure 1. It can be clearly observed that filtering problem is first modeled and then weight adoption is achieved using the NN concept for optimum solution. The various filter application s are mentioned in the Table 1.These are categorized to class of identification, prediction, inverse modeling and interference cancelation to achieve the filtering.

Table.1 Applications of Adaptive Filters

Adaptive filtering Class	**Application**	*Purpose*
Identifications	Identification of System	Given an unknown dynamical system, the purpose of system identification is to design an adaptive filter that provides an approximation to the system.
	Modeling of Layered earth	In exploration seismology, a layered model of the earth is developed to unravel the complexities of the earth's surface.
Inverse modeling	Equalization of data	Given a channel of unknown impulse response. the purpose of an adaptive equalizer is to operate on the channel output such that

		the cascade connection of the channel and the equalizer provides an approximation to an ideal transmission medium.
Prediction	Predictive coding	The adaptive prediction is used to develop a model of a signal of interest (e.g.. a speech signal): rather than en-code the signal directly, in predictive coding the prediction error is encoded for transmission or storage. Typically the prediction error has a smaller variance than the original signal hence the basis for improved encoding.
	Spectrum analysis	Predictive modeling is used to estimate the power spectrum of a signal of interest.
Interference cancellation	Noise cancellation	The purpose of an adaptive noise canceller is to subtract noise from a received signal in an adaptively controlled manner so as to improve the signal to noise ratio. Echo cancellation, experienced on telephone circuits is a special form of noise cancellation. Noise cancellation is also used in electrocardiography.

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4. Multichannel Modulation Generation

The first step is the simulation of the amplitude modulated speech signal. The mathematical modeling equation for input sequence generation is shown in eq (1). . In this work the depth of modulation m is set to 0.8 to work near optimum.

$$X = (1 + m\,sin(2\pi * fa * t) +).* sin(2\pi fc * t) \quad (1)$$

The example of the amplitude modulated signal generation and the random noise addition is shown in the Figure 2.

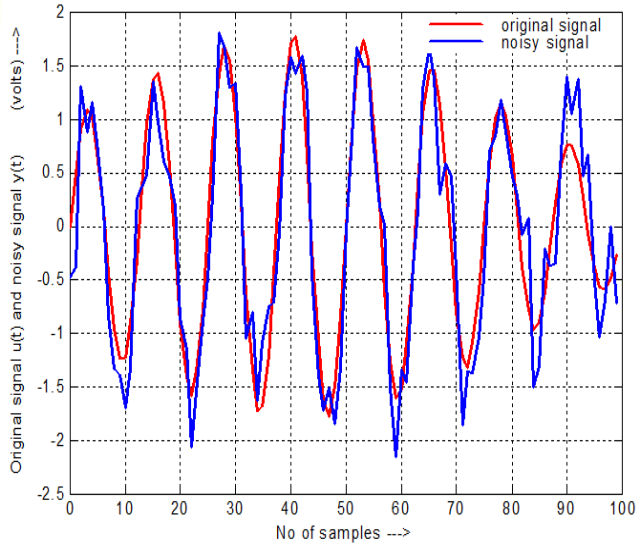


Figure 2 Example of Modulated data and noisy data generation

3. Review of Related Works

Stella, M et al [1] stated that ADALINE is a straightforward neural network they employ in their research as an adapting filter. Their tests were focused on how well car can cancel out engines noise. J. C. Montesdeoca et al [2] have preseted the performance evaluation of noise cancelers. In order to evaluate performance different changes are made, and there study provides an implementation example of a noise canceller utilizing the ADALINE network. Settings for audio recording, as well as a synaptic analysis Weights are used to assess the effectiveness of the adaptive filter. Pankaj Vyas et al [3] has preseted the design methodology of adaptive filter designs using the ADALINE and BPNN neural networks. They have preseted the estimation error and means square errors performance and stated that BPNN is best.

Yanji Jiang et al [4] has preseted enhanced BP technique for adapted noise cancellation is described in this research, which applies neural networks to adapted noise cancellation technology. First, a quick explanation of the adaptive noise cancellation technological premise is given, and then a list of some of the most popular adaptive noise cancelling algorithms is provided. Then, MATLAB simulates the adaptive noise reduction system built on neural networks from both perspectives. Two distinct signals are utilized to model the system when two noise sources are linearly coupled.

Ezilarasan et al [5] have proposed ADALINE (adaptive linear element), an effective flexible MAC (multiply accumulate) core-based finite impulse response (FIR) filter construction. The most popular techniques for maximizing filter coefficients are least mean square (LMS) and recursive least square (RLS). The RLS technique has not been favored for applications in real time despite surpassing the LMS because to its greater design arithmetic complexity. Rekha, K e al [6] has studied the NLMS algorithm is utilized to lower errors at the receiver's result in a wire-free communications system. A fifth order NLMS adaptive filter is designed with Verilog implementations. It has been demonstrated that the NLMS Algorithm exhibits good behavior when compared to conventional LMS. Together with charts produced in the Mat lab, the results of ModelSim simulations demonstrate the same.

Pari, B et al [7] have worked to suggest an efficient flexible FIR filter topology that uses a multiply-accumulate (MAC) core and is adaptable. The most popular filter coefficient optimization algorithms are recursive least square (RLS) and least mean square (LMS). Although the recursive least square (RLS) algorithm performs better than the least mean square (LMS), real-time applications have not favored it due of its greater design arithmetic complexity. Britto Pari et al [8] proposed a notion of time shared multiplier design is used in this research to present an effective adaptive FIR filter design employing a single multipliers and adder regardless of the number of taps. Output Product Code and paralleled pipe line multiplier are used for effective optimization of multiplier architectures. Verilog is used to create the suggested adapted FIR filter layout for 32 taps, and the XILINX VIRTEX-5 FPGA chip is used to synthesize it.

Q. Noman et. al. [9] has improved adapted noise cancelling (ANC) based on the normalized last-mean-square (NLMS) algorithms are the subject of this work. The filter length (Lj) parameter, which is determined in a 2n sequence of 2, 4, 8, 16,... 2048, and the step size (n), which is picked at random

using variable n (VSS) optimization, are the parameters of the ANC-NLMS algorithm. The procedure is first put through an experimental process to determine the best n range for the particular situation of 11 Lj values.

J. Chhikara et al [10] have studied the least mean square (LMS) and non-local mean square (NLMS) algorithms are used to cancel noise on voice signals. Select algorithms that offers an effective performance while being less computationally complex. Jia-Haw Lee et al [11] basic noise-cancelling technique, the Least Mean Square (LMS) algorithm, is examined and improved with an adaptive filter in this study. The LMS adaptive filter method is used to simulate cancellation of noise. The LMS adaptive filter algorithm uses the engine noise signal and the speech signal that has been distorted by noise as inputs. To emphasize the degree of attenuation of the noise message, the filtered signal is contrasted with the initial noise-free speech signal.

4. Proposed Methodology

The current study describes an adaptive noise cancellation-based NN signal quality enhancements system. Signals that have been multi tone modulated are sent through a channel in a wireless communication system. In this study, simulated signals have been transformed into noisy signals by introducing random or Gaussian noise. The noises from signals are subsequently cancelled using the BACK PROPAGATION procedure, and the results' effectiveness is assessed on the basis of estimated error before being subjected to the ADALINE method. The effectiveness of the system is also assessed by modifying filtering order, eta, and other factors. Similar noise cancelers are proposed by [12, 13 and 14] in recent times

4.1 ADALINE Network System

The ADALINE was recently used in a time domain noise cancelling investigation. The test statements are 100 amplitude-modulated samples in aggregate. Every word is sampled with a 4 KHz sampling rate and uses a 300 Hz modulation frequency. The pure voice signal is combined with the scalable and normalized random noise to create the contaminated speech.

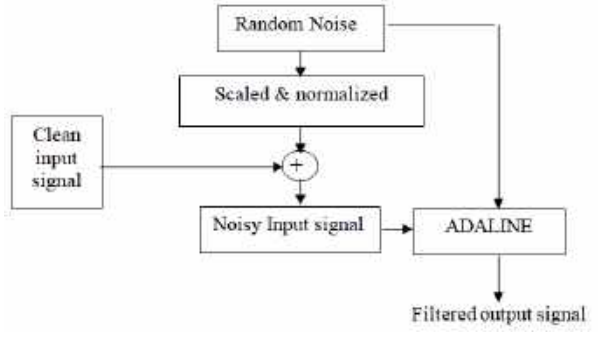


Figure 3 Block diagram of ADALINE NN network system

The ADALINE is then employed with the raw inconsistencies as the data being entered as signal and the degraded speech signal being the target signal. The ADALINE adjusts based on the LMS rule to remove noise out of the noisy signal and provide a pure speech signal. In this arrangement, the network's mistake is produced as a clean voice signal.

4.2 Filter Using Back Propagation

Basically, Back propagation [2, 3] is a gradient descent technique to minimize some error criteria E. In the batched mode variant the descent is based on the gradient $\nabla\acute{\varepsilon}$ for the total training set:

$$\Delta Wij\ (n) = -\eta\ \frac{\delta E}{\delta \omega} + \alpha * \Delta Wij\ (n\text{-}1) \quad (2)$$

It is based on steepest decent search. Where, η and α are learning rate along with momentum are two nonnegative constant quantities. When the error terrain is particularly flat, momentum may increase training, therefore leaning rate is kept low so as to preserve a smooth flight in the weight space. For the supervised development of multiplayer perceptron's, the back propagation NN (BPNN) technique has cemented its position as the backbone.

The algorithm offers a sophisticated approach to resolving the credit assignment issue. This issue is related to the fact because the error signals detected at the multiplayer perceptron's output layer are partially caused by the hidden neurons [13]. Since such neurons are physically unattainable, the application of intended responses for their individual outputs cannot be made, but the algorithm compensates for this shortcoming through layer-by-layer BPNN of erroneous signals through the network. Like the LMS Algorithm, the BPNN algorithm is resistant to disturbances.

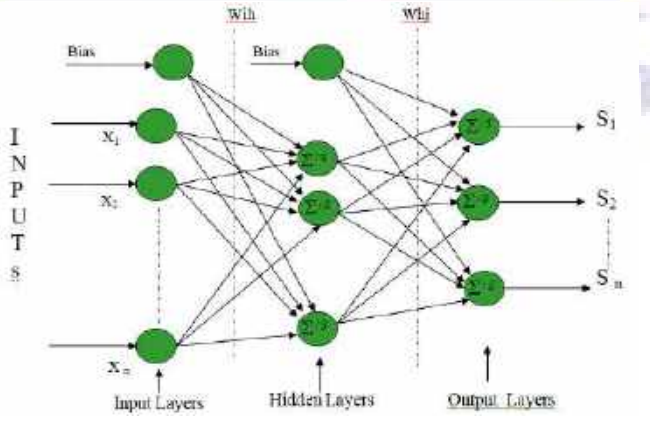


Figure 4 Multi perceptron NN model used for filter design

WEIGHT UPDATION For hidden to output layer weights are updated as:

$$w_{hj}^{k+1} = w_{hj}^{k} + \Delta w_{hj}^{k} \quad (3)$$

$$= w_{hj}^{k} + \eta\left(-\frac{\partial \varepsilon_k}{\partial w_{hj}^{k}}\right) \quad (4)$$

$$+ w_{hj}^{k} + \eta\delta_j^{k}\delta\left(z_h^{k}\right) \quad (5)$$

For input to hidden layer weights:

$$w_{ih}^{k+1} = w_{ih}^{k} + \Delta w_{ih}^{k} \quad (6) \quad = w_{ih}^{k} + \eta\left(-\frac{\partial \varepsilon_k}{\partial w_{ih}^{k}}\right) \quad (7)$$

$$= w_{ih}^{k} + \eta \delta_j^k \delta_h^k x_i^k \quad (8)$$

This systematic approach is used as weight adoption procedure for BPNN Filter design.

5. Results and Evaluations

In this section some of our adaptive filtering results are shown for AM signal modeling and filtering. Plots of the results are presented for number of samples N=100 for the sampling frequency as carrier frequency of audible range of fc=4kHz,. The message signal frequency range of the fa=300Hz, Ts=15 sec, is set as modulation frequencies sample duration.

The initial input data and the AWGN noisy data are shown in the Figure 5.

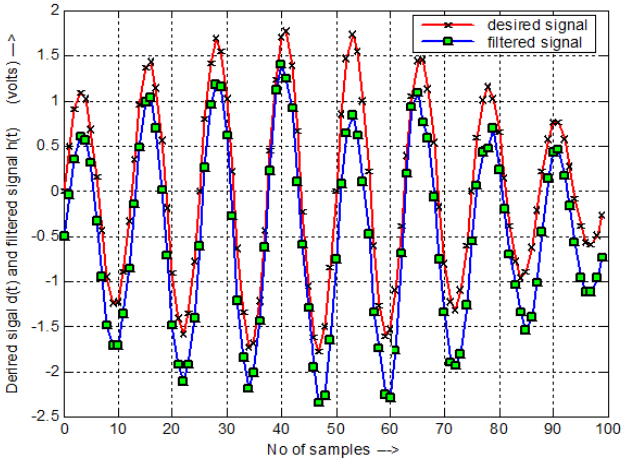


Figure 5 Simulation of the true data and noisy data

The desired signal is generated using the FIR filtered noisy data as shown in example of Figure 6. These desired signals are used to model the adaptive fitter from recursion process to filter the data. The adaptive filter is tuned and weights are updated optimally.

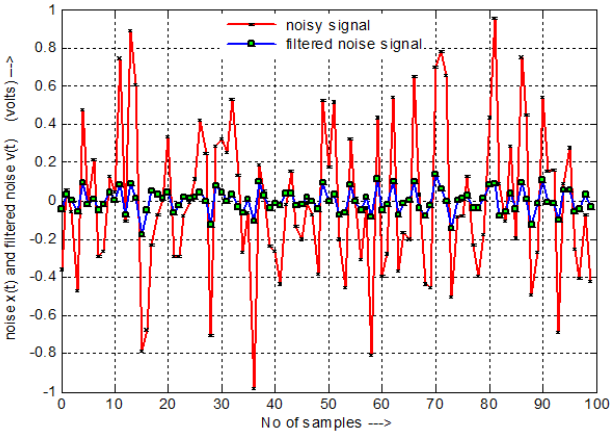


Figure 6 results of desired signal using FIR filtering.

Finally in this work the estimation error is calculated for the ADALINE and the BPNN based filter design models. The comparisons of the error with both models are shown in Figure 7. The BPNN offers minimum estimation erro compared to that of the ADALINE. The respective parametric performance is plotted inn the Figure 8 the learning rate and momentum parameter are varied for the evaluation of the estimation error for BPNN based filtering.

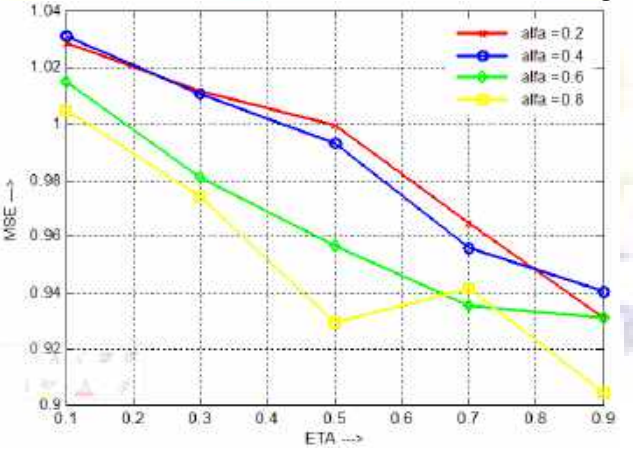
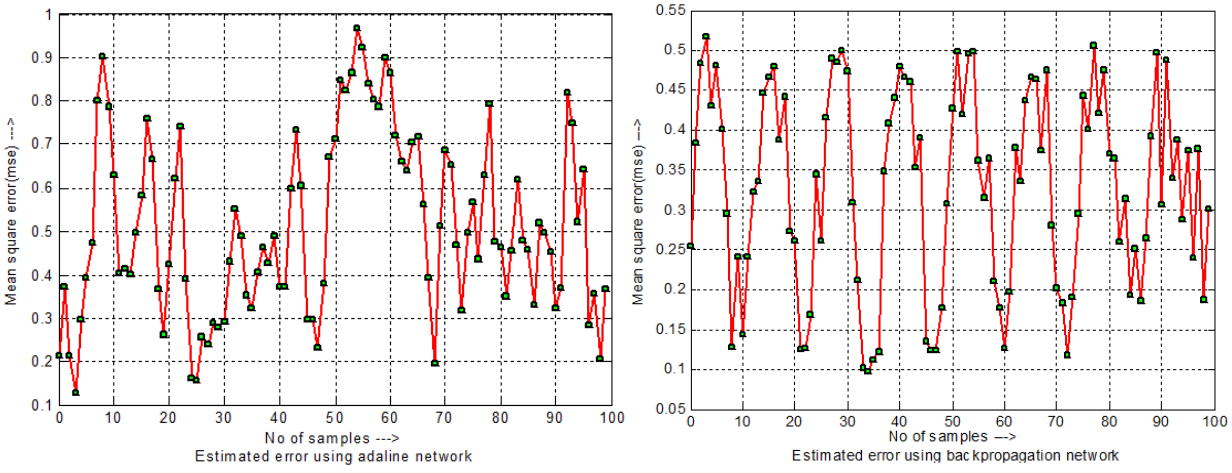


Figure 8 BPNN estimation error comparison for different η and α



a) Estimation error with ADALINE NN b) Estimation error with BPNN

Figure 7 Comparison of the estimation error of the ADALINE and BPNN based neural network for the sinusoidal input signal.

7. Conclusions and Future Works

Adeline as well as BPNN-based NN filter designs will be used in this article to create an adaptive neural filter. To get the absolute result based upon the steepest decent search employing both NN models, the learning rates as well as momentum factor are changed. The multichannel modulation system is emulated using the modulated amplitude signals. For the benefit of the modulated signal, the noisy data is created at random. Adaptive filters based on the BPNN and ADALINE multi-perceptron neural networks models are used to eliminate noise. Based on predicted error evaluation, the performance and outcomes demonstrated the superiority of BPNN. The MSE is averaged from 0.5 to 0.6 with ADALINE network while the MSE is averaging from 0.25 to 0.3 with BPNN network.

In future the filter may be tested on real time communication system and can be tested under the fading environment.

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Wavelet Based EEG Classification using Optimum IIR Filter Based Artifact Removal

Deepak Pancholi, Raghvendra Sharma, Rajeev Goyal, Paresh Rawat
Amity Univ. Gwalior[1,2,3], SN Technology Bhopal[4]
erdeepakpancholiind@gmail.com

***Abstract*— the Electroencephalography (EEG) signals is a combination of multiple low frequency modes. For further analysis of various disease patterns it is required to classify these sub frequencies in the EEG data. Since EEG signals suffers from motion artifacts present dosing acquisition time. This may affect the efficiency of EEG classification too. Thus this paper proposed to eliminate the artifacts first and then classify the data using wavelet classifiers. The performance of the classification using various combinations of EEG artifact removal methods for EEG data classification are compared and presented. Overall the proposed optimum reduced order Filter is capable of better classifying the EEG data. The wavelet based classifiers is easiest and efficient way of doing so. This paper have filtered the EEG data suing EEMD-CCA based filters and then the wavelet classifiers are applied on true and filtered data and results are preseted.**

***Keywords*— EEG classification, EEG Motion Artifacts, EEMD, CCA, IIR Filter, Optimization, Wavelet Transform**

5. Introduction

The brain EEG signals are captured using the scalp multi electrodes system. In conventional approach 10 to 20 electrodes are used for data acquisition. Thus captured EEG is combination of multi sub band low frequencies. The prime concern of this paper is to demonstrate the accuracy of the wavelet based classifier for these sub bands detections. Broadly in initial phase the FFT analysis was carried out for EEG signal analysis. The broad classification of the EEG features is given in the Figure 1, stating it as Rhythms and Transients of low frequencies sub bands. For different EEG signal based brain activity analysis and disease classification are based on the categorization of these Rhythms. The purpose of this research is to describe the use of wavelet feature based models for EEG signal classification. The five Rhythms of EEG signals are classified using the various combinations of the EEMD-CCA [8] for noise and artifact removal and the wavelet transform for the sub band classification.

Deepak Pancholi, Department of Electronics and Communication Amity University, Gwalior 474001, Madhya Pradesh, (erdeepakpancholiind@gmail.com)

(Dr.) Raghvedra Sharma Department of Electronic and Comm Engineering Amity University, Gwalior 474001, Madhya Pradesh

(Dr.) Rajeev Goyal Department of Computer Sciences Engineering Amity University, Gwalior 474001, Madhya Pradesh

prof. (Dr.) Paresh Rawat,Department of Electronics and Communication Engineering ,Sagar Institute of Science & Technology, Bhopal 462036, India (parrawat@gmail.com)

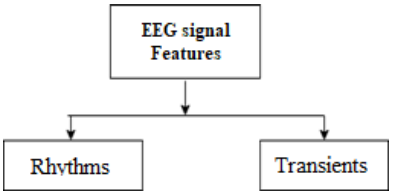


Figure: 2 Basic Classifications of EEG Features

6. EEG Signal Feature:

Bipolar electrodes are positioned on the scalp of the brain's cortex for gathering the EEG signal. The two different distinct kinds of EEG signal activity are transient as well as rhythmic. In addition rhythmic movement was divided into several frequency bands. The different elements of rhythmic and transitory sub bands frequencies are listed in Table 1.

TABLE I: EEG signal features as frequency sub bands

Components of the EEG signal and frequency band		
Rhythmic or Transitory	EEG sub bands	Frequency ranges in (Hz)
Rhythmic	Delta band	< 4 Hz
Rhythmic	Theta band	4-8 Hz Hz
Rhythmic	Alpha band	8-13 Hz
Rhythmic	Beta band	13-30 Hz
Rhythmic	Gama band	>30 Hz
Transient	Seizure activities	0.5-30 Hz

The FFT analysis stated that as shown in Table 1 based on previous findings that this EEG spectra comprises certain distinct waveforms. That fall largely within 4 frequency sub bands as: theta (4-8 Hz),, delta (1-4 Hz), alpha (8-13 Hz), and beta (13-30 Hz). Such approaches have proven useful for a variety of EEG characterizations; The captured EEG data suffers from motion artifacts while capturing time. Thus first part of paper proposed to eliminate these artifacts using optimum IIR filter design using EEMD-CCA and then in second pass the wavelet classification is evaluated to separate the sub bands.

Artifacts:

EEG data can be influenced by a number of artifacts including unwanted signals. Extrinsic versus intrinsic artifacts are the two major types of artifacts. The intrinsic ones are due to motion artifacts as seen in Figure 2. These intrinsic artifacts require complicated algorithms for filtering. Significant artifacts, which include ocular (EOG) artifacts induced by eyeball movement including blinking,

help to identify inherent artifacts. Muscular (EMG) artefacts which include head movement, reading while talking, sniffing, as well as body motion generate responses in the muscles depicted in Figure 2.

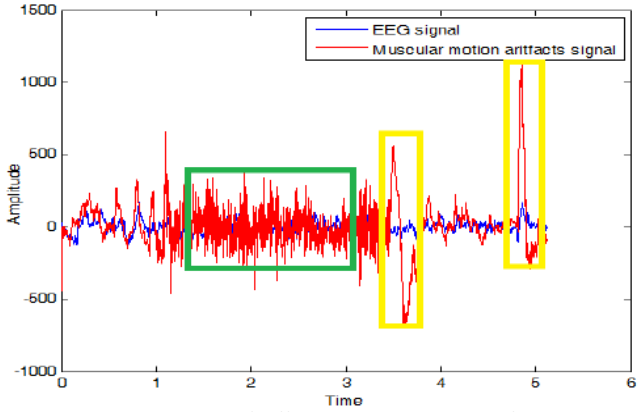


Figure 2 Representation of different intrinsic motion artifacts in EEG

7. Artifact Removal Techniques:

Paper proposed the combination of the EEMD-CCA and the adaptive neural filter for the artifact removal. The proposed system block representation is given in Figure 3.

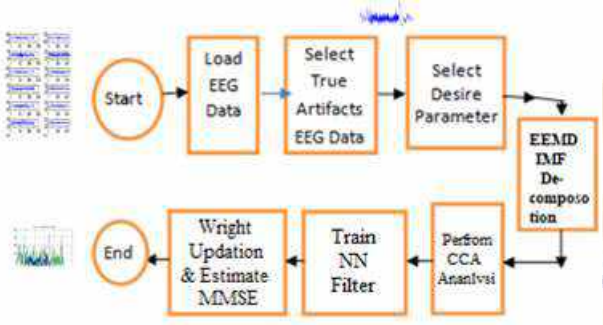


Figure 3 proposed EEG filtering system diagram

In this paper it is proposed to first decompose the EEG data to mluti frequency using EEMD followed by CCA decompositions. The average CCA components are passed for better filtering to neural network based adaptive filter for signal reproduction and elimination of artifacts as shown in Figure 3.

8. Literature Review

Huge set of research was carried out for EEG sub band classification and artifact removal. These sections have precisely reviewed the most relevant ones.

Abdulhamit Subasi et al [1] suggested the Mixture of experts (ME), a supervised learning module neural network structure built for identifying epileptic episodes. The ME network's structure now includes the double-loop expectations-maximization (EM) algorithm. The detection of epileptic waveform discharges via an EEG is an essential process in epilepsy diagnosis. Each of the frequency sub-bands in the EEG signals were separated employing the discrete wavelet transform (DWT). Then, as an input, a ME network with two unique outputs normal and epileptic was used to receive these sub-band frequencies. The outputs of network experts were blended based on an arrangement of regional weights described as the "gating function" so as to improve accuracy.

P. Jahankhani and colleagues [2] described the classification of EEG signals undergoing a mental arithmetic assignment as mental stress is explored in this study on EEG analysis utilizing a feature extract methodology centered on the discrete wavelets transformations. Everyday tension is common. Because stress causes sleeping problems, anxiety assessments are more important than sleep analysis. The EEG measures the electrical activity of the brain. Wavelet decomposition was utilized to extract features in the domain of time-frequency obtained from a single-channel EEG signal prior to and while taking a mental arithmetic exam.

H. Hasnaoui and colleagues [3] employed a complexity-based methodology to investigate how the brains as well as heart respond to different auditory stimuli. They selected the three pieces of music on the basis of the complexity of embedding noise (which involves white, brown and pinkish noise) in them. We played these musical compositions to 11 participants (7 men and 4 women) in order to determine the size of fractals with sample entropy using EEG signals along with R-R time sequences and hear rate variability (HRV). M. K. Islam et al [4] have preseted the mother wavelet optimization approach for EEG filtering.

S Taran and colleagues [5] proposed method for brain-computer interface (BCI) for persons with impairments. They can communicate with their surroundings using a stem that incorporates motor imagery (MI) exercises. The effectiveness of the BCI system is reliant on how successfully all the different MI assignments are evaluated as well as identified. EEG recordings provide a non-invasive way to visualise MI problems in the brain cortex BCI system. In this framework, a tunable-Q wavelets transform (TQWT)-based extraction of attributes method is provided for the identification of various MI activities EEG signals. Taran et al.[6] have further examine and enhance filtering efficiency and shorten filter computation time in highly noisy environments, a novel strategy is provided. In order to remove motion artifacts from EEG signals, this novel CCA method is based on the Gaussian elimination method, which is utilized to calculate correlation coefficients via the backslash operation.

Roy Vandana et al [7] has proposed method is compared to existing artifact removal techniques using EEMD-CCA and wavelet transform. Data using synthetic and genuine EEG signals are used to assess the effectiveness. To evaluate the proposed artifacts removal technique, productivity matrices such as the (DSNR), lambda, RMSE), elapsed time, as well as the ROC variables are employed. Alam et al. [8] investigated the utilization of empirical mode decomposition (EMD), a kind of signal processing approach, to characterize and recognize motor imagery (MI) movements using EEG signals collected from volunteers. EMD has been used to remove electrooculography (EOG), which is prominent in frontal electrodes of EEG, including power line noise that is mostly caused by fluorescent light.

Somers and co-authors [9] have studied to provide a general EEG artifacts removal method that enables the user to annotate a few artefact segments in the EEG recordings to guide the algorithm. In our proposed technique, the artefact covariance matrix is replaced with a low-rank approximation

based on the generalized eigenvalue decomposition, which is based on the multi-channel Wiener filter (MWF). Zeng, Ke, et al [10] proposed a method (called EEMD-ICA) to first use ensemble empirical mode decomposition (EEMD) to break down multivariate brain data that may be noisy into intrinsic mode functions (IMFs), and then separate the artefact components from the real components using independent component analysis (ICA) on the IMFs.

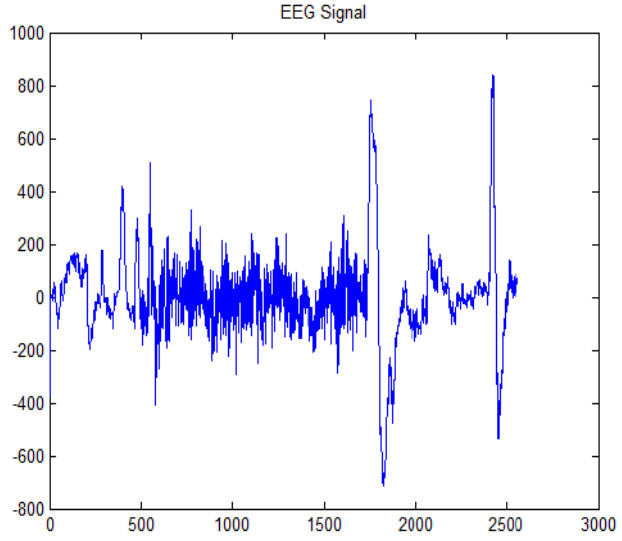
The method was tested against the case of two most popular artefact rejection techniques, automated wavelet ICA (AWICA). Neep Hazarika and others [10] have classified the EEG data using an artificial neural network (ANN) based technology and a feature extraction method, the wavelet transform, is described in this research. The wavelet transform is used to conduct signal preprocessing and data reduction. Normal, Schizophrenia (SCH), and Obsessive Compulsive Disorder (OCD) EEG signals were used.

Wang et al. [11] present a method for classifier training that employs Natural Language Processing to extract frequencies (sub-bands) and montages (sub-zones) from electroencephalography (EEG) data gathered from unique patients in three articles. The proposed method is intended to deliver personalized care. We used prior data from patient reports to develop classifiers, imitating the real-world reasoning processes of experienced people. Chen et al. [13] have researched to suggest combining multivariate empirical mode decomposition and canonical correlation analysis (MEMD-CCA) to exploit inter channel dependence information observed in the few-channel situation. The suggested technique, known as MEMD-CCA, starts by simultaneously breaking down the few-channel recordings of EEG into multivariate intrinsic mode functions (IMFs) using MEMD. Shashi et al [14] get a comparable good outcome in the proposed work, we took into account a sizable region of EEG with a decreased frontal electrode (Fp1, F3, F4, Fp2). For Valence, Arousal, and Dominance, the accuracy from K-nearest neighbour (KNN), Fine KNN, and Support Vector Machine (SVM) is 92.5%, 90%, and 90%, respectively.

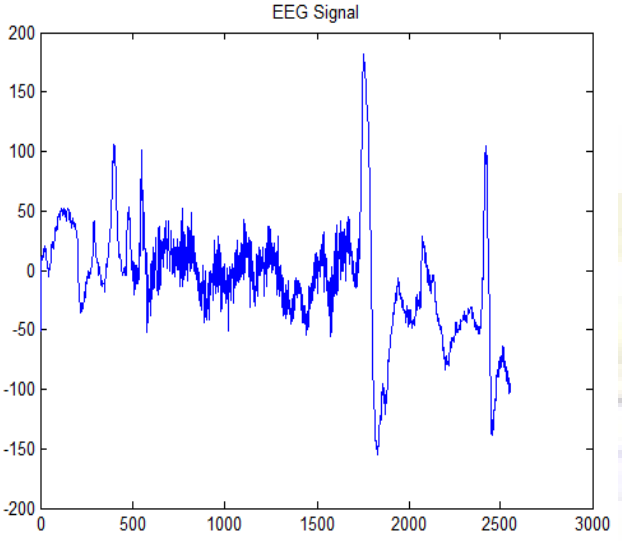
Mathe and collegues [15] proposed 2 mechanisms for classifying and getting rid of artifact are presented in this work. A specialized deep network is used in the initial step to distinguish between artifact-free and clean EEG inputs. At the feature level, classification is carried out by first extracting common space pattern features using convolution layers, and then classifying those features using the support vector machine classifiers.

9. Expected Outcomes of Filtering and Classification

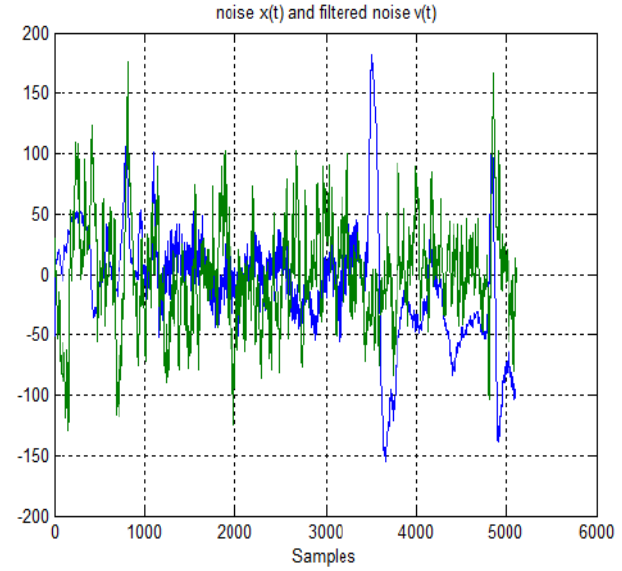
In this paper the outcomes of NN based filtering and the classification using the wavelet transform are presented. The qualitative evaluation and comparison of the motion artifact EEG data Figure 4 a) with EEMD-CCA and EEMD-CCA-NN filtered data are shown in the Figure 4 b) and Figure 4 c) respectively.. It can be clearly observed from the Figure 4 b) and c) that the high peak eye blinks are not clearly filtered after EEMD-CCA, but using the NN filter combination reaches the close approximation to true EEG data.



a) Artifact EEG data input



b) After EEMD-CCA filtered



c) After EEMD-CCA-NN filtered

Figure 4 Filtered EEG signal using the NN based adaptive filter design over the EEMD-CCA signal

In order to more clarify the statement the classification of wavelet sub bands for four cases are shown in the Figure 5. The 5 EEG sub bands are represented fro true EEG, artifact EEG, EEMD-CCA, and EEMD_CCA-NN cases.

It is clear the proposed NN filter gives the close approximation of true EEG nature.

10. Conclusions

The brain's electrical activity is read using an EEG signal, which contaminates artefact signals like EOG, EMG, and ECG. Although several techniques have been established to identify and eliminate artifacts, a high accuracy and high efficiency algorithm still needs to be created.

The limitations and benefits of the methods are also discussed, along with performance evaluation of a few methods based on a literature review. Some techniques are best for all types of artifacts,

But their computing complexity is very high. Other techniques are best for EOG and EMG artifacts in particular. In order to improve artefact detection and removal, current research combines machine learning with more established methods.

The classification results make it clear that the proposed NN filter is capable of giving the much closer approximation of the true EEG data.

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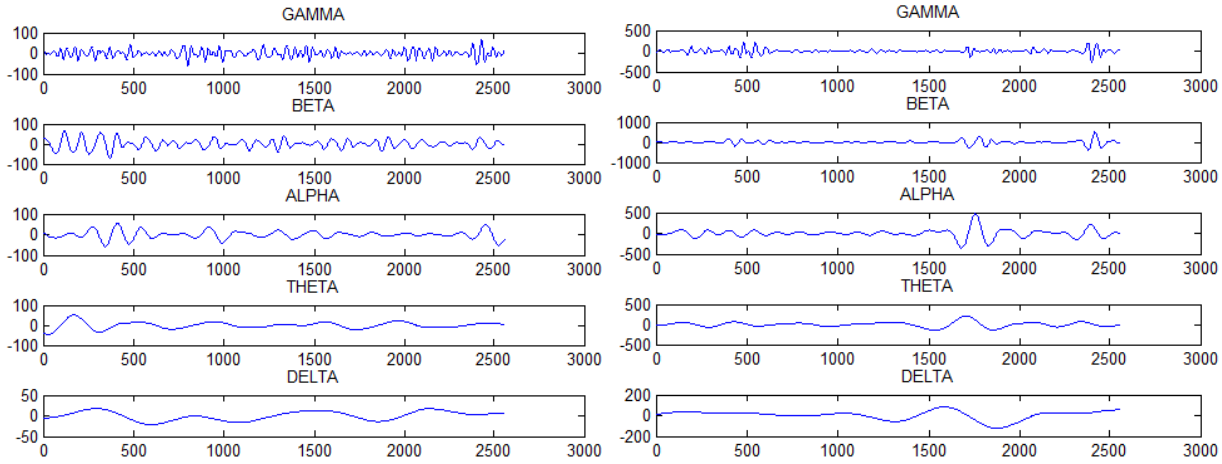


a) EEG classification of True EEG data b) EEG classification of Motion Artifact EEG data

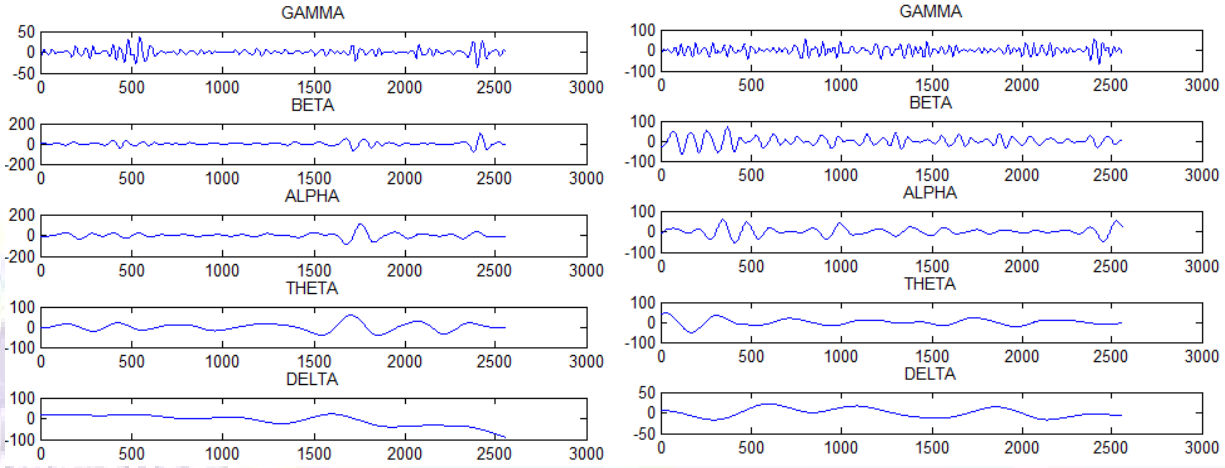


Figure 6 Result Of classification EGE Signal data

Application and Trends of Image Fusion: Challenges and Case Study of Wavelet Fusion

Babita Saxena, Dr R K Arya, Dr Asmita Moghe
Research Scholar UIT RGPV, Sr Scientist MPCST Bhopal, HOD IT UIT RGPV
babitasaxena32@gmail.com

Abstract: In recent years, a variety of technical domains and industries have been included in the scope and applications of image fusion algorithms. The most recent techniques and developments for boosting the effectiveness of fusion methods have been discussed in this article. The study examines the application of deep learning and augmented reality to image fusion. The purpose of the study is to review prospective research fields, point out challenges, and describe breadth.

Key words: Wavelet fusion, satellite navigation, visual surveillance, and medical imaging

1. Introduction

Image fusion is the process of combining many photos of the same location to create a single image that contains the best features of each shot. This could be done for a number of purposes, including improving an image's spectrum knowledge, expanding its resolution in space, or lowering noise. The ideal picture fusion strategy depends on the specific application. A based on features fusion is typically employed for situations in which accuracy in space is essential .Instances when the use of intensity-based fusion is required due to the significance of the spectrum data occur frequently. Wavelet-based fusion is widely used in applications where both depth and spectrum knowledge are crucial. Although innovation remains in its infancy, neural network fusion has showed promise for some remote sensing applications. Fusion is a useful technique for improving the aesthetic attractiveness of remote sensing imagery. It could be used to improve the images' spatial accuracy, noise reduction, and spectrum data. Image fusion is advantageous in many remote sensing uses, such as the categorization of land shelter, the identification of shifts, and the tracking of disasters. The field of picture fusion research is growing swiftly, and fresh approaches are always being developed. As these methods continue to develop, image fusion will become an even more powerful tool for remote sensing applications.

2. Wavelet Based Image Fusion

Wavelet-based picture fusion is one popular approach to image fusion. A mathematical procedure called a wavelet can be used to split a single picture into several of smaller pictures with different scales. Because of this, different levels of detail can be recreated for each of the image's components.

Babita Saxena: Research scholor RGPV bhopal and is working on signal processing
email babitasaxena32@gmail.com
Dr R K Arya Sr. Scientist MPCST Bhopal
Dr Asmita Moghe, Prof UIT RGPV and having research intrest in signal and Image processing.

There are numerous variations of wavelet-based picture fusion methods. The most prevalent algorithms may include:

- The geographically based Fourier fusing method is used to integrate the source images' wavelet decomposition coefficients at the same resolution.
- Frequency wavelet fusion is a technique that integrates the wavelet coefficients from sources with different resolutions.
- In this method, the wavelet coefficients that are calculated for the original images are combined at various levels.

The algorithm to utilize is determined by the specific application. If resolution of space is important, for example, spatial wavelet fusion is widely used in picture fusion. Bandwidth sector wavelet fusion is widely utilized in picture fusion settings where spectral information is important. Multi-scale waveform fusion is often employed for image fusion jobs where combining the spatial spectrum information is essential.

Advantages of wavelet Fusion

Wavelet-image fusion has a number of benefits over earlier image fusion methods. These advantages include:

• It can deal with photos of various spectral qualities and resolutions.
• The input photographs' edges and features can be kept.
• It is used to remove noise from photographs.
• It has good computational speed.

Disadvantages of wavelet Fusion

There are a few issues with wavelet-based image merging as well. It may be vulnerable to the wavelet basis selection, among other drawbacks For huge photos, the expense of computing may be high.

3. Applications of Fusion

There are several uses for picture fusion; the most popular recent ones are shown in Figure 1.

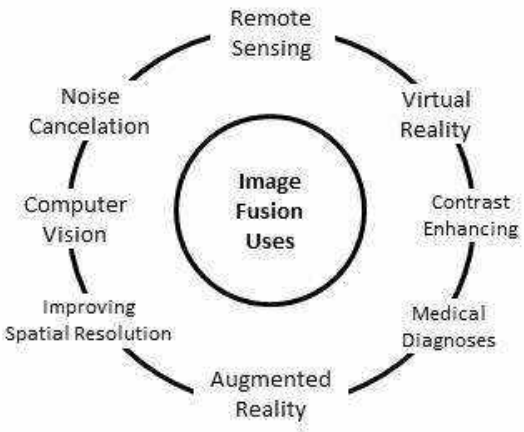


Figure 1 Frequent Recent Application of the Image Fusions

- Increasing the spatial accuracy of a picture by combining a tiny multidimensional image with an excellent quality panchromatic image. High spatial detail is provided by the panchromatic image, whereas spectrum data is provided by the multifaceted photograph.
- Increasing an image's spectral detail: This may be achieved by combining a number of multispectral photos with various spectral bands. This might be helpful for figuring out various land cover kinds or for spotting environmental changes.
- Reducing noisy in a the following picture: This can be accomplished by combining two or more photos with various noise properties. This can help an image's quality so that it can be processed or analysed further.

For mapping, a variety of image fusion algorithms are available. The most popular methods include the following:
Feature-based fusion: This method combines the edges, materials, and other characteristics of the input images.
Strength-based fusion: This method merges the input pictures' values for intensity.
Fourier-based fusion: In this method, the input images are broken down into wavelet coefficients, which are then fused.
Profound training-based fusion: In this method, the input images are combined using machine learning techniques.

The success of wavelet-based photo fusion has been proved by a variety of applications, include the ones that follow:
A. Remote sensing: The act of integrating two or more photographs of an identical scene obtained by multiple sensors into one picture that includes the best qualities of each image is known as combining images for remote sensing. This may be accomplished for a number of reasons, including: The following are some instances of picture fusion in remote sensing:
In order to generate a high-resolution photograph using the spectrum data of the multispectral image, pan sharpening involves fusing an excellent quality panchromatic photograph with a tiny multidimensional image. Satellite photos can be made useful for purposes like change detection and vegetation categorization by using pan sharpening to enhance their visual quality. S*pectrum enhancement:* In order to enrich the spectrum data of the fused image, a number of multispectral in nature photographs with various spectral bands are combined. To distinguish between various types of land cover or to spot environmental changes, spectral enhancement is applied.
Interference suppression: To increase the level of detail of the fused image, two or more photos with various noise characteristics are combined. Remote sensing images are enhanced visually and are better suited for extra processing or analysis when noise is suppressed.

B. Medical imaging:
The technique of integrating multiple photographs of the same item or scene captured using various types of medical imaging into one picture that includes the best qualities of each image is known as image merging for healthcare image processing. This might be accomplished for a number of reasons, including:
Artefact reduction can be accomplished by merging two photos with various artefacts. This can help an image's quality so that it can be processed or analysed further.

- Improving diagnosis precision: This may be achieved by combining images from other modalities that offer additional information. For better visualisation of tumours and other anomalies CT and MRI scans can be combined.

The processing of medical images can make use of a wide variety of image fusion techniques. The pixel intensities of the input images are fused using an intensity-based fusion approach. The most basic and most typical kind of image fusion is this one. The edges and colours of the input photos are combined using the feature-based fusing technique. For maintaining the minute details of an image, this may be superior to intensity-based merging. In a harmonic-based fusion method, the input images are broken down into wavelet coefficients, which are then fused. For reducing noise and artefacts, this may be more successful either intensity-based or feature-based techniques fusion. The input photos are fused using deep learning techniques in the deep learning-based fusion technique. Although it is still in the early stages of development, this method has showed promise for a number of medical picture fusion uses.
The particular application determines the best picture fusion approach. For situations where the accuracy of spatial resolution is crucial, for instance, intensity-based fusion is frequently used. Systems where the small details of a picture are crucial frequently use feature-based fusion. Systems whereby noise cancellation and artefact reduction are crucial frequently use wavelet-based fusion. Although it is an approach that is still in development, deep learning-powered fusion has showed promise for a number of medical picture fusion uses.
Several applications of healthcare image processing can use image merging, including:

- Surgery organising: By merging images from many modalities, fusion of images can be utilised to design complex procedures. This can aid doctors in planning the best course of action for the surgery and in visualising the patient's anatomy.
- Diagnosis: By merging images from many modalities, the combination of images can be utilised to diagnose disorders. This can aid medical professionals in spotting anomalies and providing more precise diagnosis.
- Treatment tracking: By integrating photos from several time periods, the combination of images might be utilised to track the development of a treatment. This can assist medical professionals in evaluating the efficacy of the medication and making any necessary modifications.
- Research: combining images can be utilised to study ailments and remedies. This could aid in the development of new diagnostic and therapeutic techniques as well as researchers' understanding of the physiological and anatomical makeup of the human body.

C. Industrial inspection:
In corporate examination, a process called image fusion is utilised to merge many photographs of the same item or scene captured from various angles. By combining images from many sensors that offer complimentary data, fusion is utilised to improve the accuracy of fault detection. For better metal part flaw detection, for instance, visible light and infrared camera pictures can be combined. A fusion applications used to monitor the calibre of produced products is control of

quality. For instance, combination of images may be used to guarantee that a product's dimensions are within tolerance. One of the main uses for image fusion could be process monitoring, which tracks how well the production process is going. For instance, a fusion of pictures can be used to monitor a product's progress by means of a line of manufacturing.

D. Surveillance Image

Fusion is a technique used in cctv to merge several photographs of the same environment captured by various sensors or views into one picture that combines the best elements of all the images. The accuracy of target detection can be improved by combining images from many sensors that each give complimentary data. For better target recognition in low light situations, for instance, images from regular light and infrared cameras can be combined Target detection in various situations, such as darkness or bad weather, can be accomplished using image fusion. Target tracking can be done via image fusion. Another use is for observation of broad areas, such roadways in cities or airports. Monitoring security at important facility locations is the only significant use from recent times.

E Computer vision (CV): In CV, a technique called image fusion is employed to increase the precision of identifying objects methods. For better object detection in low light, for instance, images from visible light and infrared cameras can be combined. To make scenes easier to grasp is another application. For instance, combining photos from multiple cameras may be beneficial to produce a scene that is more precise and comprehensive.

4. Recent Work

There are several methods for combining the photos. The classification of the most popular techniques is depicted in Figure 2.

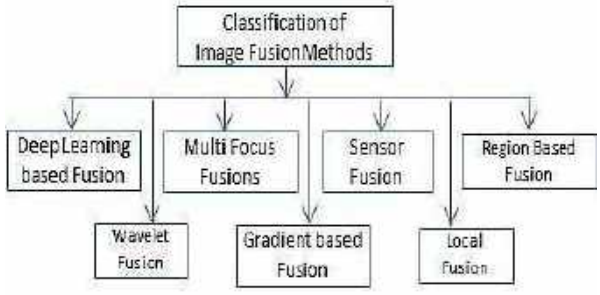


Figure 2 Classification of the Image Fusion

Kaur and co [1] in there paper discusses numerous state-of-the-art picture fusion techniques at various levels, along with their benefits and drawbacks, as well as various spatial and transform-based techniques with quality measures and their applications in many fields. This review has finished with a number of future directions for various image fusion applications. Jiao, Du, et al. [2] work on the SF concept is first expanded by adding two diagonal SFs, a reference SF (SFR) is computed from the input images, and the error SF (SFE), or the ratio of SF error (rSFe = SFE/SFR), is used as a fusion quality metric. The direction of the fusion error—over-fused (if rSFe > 0) or under-fused (if rSFe 0)—is indicated by the rSFe, which can be positive or negative.

Meher and others An overview of region-based fusion techniques is presented in this study. The classification of region-based fusion techniques is done directly. To compare the existing approaches, a thorough list of impartial evaluation measures for fusion is presented. The results of a thorough analysis are presented in tabular form. This might entice scholars to pursue this line of inquiry further.

Nie and co. preseted recent advances in deep learning techniques for remote sensing image fusion are discussed in this chapter. The various deep learning networks that are used are described first. Their training process is also discussed. The use of deep learning models to the fusion issue is then thoroughly explained. To that goal, a number of illustrative techniques are initially mentioned.

Pan and co. addressed pan-sharpening problem was addressed in this study using the innovative deep perceptive patches generative adversarial network (FDPPGAN). The first step was building a perception generator, which had a matching module that could handle images of varied resolutions as input, a fusion section, a rebuilding module employing the residual framework, and a module for extracting perceptual elements. In order to guarantee that the obtained results can maintain more intricate details, the dichotomy of the sample was converted into numerous partial pictures using a patch discriminator.

Junli Zhao and others studied fusion effect, image detail clarity, and time effectiveness can all be significantly enhanced by the suggested strategy. The studies on multi-modal medical images are conducted to evaluate algorithm stability, performance, and other factors. The results of the experiments show that our suggested strategy is superior in terms of visual quality and a number of quantitative evaluation parameters. This has been accomplished using Discrete Wavelet Transformation (DWT) and Principal Component Analysis (PCA), according to Mishra et al. In the suggested fusion method, the first principal component (PC) of the LRMS image is extracted while the PAN image is simultaneously transformed morphologically.

Chen et al., Li, X. researched and uses the built-in sensors of a virtual reality head-mounted display (VR HMD), RGB cameras, and human position estimation to collect three modalities of nine activities from VR users. These data, along with cutting-edge multimodal fusion action recognition networks, allowed us to create an action recognition model with a high level of accuracy.

Mladenovic and others preseted a chapter discusses the potential applications of augmented reality (AR) and artificial intelligence (AI) in dental practice and education now, as well as the potential directions these technologies may go in the future. Artificial intelligence (AI)-driven dental technologies that incorporate augmented reality and virtual reality are quickly developing into practical clinical practice solutions and closing the gap between the digital and physical worlds.

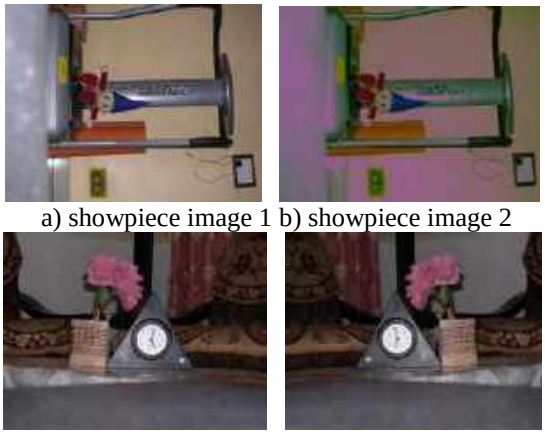
Xiao et al. designed by squeeze-and-decomposition network (SDNet), multi-modal and digital photography picture fusion is made possible in this article in real time. In order to develop a universal type of loss function that is made up of an intensity term and a gradient term, we first usually translate numerous fusion issues into the removal and rebuilding of gradients and intensity information.

Youyong Zhou and others techniques that use boundary segmentation were presented as a group of image fusion algorithms in this research. As a result, four new classification techniques for image fusion algorithms are suggested: transform domain, boundary segmentation, deep

learning, and combination fusion. Eight typical objective evaluation signs are presented in detail, along with a summary of the subjective and objective evaluation standards.

5 Case study of Multi Focus images fusion

This case study fuses the multi focus images of same object or scene using the wavelet fusion approach. An hybrid wavelet fusion rule is used for the evaluation.



a) showpiece image 1 b) showpiece image 2

c) clock image 3 d) clock image 4

Figure 3 Multi-Focus image used for case study

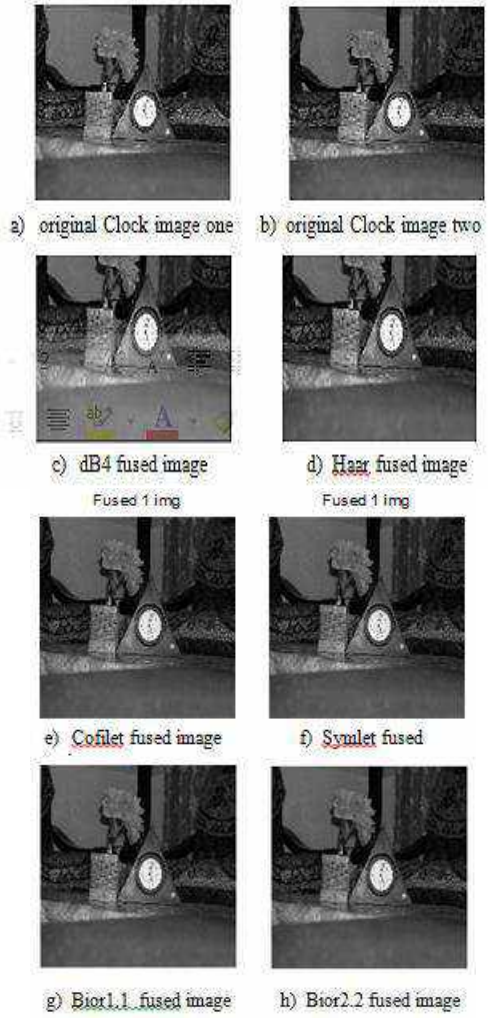


Figure 4 Results of wavelet filters for Clock 3 Image

The wavelet based fusion results are preseted for the different kind of wavelet filters in the Figure 4 for Clock image 3, and Result of fusion for the Results of wavelet filters for Drawing room image is preseted in the Figure 5 respectively. The images are converted to the gray level image and then wavelet fusion of 2 level is applied on the mages . The filters under consideration re Haar, DB2, bi orthogonal 1 and 2 order, cofwlwt and symlet filters.

Figure 5 Results of wavelet filters for Drawing room image

6. Conclusion

The study of image fusion is expanding quickly, and new and innovative ways are constantly being created. Combining images is going to be an increasingly more potent tool for processing medical images applications as these methods continue to advance. A strong and adaptable image fusion method is wavelet-based picture fusion. It has been proven successful in a number of applications.

For a given application, it is crucial to select the appropriate wavelet foundation and algorithm. The prospects for image fusion are promising. New and enhanced picture fusion methods will be created as this field of study progresses, allowing for superior results across a wider variety of uses.

There are particular Future uses for Fusion include the use of augmented and virtual reality, and the capacity for

real-time processing to combine pictures. In a number of applications, algorithms based on deep learning have showed promise for enhancing the efficiency of picture fusion methods.

Self-driving cars can perform better by adopting image fusion, which combines images from many cameras to get a deeper and more precise view of the path ahead. When it comes to security, photo fusion may be utilized to combine photos from many cameras to better detect attackers.

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Mathematical Modeling and Analysis of Plasma Combustion System with Various Operational Parameters and Mesh Refinement Using Fluent

ANAND RAJ
M.Tech Scholar Mechanical Engg. Dept. VIST, Bhopal
Vardan Singh Nayak. Arun Kumar Patel, Amit Vishwakarma
Asst. Professor Mechanical Engg. Dept. VIST ,Bhopal

ABSTRACT At the present time there is an increased interest to the study of heat-and-mass transfer in high temperature environments in the presence of burning. These processes occur in strong turbulent and non-isothermal flows, multiphase fluids, in the conditions of significant impact of nonlinear effects of thermal radiation, interfacial interactions and multistage chemical reactions. To solve the problems of modern power engineering and ecology it is especially important to study the processes of heat-and-mass transfer in the high-temperature reacting media and to simulate physical and chemical processes that occur during the combustion of pulverized coal. These problems are related, on the one hand, to the concept of "energy safety" of the country and, on the other hand, to the development of processes of "clean" fuel combustion under strict standards of emission of harmful substances into the environment.

In present study various parameters like mass flow rate, wall enhancement and mesh refinement of plasma combustion system was investigated by CFD Simulation. Simulation results shows that wall temperature is more effective as compare to other parameters. Temperature and pressure is getting a higher range when we increased the wall temperature and emissions is decreased due to high combustion rate. When we update the whole Plasma combustion system from coarse to fine Mesh slight change is shown on the simulation results which means mesh refinement is also effective for Numerical investigation of any computational fluid Dynamics system.

Key words: Repowering, Thermal power plant, Energy, Plasma combustion Plasma CFD, Fluent etc.

1. INTRODUCTION

The technology of plasma ignition of coal and its realizing plasma-fuel systems (PFS) is electro- thermo-chemical preparation of fuel to burning (ETCPF) [1] – [6]. In this technology pulverized coal is replaced traditionally used for the boiler start up and pulverized coal flame stabilization fuel oil or natural gas. Part of the coal/air mixture is fed into the PFS where the plasma-flame from plasma torch, having a locally high concentration of energy, induces gasification of the coal and partial oxidation of the char carbon. As coal/air mixture is deficient in oxygen, the carbon being mainly oxidized to carbon monoxide. As a result, a highly reactive fuel (HRF) composed of mixture of combustible gases (at a Temperature of about 1300 K) and partially oxidized char particles is obtained at the exit of the PFS. On entry to the furnace, this HRF is easily ignited. Plasma assisted coal combustion is a relatively unexplored area in coal combustion science and only a few references are available on this subject [1]. Coal fired utility boilers face two problems, the first being the necessity to use expensive oil for start-up and the second being the increased commercial pressure requiring operators to burn a broader range of coals, possibly outside the specifications envisaged by the manufacturer's assurances for the combustion equipment. Each of these problems results in a negative environmental impact. Oil firing for start-up increases the gaseous and particulate burden of the plant. The firing of poorer quality coals has two disadvantages: reduced flame stability performance necessitating oil support and its consequential emissions and cost implications; and reduced combustion efficiency due to a increased amounts of carbon in the residual ash, resulting in an increase of emissions per MW of power generated. Plasma aided coal combustion represents a new effective and ecological friendly technology, which is equally applicable to alternative 'green' solid fuels. One of the prospective technologies is Thermo Chemical Plasma Preparation of Coals for

Burning (TCPPCB). This technology addresses the above problems in TPP. The realisation of the TCPPCB technology comprises two main steps. The first includes numerical simulations and the second involves full-scale trials of plasma supported coal combustion in a TPP boiler. For both the numerical study and full-scale trials, the boiler of 200 MW power of Gusinoozersk TPP (Russia) was selected. In the framework of this concept some portion of pulverized solid fuel (pf) is separated from the main pf flow and undergone the activation by arc plasma in a special chamber – PFS (Fig.1). The air plasma flame is a source of heat and additional oxidation, it provides a high temperature medium enriched with radicals, where the fuel mixture is heated, volatile components of coal arc extracted, and carbon is partially gasified.

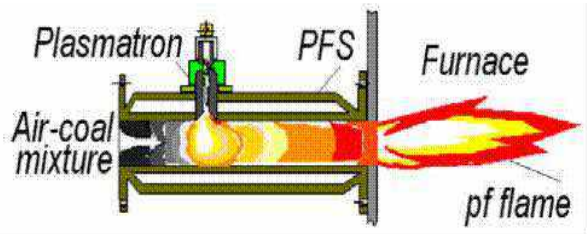

Figure 1 Arch plasma in a special chamber

This active blended fuel can ignite the main pf flow supplied into the furnace. This technology provides boiler start-up and stabilization of pf flame and eliminates the necessity for additional highly reacting fuel. PFS have been tested for boilers plasma start-up and flame stabilization in different countries at 27 power boilers steam productivity of 75 to 670

TPH equipped with different type of pulverized coal burners [3]. At PFS testing power coals of all ranks (brown, bituminous, anthracite and their mixtures) were used. Volatile content of them varied from 4 to 50%, ash - from 15 to 48% and calorific values - from 6700 to 25100 kJ/kg.

2. LITERATURE REVIEW

Beyca n Ibrahimoglu , M. Zeki Yilmazoglu , Ahmet Cucen[1] In this study, numerical analyses of repowering of a thermal power plant boiler using plasma combustion systems were performed. In order to reduce the energy consumption of the power plant, fuel-oil burners were disassembled and plasma combustion systems were installed on t e surfaces of the boiler. The integration procedure, design data, and boundary conditions were given in detail. Superheater, economizer tubes (dome) were modeled as porous media and the pressure losses of each section were compared with design data. The power plant was modeled according to the design parameters using the Thermoflex commercial software, in order to find the heat loads of each boiler section. These results were used as input data in CFD (Computational Fluid Dynamics) code. ANSYS Fluent was used for numerical analyses. Temperature contours, velocity vectors, and isosurfaces of temperature in the furnace were compared. According to the results, the integration of the plasma combustion systems to the boiler slightly decreases the velocities at the inlet of each domain. Additional energy from the plasma combustion system has no reverse effect in the case of overheating, especially for convective surfaces. **V. E. Messerle, A. B. Ustimenko, and O. A. Lavrichshev[2]** Application of direct-flow and vortex plasma-fuel systems (PFS) for coal-fired boilers of thermal power plants (TPP) at Ust-Kamenogorsk, Shakhtinsk, and Almaty (TPP-2 and TPP-3) (Kazakhstan) is discussed. In the plasma technology coal replaces traditionally used for the boiler start up and pulverized coal flame stabilization fuel oil or natural gas. Part of coal/air mixture is fed into the PFS where the plasma-flame from plasma torch induces gasification of the coal and partial oxidation of the char carbon. As coal/air mixture is deficient in oxygen, the carbon being mainly oxidized to carbon monoxide.

3. OBJECTIVE OF THE STUDY:

In present study we will investigate the plasma combustion model with various operating parameters like mass flow rate, Turbulence intensity and wall enhancement for the better mixing and penetration of Air/Fuel mixture. In the second step we will also investigate the mesh refinement of the plasma combustion model for the better accuracy of the simulation results.

4. METHODOLOGY

4.1 CFD METHOD APPLIED

The model was simulated and the required geometry configurations were pre-processed in ANSYS 14.5. This following section illustrates the method used in the CFD simulations in this particular study.

STEP I GEOMETRY OR MODEL FORMATION

The study focuses on the to calculate the NOx percentage and the geometry used for the simulations is therefore only a part of the whole exhaust gas system in order to save computational time. The generation of the model by using ANSYS shown below:-

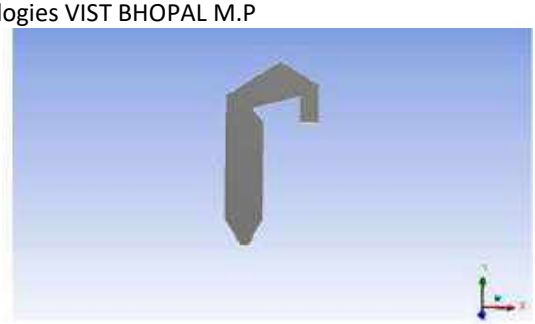

Figure 4.1 CAD MODEL

Figure 4.2 MESH MODEL

STEP 2

MESH FILE – To be Meshed

STEP 3 CHECKS THE MESH: -

Various checks on the mesh and reports the progress in the console. Also check the minimum volume reported and make sure this is a positive number select mesh to mm.

METHODS

1. Pressure based
2. 3D Model is used.
3. Gravity is enabling

MODEL

1. Energy equation is enabled.
2. K-Epsilon turbulence model used.
3. P-1 radiation model is used, since it is quicker to run. However DO radiation model can be used for more accurate results in typical models.
4. Finite rate / eddy dissipation in turbulence chemistry. Interactions are used for species model.

STEP 4 SIMULATION SET UP

4.2 Boundary conditions

[1] INLET– 1. Fuel Inlet- Mass flow rate -0.5 , 1.0 and 1.5 Kg/s

2. Air Inlet – Stoichometric Ratio calculated by CFD

[2] Wall Enhancement – Wall Temperature – 500, 1000 and 1500 k

[3] Mesh Refinement – 1. Coarse – Element size – 3.21e-03

2. Fine Mesh - Element size – 2.03e-04

4.3 MATERIAL

Properties of SOMA/EYNES coal

Proximate analysis (as received) [wt.%]	
Moisture	25.22
Volatile matter	32.83
Fixed carbon	23.55
Ash	18.4
Ultimate analysis (dry basis) [wt.%]	
C	39.48
H	2.95
N	0.59
O	12.83
S	0.53
Lower heating value [kJ/kg]	14.248

1. Mixing law is used and chemical kinetic mechanism is used for NOx evaluation.
2. Thermal conductivity: - Define two polynomial coefficients

(a) 0.0057894 (b) $5.1247*10^{-6}$

3. Polynomial coefficient for viscosity

(a) 8.945e-07 (b) 3.2145e-9

4. For absorption coefficient take stable domain.
5. Scattering coefficient is 1.5e-9.

STEP 5 SOLUTIONS Method

1. Coupled
2. Presto model is used:-

Presto model is often used for buoyant flows where velocity vector near walls may not align with the wall due to assumption of uniform pressure in the boundary layer so presto can only be used with quadrilateral or exhahyderal.

Meshes:- Pseudo transient is enabled

1. 0.1 time scale factor of turbulent kinetic energy and turbulent dissipation rate
2. Time scale factor of species and energy is 10

NOTE: - Higher time scale size is used for the energy and species equation to converge the solution in less number of iterations.

SOLUTION INITIALISATION: - The solution is initialized

RUN CALCULATION: - Start the calculation for 1500 iterations.

***5.* Results & Discussion**

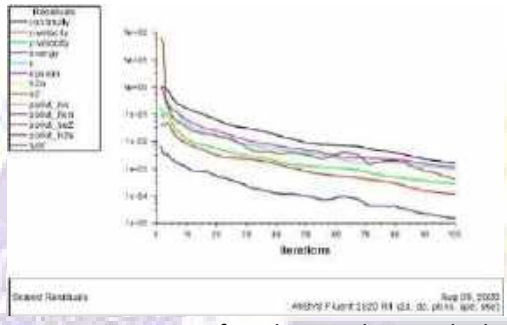

Figure 1 Progress of Analysis Scales Residuals

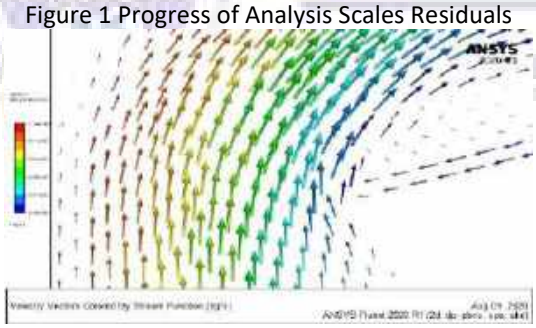

Figure 2 Velocity Stream line Function

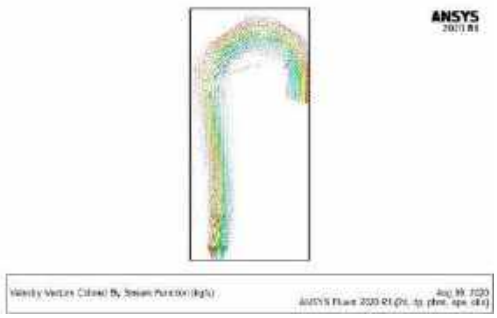

Figure 3 Velocity Vector contour by Stream Function

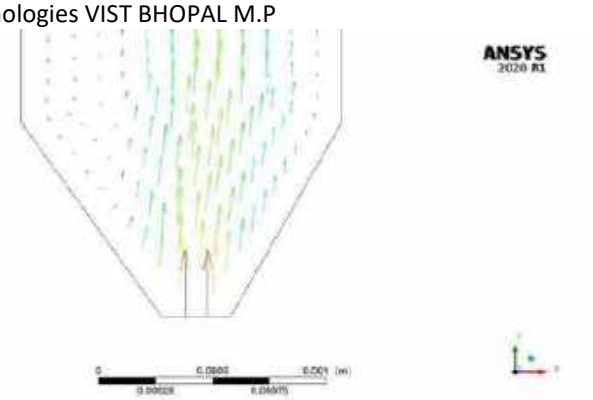

Figure 4 Velocity Vector contour (close up) by Stream Function

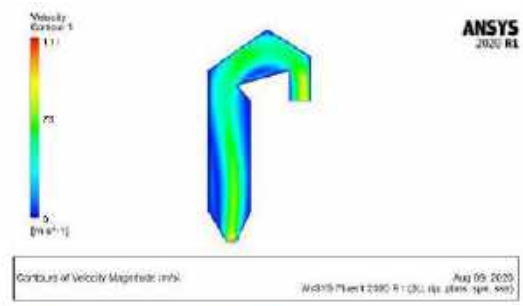

Figure 5 Velocity Magnitude (m/s) of Case

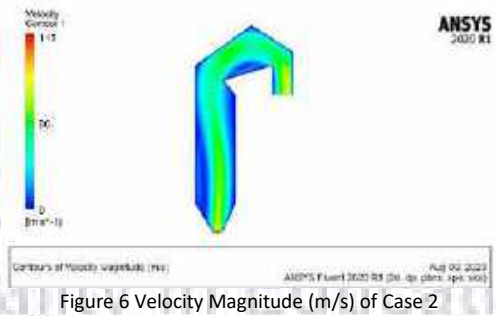

Figure 6 Velocity Magnitude (m/s) of Case 2

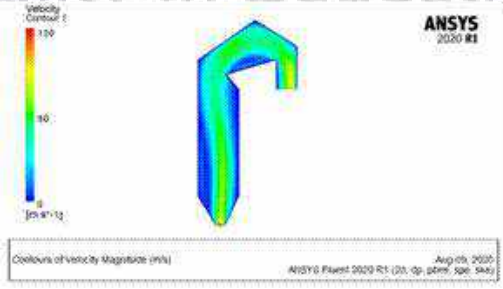

Figure 7 Velocity Magnitude (m/s) of Case 3

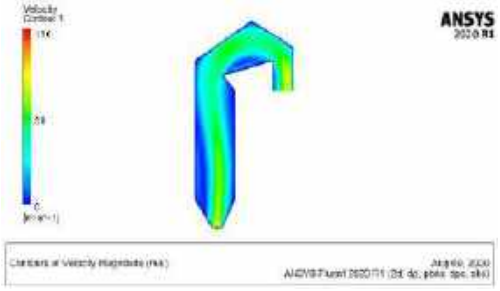

Figure 8 Velocity Magnitude (m/s) of Case

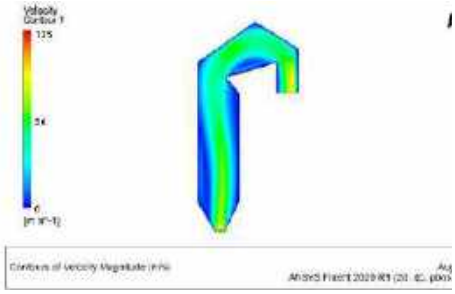

Figure 9 Velocity Magnitude (m/s) of Case 5

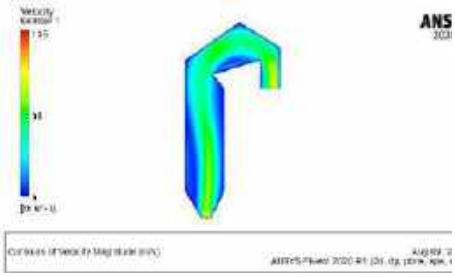

Figure 10 Velocity Magnitudes (m/s) of Case 6

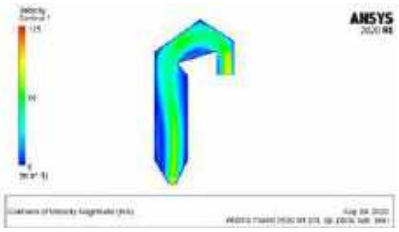

Figure 11Velocity Magnitude (m/s) of Case

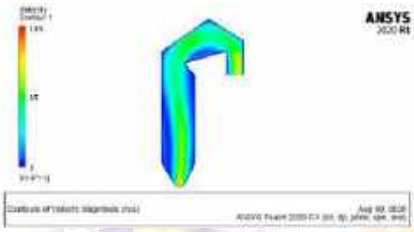

Figure 12Velocity Magnitude (m/s) of Case 8

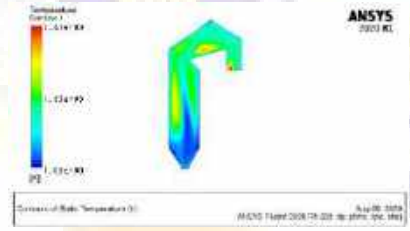

Figure 13 Temperature (K) of Case 1

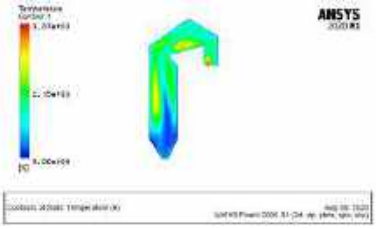

Figure 14 Temperature (K) of Case 2

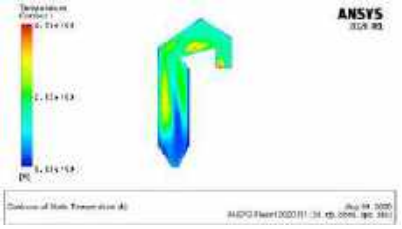

Figure 15 Temperature (K) of Case 3

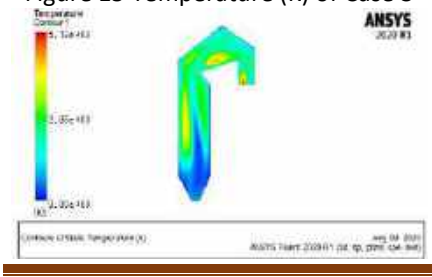

Figure 16 Temperature (K) of Case 4

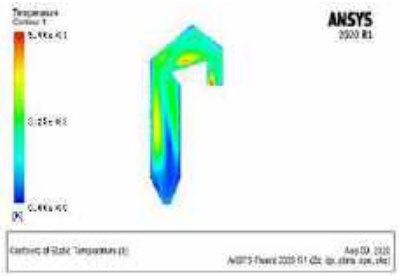

Figure 17 Temperature (K) of Case 5

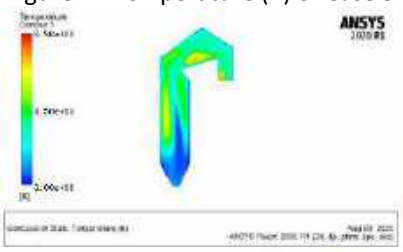

Figure 18 Temperature (K) of Case 6

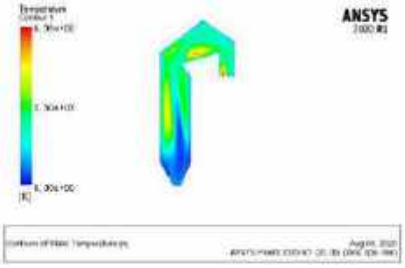

Figure 19 Temperature (K) of Case 7

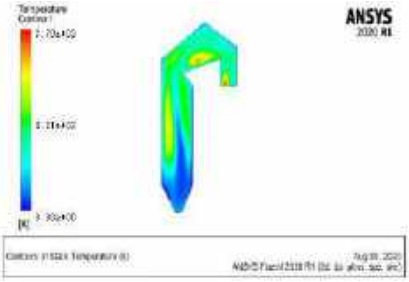

Figure 20 Temperature (K) of Case 8

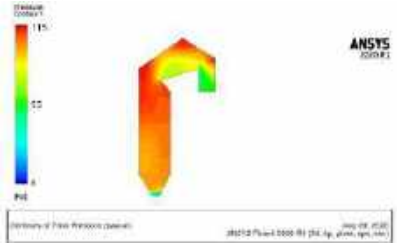

Figure 21 Total Pressure (Pa) of Case 1

Figure 22 Total Pressure (Pa) of Case 2

Figure 23 Total Pressure (Pa) of Case 3

Figure 24 Total Pressure (Pa) of Case 4

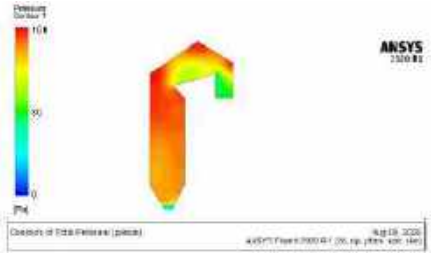

Figure 25 Total Pressure (Pa) of Case 5

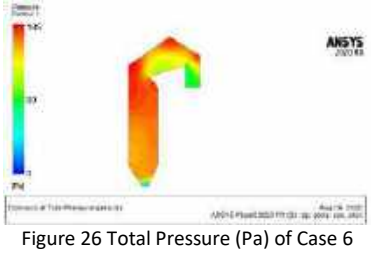

Figure 26 Total Pressure (Pa) of Case 6

Figure 27 Total Pressure (Pa) of Case 7

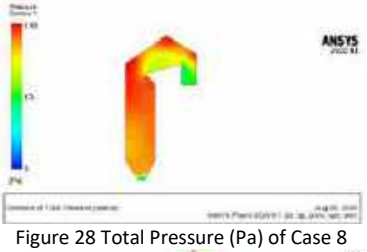

Figure 28 Total Pressure (Pa) of Case 8

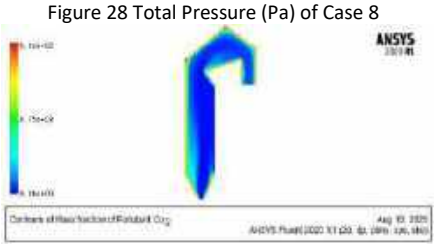

Figure 29 Mass fraction of CO2 in Case 1

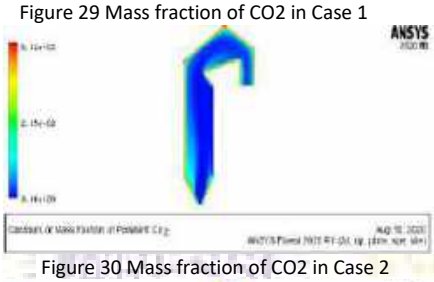

Figure 30 Mass fraction of CO2 in Case 2

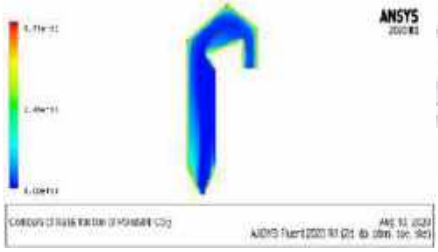

Figure 31 Mass fraction of CO2 in Case 3

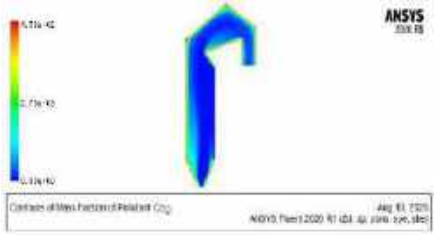

Figure 32 Mass fraction of CO2 in Case 4

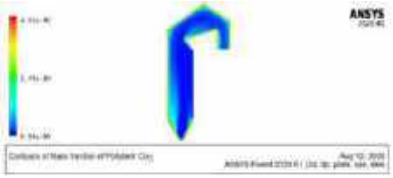

Figure 33 Mass fraction of CO2 in Case 5

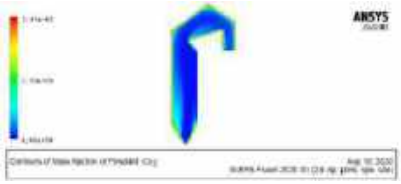

Figure 34 Mass fraction of CO2 in Case 6

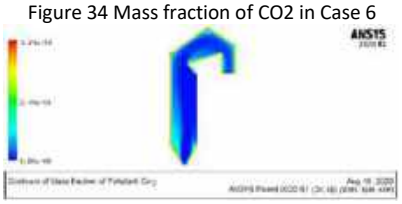

Figure 35 Mass fraction of CO2 in Case 7

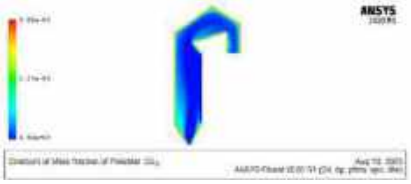

Figure 36 Mass fraction of CO2 in Case 8

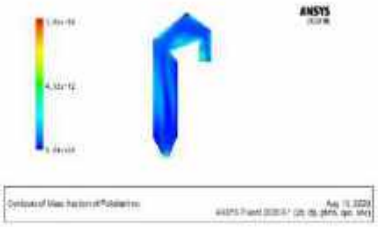

Figure 37 Mass fraction of NO in Case 1

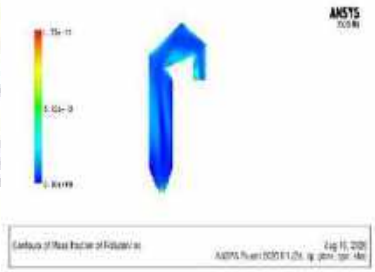

Figure 38 Mass fraction of NO in Case2

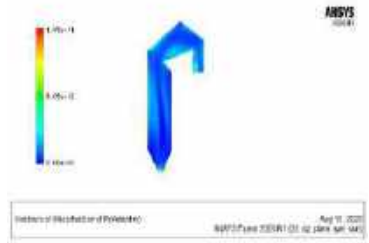

Figure 39 Mass fraction of NO in Case 3

Figure 40 Mass fraction of NO in Case 4

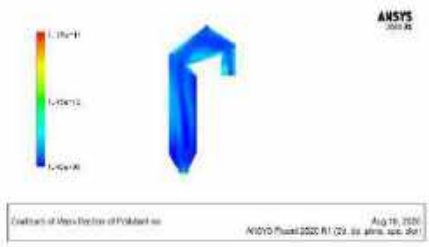

Figure 41 Mass fraction of NO in Case 5

Figure 42 Mass fraction of NO in Case 6

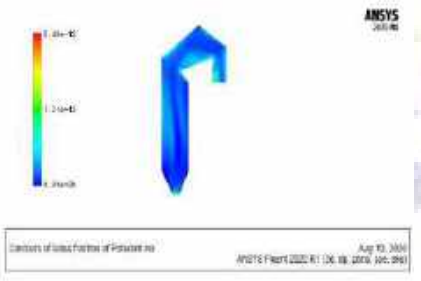

Figure 43 Mass fraction of NO in Case 7

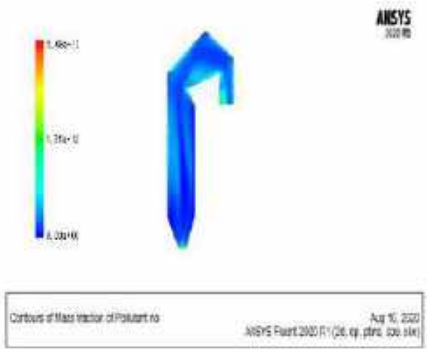

Figure 44 Mass fraction of NO in Case 8

Result Table

Plasma Combustion Operational Parameters → / ↓	Mass flow rate (Kg/s) Study No. 1			Wall Enhancement (K) Study No. 2			Mesh Refinement Study No. 3	
	Case1	Case2	Case3	Case4	Case5	Case6	Case7	Case8
Final Outcomes	0.5	1	1.5	500	1000	1500	Coarse	Fine
Temperature (K)	3410	3870	4560	5120	5800	6560	6560	6700
Total Pressure (Pa)	115	135	165	175	180	185	185	190
Velocity (m/s)	111	115	130	130	135	135	135	138
Mass Fraction of C02	5.02e-02	5.62e-02	5.71e-02	4.58e-02	4.32e-02	3.21e-02	3.21e-02	3.29e-02
Mass Fraction of N02	1.62e-11	1.75e-11	1.85e-11	1.46e-11	1.25e-11	5.46e-12	5.46e-12	5.48e-11

5. CONCUSION

In results table comparison between various mass floe rate, wall enhancement and mesh refinement of the plasma combustion system is shown. In plasma combustion velocity of the profile is slow down so the residence time of combustion is increased which is helpful for emission reduction because complete combustion can be achieved with increasing residence time and pressure drop is also decreasing in stable system. The velocity profile of each burner stage was investigated before and after the integration of the plasma combustion systems. The flame has to be a rotational characteristic to ensure the mixing and turbulence. As a result of mixing and turbulence, a complete combustion can be achieved. Finally we calculate the emissions of COx and NOx from CFD simulation and using chemical kinetics mechanism for NOx evaluation.

Comparison between conventional and plasma combustion is clearly shown on results table that all the emissions (COx & NOx) have a lower value in case of plasma type combustion and this is happened due to the complete combustion as compare to conventional oil fuel combustion . In plasma combustion there is no need oil for start-up operation and flame stabilization, that why it is a cost effective method also. Plasma activation of coal particles instead of using fuel-oil burners promotes more effective and environment friendly combustion

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Development of Hybrid Solar Thermal System With Dish Concentrators and Fresnel Lens for Hot Water Generation.

[1]Arunesh Verma,[2] Vardan Singh, [3]Arun Kumar Patel, [4]Amit Vishwakarma[1]
[1]MTech Scholar, Vidhyapeeth institute of science and technology Bhopal, India
[2]Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[3] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[4] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[1]arunesh.om@gmail.com, [2] nayak.vardansingh@gmail.com, [3]patel.arun2020@gmail.com, [4]amitvishwa4@gmail.com

Abstract:- **Solar water heating is the only solar energy-based technique that's been widely commercialized because to its great reliability and low cost compared to other methods. The components of a solar water heating system usually include solar collectors, a water storage tank, pipes, and an auxiliary heating device, among other components. A solar heating system's core component, the collector or receiver, converts solar energy into heat and then transmits that heat to a fluid passing through it. In previous project a 4 foot diameter parabolic solar collector for experimental testing in order to create a commercial water heating system for residential usage is designed and fabricated. After three sets of studies, we've discovered an average temperature increase of 35 degrees centigrade above ambient while the receiver is focused open to the air and the incoming water flow rate is 600 ML per Minute. Second, at a mass flow rate of 600 ML per Minute with a receiver at focus covered with a black box, we found an average temperature of 45 degrees centigrade higher than ambient. Third, in a pump-provided system for 20L water, we noticed an average 46-degree centigrade rise in temperature over the course of an hour when the receiver was covered with a black box. The average temperature found at the receiver part was around 150 degree centigrade but we have not received this amount of thermal energy in useful cause as indicated in the results above. In current project a Fresnel lens of 12*8 inches is fixed at optimum height near focus of the dish and the radiations are intensified with it. Thermal energy generated is further received on same receiver and found increment in it.**

Key words:- **concentrated solar energy, dish collector, Fresnel lens, receiver material, solar thermal, thermal efficiency,**

1 Introduction

Solar thermal energy is one form of energy and different technologies are available for harnessing solar energy and to generate thermal energy which will be used for different applications. Solar thermal collectors are used to convert the solar energy coming from sun into thermal energy, which consists of reflector and receiver. Solar thermal collectors are classified into low, medium and high temperature collectors. The collectors concentrate sunlight using mirrors or lenses. The parabolic dish, trough and tower systemsare the types of high temperature collectors. Compared to trough and tower collectors the parabolic dish collector paid the most attraction in the field of solar thermal power generation research due to its less area requirement , higher system efficiency and concentration ratio. This type is more suitable for small and medium scale applications with high temperature output

1.1 Classification Of Solar Collectors

A solar collector (reflector and receiver) is a device that collects solar radiations and converts into heat energy, then transfers the heat energy in to a fluid which is passing through the receiver. Utilization of solar energy requires solar collectors. Two types of solar collectors are available and are listed below.

- Non-concentrating solar collector
- Concentrating solar collector

In non-concentration type, the glazing (glass cover plate) area which transmit the solar radiations on to the collecting surface (absorber area) and collecting area are same (concentration ratio is 1). On the other hand, in concentrating collectors the concentration ratio is high sometimes hundred times greater than the non-concentrating (flat plate) collector. Non concentrating or stationary collectors are permanently fixed in position and do not track the sun, this type of collectors can achieve the temperature range of 30-80^{o}C (Kalogirou 2004). For higher temperature range, the concentrating collectors are more suitable than the non-concentrating collectors.

1.2 Concentrating Solar Collectors

In this type of collectors the solar radiation reflected by the reflector surface are focused on to the smaller surface (absorber) area of the receiver, only the direct radiation are reflected and indirect radiation are not reflected by reflector. The range of temperature achieved is based on the ratio of reflector area to the absorbing area (absorber) of the receiver; it is defined as concentration ratio of the collector system.

1.2.1 Types Of Concentrating Solar Collectors

There Are Four Basic Types Of Concentrating Collector

1. .Parabolic dish collector
2. Parabolic trough collector
3. Linear Fresnel lens/ reflector
4. Central tower receiver

1.**3. Parabolic Dish Collector**

These are dish-shaped parabolic mirrors as reflectors to focus and concentrate the sun's rays onto a receiver, which is mounted above the reflector. It works by focusing the Direct Normal Irradiations (DNI) from the sun with a dish shaped surface onto a cavity absorber area of the receiver, which transfer the absorbed heat to the heat transfer fluid. The possible temperature ranges of heat transfer fluid is100 to 1500^{o}C (BarIiv *et al.*2011), with the concentration ratio range of 100 to 1000. More number of setups is connected in series when this type of collectors is used in larger power plants.

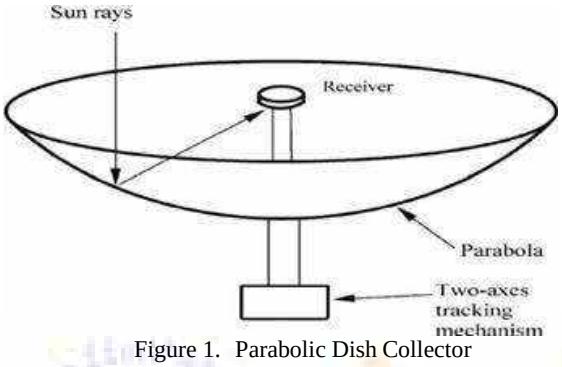

Figure 1. Parabolic Dish Collector

1.3.1 Components Of Parabolic Dish Collector

A parabolic dish collector is similar in appearance to a large satellite dish, but has mirror-like reflectors and an absorber at the focal point. It uses a dual axis sun tracker. A parabolic dish system uses a computer to track the sun and concentrate the sun's rays onto a absorbing area (absorber)of the receiver located at the focal point in front of the reflector. The receiver absorbs the reflected solar energy and transfers it into the HTF, which is circulated inside the receiver. Collector system can attain a temperature of about 1500ºC. The main components of parabolic dish collector system are dish reflector, receiver, support structure and tracking system.

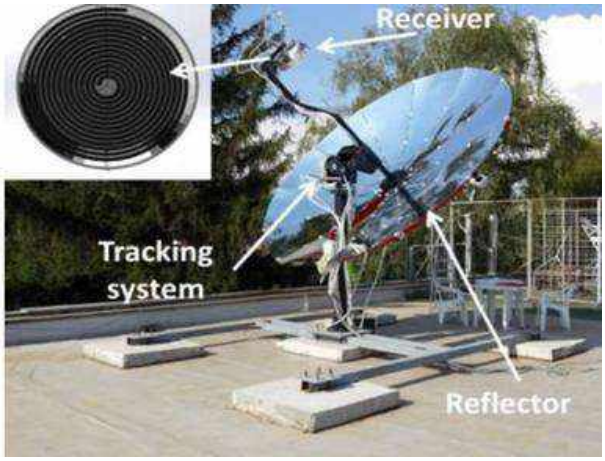

Figure 2 Parabolic dish collector system

DISH REFLECTOR

A parabolic dish reflector reflects and concentrates the sun's rays to the cavity receiver which is located at the focal point of the receiver. The reflector is made upon by the parabolic dish shaped mirrors or polished metal sheets with optimum reflectivity. The glass mirrors with reflective silver layer coating on the back side of the glass is used as the reflector. A special multilayer paint coating below the silver layer protects the silver and to ensurethe better performance of the reflector.

Cavity Receiver

Cavity receivers are either single or multi cavity type. It absorbs or receives the solar radiations and transfers its energy into the heat transfer fluid. There are two types of receivers: tubular and volumetric. Tubular receivers are used when liquid HTF such as water, molten salt thermic oil and liquid sodium are used. The volumetric receiver's are used when air or super critical CO_2 are used as HTF. The type of receiver used is also depends upon power cycle (Rankine or Brayton) used in the system.

Supporting Structure

Steel supported structure in the back of the reflector mirror provides mechanical strength to the collector to withstand the wind loads. Themain emphasis is to minimize the weight of the support structure and also to reduce the deformation of the structure, which ensures exact and effective focus of the solar radiation to the absorber cavity.

Tracking Mechanism

A tracking mechanism of dish is usually aligned on a east-west axis to track the sun during the day time and also has the mechanism to set the track for seasonal positions of the sun. The tracking mechanism operated mechanically and controlled by computer programming. The computer control tracking system gives high accuracy in tracking and give higher efficiency.

1.4 Domestic Hot Water And Its Need:

Everywhere in the country, demand for hot bath water varies enormously. When it's cold outside, a medium-sized family needs 85 liters of hot water each day to accomplish things like wash dishes, soak grains, and cook. Hot water is typically utilized around 68 degrees centigrade, according to research. Greentech Knowledge Solutions (P) Ltd New Delhi conducted a survey to find out how often people use hot water. According to these statistics, households used hot water for an average of six months out of the year. Climate change and human behavior have an impact on hot water usage, according to the results of a main survey (which is influenced by culture and traditional practices).

According to the results of the survey, there is a large demand for hot bathing water outside of cold and mild climate regions (>8 months of the year). Maharashtra, Kerala and Tamil Nadu households report using hot water for more than eight months of the year, despite the warm temperature. The use of hot water is common in a wide range of businesses, from dairy processing to soap manufacture to chemical manufacturing to hotels.

Heat is generated by a variety of things, including: Water can be heated using a variety of methods, the most common of which are liquid fuel, wood burning, or electric geysers. When deciding on a mode, keep in mind the costs of both operation and maintenance. Furthermore, the ecosystem is harmed by the produced flue gases.

As previously said, solar water heating can be an important approach to promote free energy systems while also operating at a low cost per unit of used energy. The study found that installing a solar water heater pays for itself in fuel savings within a year, even if the upfront cost is higher.

2. LITERATURE REVIEW

1. **Anurag arpan, Vardan Singh** have designed and fabricated a 4 foot diameter parabolic solar collector for experimental testing in order to create a commercial water heating system for residential usage. After three sets of studies, they've discovered an average temperature increase of 35 degrees centigrade above ambient while the receiver is focused open to the air and the incoming water flow rate is 600 ML per Minute. Second, at a mass flow rate of 600 ML per Minute with a receiver at focus covered with a black box, they found an average temperature of 45 degrees centigrade higher than ambient. Third, in a pump-provided system for 20L water, they noticed an average 46-degree centigrade rise in temperature over the course of an hour when the receiver was covered with a black box.

2. ***Nawar Saif*** **Al-Dohani et al** have developed a proto Fresnel lens power house which was made to generate electricity. The focused heat from Fresnel lens was used to heat the molten salt in a heat exchanger to produce the steam. The generated steam was used to rotate the steam engine coupled to a generator. In the work, a maximum power of 30 W was produced. In addition, comparative study was carried out regarding solar salts and heat exchanger materials to understand the Fresnel powerhouse performance. Overall their study gave valuable information regarding usage of Fresnel lens for electricity generation in Oman.

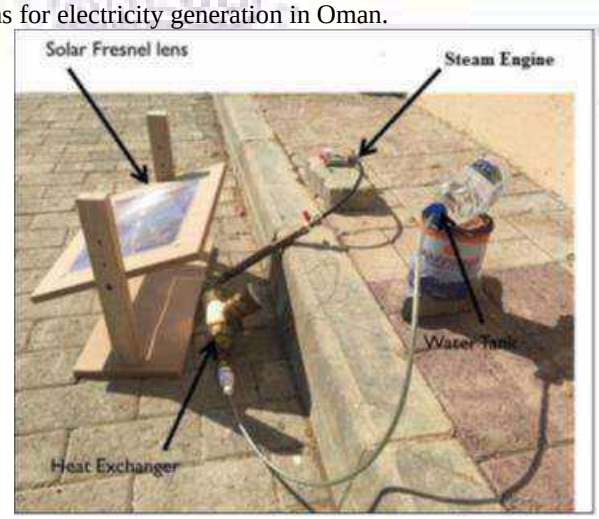

Figure 3 example of Solar hater

2. **Abdukkarim Hamza El-Ladan et al** The preliminary data collected shows that there is great potential in using Fresnel lens concentrator as a small standalone system for both cooking and electricity generation with high efficiency, easy to fabricate at a lower cost for communities to afford. Modification is on-going to produce a better and more efficient system using simple optics, which will reduce the overall cost and thereby reducing fossil fuel consumption which in return reduces CO2emission. Up till now no full-scale thermal systems using Fresnel lenses are known to be in operation as commercial power plant, it is time to give Fresnel lens technologies a chance for possible integration into the solar thermal concentrator system for both heat and electricity generation considering its higher stagnation temperature generation capability as compared to a parabolic trough of the same geometrical magnitude. The preliminary experimental result shows that the highest stagnation temperature recorded at the receivers of 50cm aperture parabolic trough, 50cm diameter 3mm thick Fresnel lens and 25cm 3mm thick Fresnel lens with no load were found to be about 170°C, 900°C and 250°C respectively. This indicates that the Fresnel lens technology is very promising, a small standalone system for both cooking and electricity generation with high efficiency, easy to re-fabricate at a lower cost can be actualized, modification is on-going to actualize this system, which will reduce the overall cost and thereby reducing fossil fuel consumption which in return reduces CO2 emission.

4. As a demonstration prototype,

J.Macedo-Valencia etal described the stages of design, modelling and assessment of a parabolic trough collector (PTC) for heating water. The parabolic aperture of 0.5 m wide by 0.95 m long was taken into account during the design process. Computer-aided design and manufacturing were used in the creation of the design. To determine the thermal performance of the parabolic trough collector, the results of the evaluation showed that at a flow rate of 0.200 L/min and a solar radiation of 783 W/m2, the maximum output temperature was 47.3 °C.

3. Problem Formulation And Objective: -Problem:-

In previous project (our base paper) a 4 foot diameter parabolic solar collector for experimental testing in order to create a commercial water heating system for residential usage was designed and fabricated. After several set of experiments the water was heated up to 45℃ above ambient temperature also the mass flow rate was 600 Ml per Minute but the average temperature found at the receiver part was around 150 degree centigrade but we have not received this amount of thermal energy in useful cause as indicated in the results above.

Figure 4 Previous experimental model of dish collector and receiver system.

Objective:-

In current project we shall place a Fresnel lens at optimum distance near focus so that the heat produced through solar radiations shall be more intensified and shall get better results, so that the existing water heating systems shall be replaced by this new commercial model.

4. Construction of Model

So as to satisfy the objective we have developed model in two stages.

4.1 The concentrator and receiver

Figure 5 Proposed construction of setup

The construction of setup is done in following steps and shown in figure. 5

1. A 1200 mm diameter dish with depth of 240 mm is made of MS sheet.
2. Mirrors are pasted by adhesive on its surface
3. The parabolic dish is mounted on a structure so as to find necessary angular moment and able to be adjusted in different angles incident to sun.
4. Receiver coil of 300 * 240 mm is made by a copper tube of 12mm diameter and placed at the focus of dish.

4.2 The Fresnel lens

A rectangular Fresnel lens of glass of 240*300 mm is used in this work as shown in the figure which itself is producing temperature of 107.5 C in just one minute time. Now the lens is kept at focus of the dish and receiver coil nearer to focus of lens. Water tank connected with the receiver is now allowed to pass and the results are viewed

a) A rectangular Fresnel lens of glass

Figure 6 A rectangular Fresnel lens of glass

5. EXPERIMENTATION AND OBSERVATION

The experimentation shall be done in two set of events.

Event I :- Receiver at focus open in air (without lens)

Note: -

• *All temperature readings are taken in degree Celsius.*

• *For both events a submersible pump is put in tank of 10 L and water is circulated and readings are taken for half hour*

a)

b)

Event I Observation date 01.03.2022

S.NO.	TIME	AMBIENT TEMPRATURE	TEMPERATURE OF RECEIVER	INLET TEMPRATURE	OUT LET WATER TEMPERATURE	TEMPERATURE DIFFERENCE
1	10:00am	32	35	22	25	3
2	10:10am	32	38	25	31	6
3	10:15am	32	43	31	38	7
4	10:20am	32.5	49	38	44	6
5	10:25am	32.7	54	44	47	3
6	10:30pm	33	63	47	55	8

Event I Observation date 02.03.2022

S.NO.	TIME	AMBIENT TEMPRATURE	TEMPERATURE OF RECEIVER	INLET TEMPRATURE	OUT LET WATER TEMPERATURE	TEMPERATURE DIFFERENCE
1	10:00am	30	34	22	24	2
2	10:10am	30	40	24	30	6
3	10:15am	31	56	30	39	9
4	10:20am	32	58	39	43	4
5	10:25am	32.5	63	43	45	2
6	10:30pm	33	69	45	52	7

Event I Observation date 03.03.2022

S.NO.	TIME	AMBIENT TEMPRATURE	TEMPERATURE OF RECEIVER	INLET TEMPRATURE	OUT LET WATER TEMPERATURE	TEMPERATURE DIFFERENCE
1	10:00am	28	33	22	26	4
2	10:10am	28	38	26	28	2
3	10:15am	29	47	28	33	5
4	10:20am	31	51	33	36	3
5	10:25am	31.6	56	36	40	4
6	10:30pm	32.1	67	40	44	4

The average rise in temperature found is 28 degree centigrade in this event.

Event II :- Receiver at focus of lens and open in air

Event II Observation date 04.03.2022

S.NO.	TIME	AMBIENT TEMPRATURE	TEMPERATURE OF RECEIVER	INLET TEMPRATURE	OUT LET WATER TEMPERATURE	TEMPERATURE DIFFERENCE
1	10:00am	28	37	22	25	3
2	10:10am	28.7	41	25	33	8
3	10:15am	29.1	48	33	40	7
4	10:20am	30	52	40	48	8
5	10:25am	32	59	48	55	7
6	10:30pm	32.8	67	55	64	9

Event II Observation date 05.03.2022

S.NO.	TIME	AMBIENT TEMPRATURE	TEMPERATURE OF RECEIVER	INLET TEMPRATURE	OUT LET WATER TEMPERATURE	TEMPERATURE DIFFERENCE
1	10:00am	31	33	22	25	3
2	10:10am	31	39	25	31	6
3	10:15am	31.6	46	31	39	8
4	10:20am	32	53	39	45	6
5	10:25am	32.3	62	45	52	7
6	10:30pm	32.8	71	52	60	8

Event II Observation date 06.03.2022

S.NO.	TIME	AMBIENT TEMPRATURE	TEMPERATURE OF RECEIVER	INLET TEMPRATURE	OUT LET WATER TEMPERATURE	TEMPERATURE DIFFERENCE
1	10:00am	32	33	22	27	5
2	10:10am	32.2	40	27	31	4
3	10:15am	32.8	51	31	39	8
4	10:20am	33	59	39	48	9
5	10:25am	33.6	66	48	55	7
6	10:30pm	34	73	55	63	8

The average rise in temperature found is 40 degree centigrade in this event

6. Conclusion

The experimentation in this work shows that the performance of parabolic solar collectors. Parabolic solar collector of 4 feet diameter with Fresnel lens is designed and fabricated for experimental testing so as to make a commercial water heating system for house hold purpose.

The experiments are done are in two set of events, first when receiver at focus a pump provided system for 10L water we have found average 28 degree centigrade rise in temperature in a duration of half hour. second when receiver at focus of lens and dish both and a pump provided system for 10L water we have found average 40 degree centigrade rise in temperature in a duration of half hour.

Analysis shows that design of solar water heating system should be done based on demand of solar water and non-useful roof area allowable for the installation of solar collectors. Economic analysis indicates that solar water heating system is much attractive compared to electric and gas heaters so this model can be viewed as a new commercial model to replace existing water heating systems.

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Mathematical modeling and Investigation of Mixing characteristics in combustion system of Jet Engine using CFD

SADDAM HUSSAIN
M.Tech Scholar Mechanical Engg. Dept. VIST, Bhopal
VARDAN SINGH NAYAK, AMIT VISHWAKARMA, ARUN KUMAR PATEL
Asst. Professor Mechanical Engg. Dept. VIST, Bhopal

ABSTRACT Among the three critical components of the scramjet engine, the combustor presents the most formidable problems. The complex phenomenon of supersonic combustion involves turbulent mixing, shock interaction and heat release in supersonic flow. The flow field within the combustor of scramjet engine is very complex and poses a considerable challenge in design and development of a supersonic combustor with an optimized geometry. Such combustor shall promote sufficient mixing of the fuel and air so that the desired chemical reaction and thus heat release can occur within the residence time of the fuel-air mixture. In order to accomplish this task, it requires a clear understanding of fuel injection processes and thorough knowledge of the processes governing supersonic mixing and combustion as well as the factors, which affects the losses within the combustor.

Development of scramjet engines of satisfactory performance requires enhancement of the fuel-air mixing and flame stabilization. The effect of geometrical shape of fuel injector on fuel-air mixing and flame stabilization is investigated numerically in the current study. A numerical tool is developed using the Reynolds Average Navier-Stokes equations. Chemical kinetics model is employed to compute the finite rates of the chemical reactions. The topics covered include the fundamental problem of supersonic mixing layers, high-speed combustion modeling efforts, and actual calculations of realistic scramjet combustors. In present investigation we compare the two different type of fuel injector on the basic of combustion rate , shock wave structure and stability of flow field . Simulative results show that in Pylon injector total temperature and energy is increased due to rapid mixing of air-fuel as compare to the central wedge shape injector. Shock wave absorbing capacity and stability of flow field is balanced in case of Pylon Injector as per stream line flow.

Keywords: Scramjet Engines; Computational Fluid Dynamics; Chemically- Reacting Flows; Reynolds-Averaged Navier-Stocks; Turbulent Flows; Supersonic Combustion, Central strut injector, Pylon Injector.

1. INTRODUCTION

The Supersonic Combustion Ramjet (SCRAMJET) motor has been seen as the most encouraging air-breathing impetus framework for the hypersonic flight (Mach number above 5). Lately, innovative work of scramjet motor has advanced the investigation of ignition in supersonic stream. Broad examination is being completed over the world for understanding the scramjet innovation with hydrogen fuel with huge consideration concentrated on different eras of space launchers and worldwide quick response observation missions. In any case, application for the scramjet idea utilizing high warmth sink and hydrogen fills offers essentially upgraded mission potential for future military strategic rockets. Scramjet being an air-breathing motor. The execution of the rocket framework in light of the scramjet drive is imagined to improve the payload weight and rocket range. Supersonic burning ramjet motor for an air breathing drive framework has been identified and exhibited by USA on ground and in flight. Real center towards enhancing the scramjet combustor execution is delivered to the successful blending of fuel and air. Because of highly active vitality of the air stream, cross stream blending in the middle of fuel and air is extremely troublesome. Henceforth unique liquid instrument is required to accomplish complete blending.

The scramjet is composed of three basic components:

A focalizing bay, where approaching air is packed and decelerated, a combustor, where vaporous fuel is smoldered with barometrical oxygen to create heat, and a wandering spout, where the warmed air is quickened to deliver push. Not at all like a run of the mill plain motor, for example, a turbojet or turbofan motor, a scramjet does not utilize pivoting, fan-like segments to pack the air; rather, the achievable velocity of the flying machine traveling through the air causes the air to pack inside of the gulf. Thusly, no moving parts are required in a scramjet.

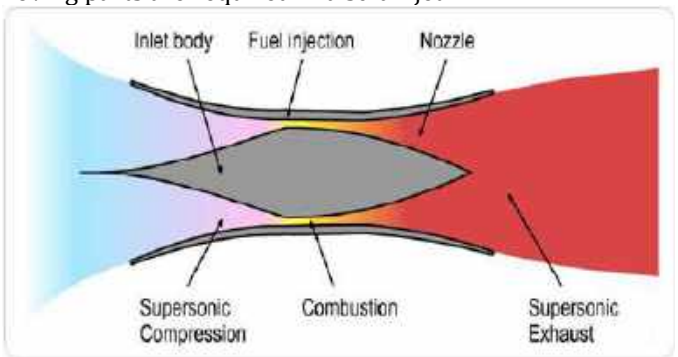

Fig.1.1- Basic Components of Scramjet

2. LITERATURE REVIEW

1.K.M.Pandey, *Member IACSIT* and A.P. Singh - Survey of experimental and numerical studies have been done for different complex flow fields with respect to different aspect by mixing of different types of fuel and mixture with high

speed flows in the combustion chamber. In this field many researchers worked to develop a configuration giving efficient mixing and combustion, also meeting the requirements of flame holding and completion of combustion with sufficient stabilization in the flow field. The main attention is paid to the local intensity of heat release, which determines, together with the duct geometry, techniques for flame initiation and stabilization, injection techniques and quality of mixing the fuel with oxidizer, the gas-dynamic flow regime. From the survey it concluded that some area in which more attention to be paid like total pressure loss in combustion chamber and design a contour to make the flow at Mach number 2 for various higher Mach numbers for supersonic combustion and analyze the flow properties in combustion chamber and its effect by using the variety of fuel with the help of CFD tool**.**

2. K.M.Pandey and T.Sivasakthivel - As one of the most promising propulsive systems in the future, the scramjet engine has drawn the attention of many researchers. The two-dimensional coupled implicit NS equations, the standard k-ε turbulence model and the finite-rate/eddy-dissipation reaction model have been applied to numerically simulate the flow field of the hydrogen fueled scramjet combustor with a planer strut flame holder under two different working conditions, namely, cold flow and engine ignition. The obtained results show that the numerical method used in this paper is suitable to simulate the flow field of the scramjet combustor. The static pressure distribution along the top and bottom walls for the case under the condition of engine ignition is much higher than that for the case under the condition of cold flow. There are three clear pressure rises on the top and bottom walls of the scramjet combustor. The eddy generated in the strut acts as a flame holder in the combustor, and it can prolong the residence time of the mixture in the supersonic flow.**3-DEEPU, Mukundan N.1*, GOKHALE, Sadanand. S.2, and JAYARAJ, Simon3**-Numerical simulation of supersonic combustion of hydrogen in air has been done using point implicit finite volume method. This method treats all chemical species terms implicitly and all other terms explicitly. Solver is based on the solution of unsteady, compressible, turbulent Navier-Stokes equations, using Unstructured Finite Volume Method (UFVM) incorporating RNG based κ-ε two equation model and time integration using three stage Runge-Kutta method. Reaction of hydrogen with air is modeled using an eight-step reaction mechanism.

3. OBJECTIVE OF THE STUDY:

This study demonstrates the evaporation and combustion of liquid fuel using the dispersed phase modeling capability to compute coupled gas flow and liquid spray physics. The mixture fraction/probability density function (PDF) equilibrium chemistry model is used to predict the combustion of the vaporized fuel. The mixture-fraction/PDF modeling approach allows you to model non-premixed turbulent combustion by solving a transport equation for a single conserved scalar. Multiple chemical species including radicals and intermediate species, may be included in the problem definition and their concentrations may be derived from the predicted mixture fraction using the assumption of equilibrium chemistry. Property data for the species are accessed through a chemical database. Turbulence-chemistry interaction is modeled using a PDF.

Our main objective of the study is to compare the different type of Fuel Injector in Scramjet combustor in supersonic model. In present study we have taken Hydrogen as a fuel and two type of fuel injector is used which is central strut wedge and Pylon Injector. Simulation will be done by FLUENT14.5. Comparison will be done with the basis of simulative results like Temperature, Pressure, Velocity Variation, Turbulent kinetic energy, Total energy, etc. CFD model (Flow pattern) will also give the information about Stability of the model that model is stable or not.

4. METHODOLOGY

Basic Steps to perform CFD Analysis:

1. Preprocessing:

- **CAD Modeling:** Creation of CAD Model by using CAD modeling tools for creating the geometry of the part/assembly of which you want to perform FEA.CAD model may be 2D or 3d.
- **Meshing:** Meshing is a critical operation in CFD. In this operation, the CAD geometry is discretized into large numbers of small Element and nodes. The arrangement of nodes and element in space in a proper manner is called mesh. The analysis accuracy and duration depends on the mesh size and orientations. With the increase in mesh size (increasing no. of element), the CFD analysis speed decrease but the accuracy increase.
- **Type of Solver:** Choose the solver for the problem from Pressure Based and density based solver. **Physical model:** Choose the required physical model for the problem i.e. laminar, turbulent, energy, multiphase, etc**.**
- **Material Property**: Choose the Material property of flowing fluid.
- **Boundary Condition:** Define the desired boundary condition for the problem i.e. velocity, mass flow rate, temperature, heat flux etc.

2. Solution:

- **Solution Method :** Choose the Solution method to solve the problem i.e. First order, second order
- **Solution Initialization:** Initialized the solution to get the initial solution for the problem.
- **Run Solution:** Run the solution by giving no of iteration for solution to converge**.**

3. Post processing.

- **Post Processing:** For viewing and interpretation of Result. The result can be viewed in various formats: graph, value, animation etc.

CFD Analysis of hydrogen combustion using Ansys Fluent

1. Preprocessing:

CAD Model: Generation of 2d axisymmetric geometry in Fluent.

CFD METHOD APPLIED

STEP I GEOMETRY OR MODEL FORMATION

The study focuses on the Analysis of Hydrogen Combustion Using ANSYS Fluent for the simulations. The generation of the model by using ANSYS shown below:

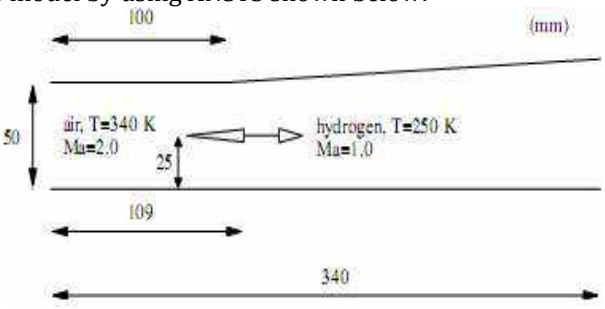

Figure-4.1: Reference model detail

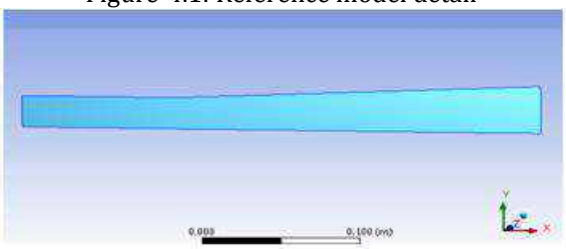

Figure 4.2 CAD Model of 2d Geometry

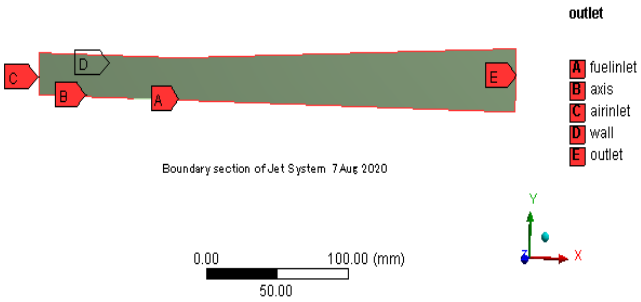

Figure 4.3 Boundary Section of Jet system for Simulation

STEP 2

MESH FILE – To Be Meshed Generated Mesh Model in the ANSYS shows in 4.5 , 4.6 and 4.7

Figure 4.4 Mesh Refinement (close-up) Model of 2d axis symmetry Geometry

Mesh Type: Grid meshing
Element Edge Length =2.5E-004 m
No. of Nodes = 167898
No. of Element = 124678

Fluent setup: After mesh generation define the following setup in the Ansys fluent.
Problem Type: 2D axisymmetric
Type of Solver: Pressure-based solver.
Physical model: Viscous: K, epsilon two equation turbulence model.
Use P1, Finite rate/ Eddy dissipation model
Material Property: Flowing fluid is air
Density of air = 1.225 kg/m^3
Viscosity = 1.7894e-05

Boundary Condition:

Operating Condition: Pressure = 101325 Pa

Variables	Air	H_2
Ma	3.0	1.0
U (m/s)	750	1300
T (K)	340	250
P (Pa)	101325	101325
Density	1.002	0.097
Y_{O2}	0.232	0
Y_{N2}	0.736	0
Y_{H2O}	0.032	0
Y_{H2}	0	1
Mass flow rate (kg/s)	2.5	0.02

2. Solution:
Solution Method:
Pressure- velocity coupling – Scheme -SIMPLE
Pressure – Standard
Momentum – Second order
Turbulent Kinetic Energy (k) Second order
Turbulent Dissipation Rate (e) Second order
Solution Initialization: Initialized the solution to get the initial solution for the problem**.**
Run Solution: Run the solution by giving 5000 no of iteration for solution to converge**.**
Post Processing: For viewing and interpretation of Result. The result can be viewed in various formats: graph, value, animation etc.

***5.* Results & Discussion**

The Simulative Analysis of Scram Jet Engine with Central Stud wedge shape and pylon geometry of injector is done based on Pressure, Temperature and Velocity variation, Turbulent Kinetic Energy, function of stream line, mass fraction of H_2o, mass fraction of O_2, mass fraction of H_2, kinetic energy, total temperature , and the result is discussed here below.

Central strut Wedge shape Injector & Pylon Structure:

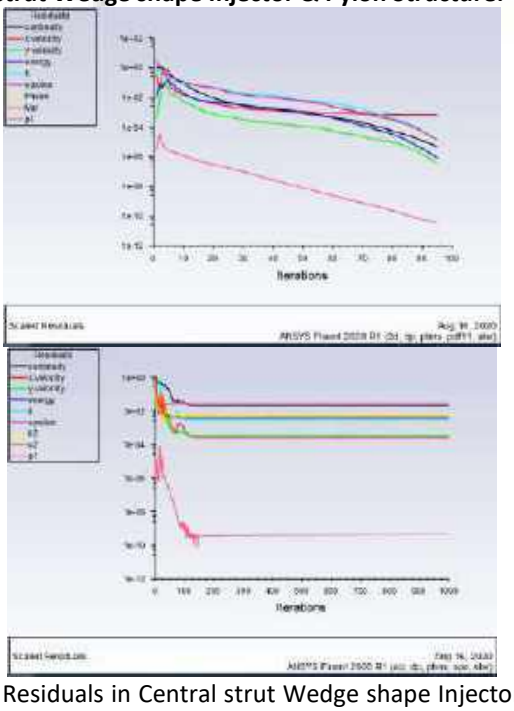

Figure 1 Residuals in Central strut Wedge shape Injector Figure 2 Residuals in Pylon Injector

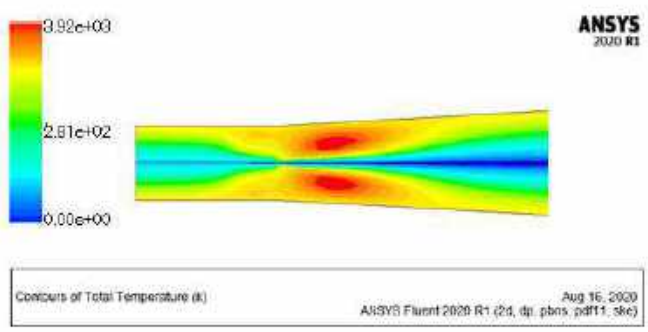

Figure 3 Contour of Total Temperature (K) in Pylon Structure

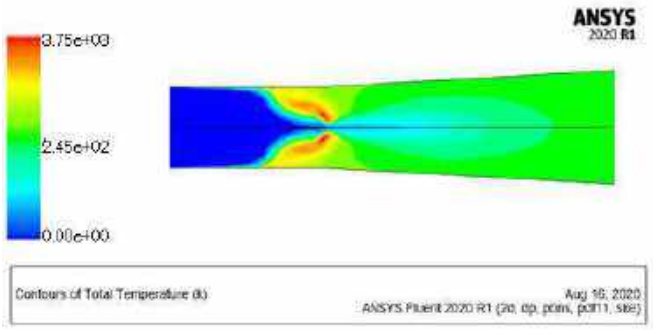

Figure 4 Contour of Total Temperature (K) in Central strut Wedge shape Injector

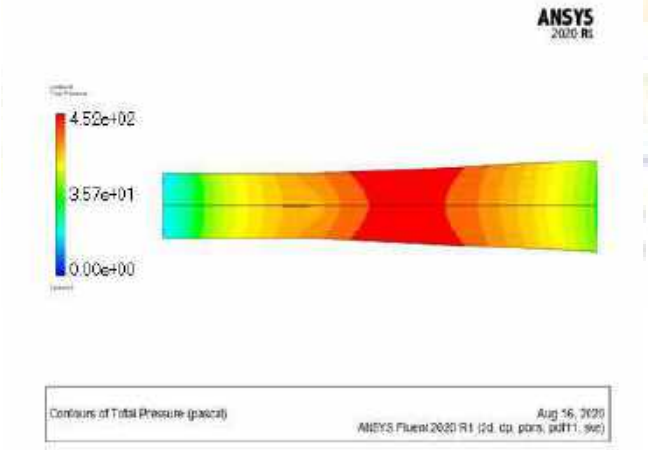

Figure 5 Contour of Total Pressure (Pa) in Central strut Wedge shape Injector

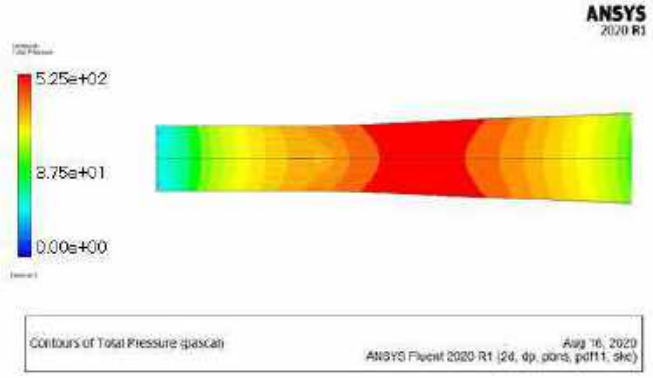

Figure 6 Contour of Total Pressure (Pa) in Pylon Structure

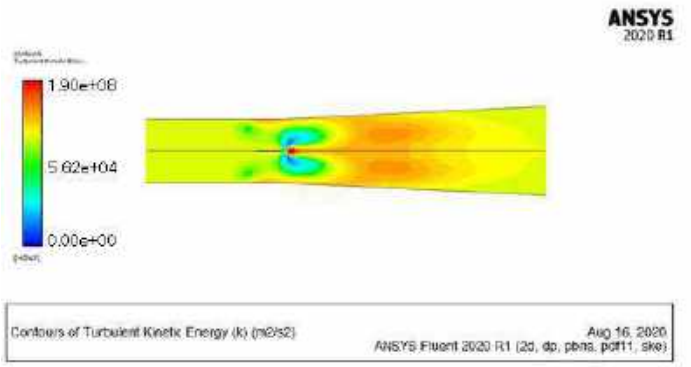

Figure 7 Contour of Turbulent Kinetic Energy in Central strut Wedge shape Injector

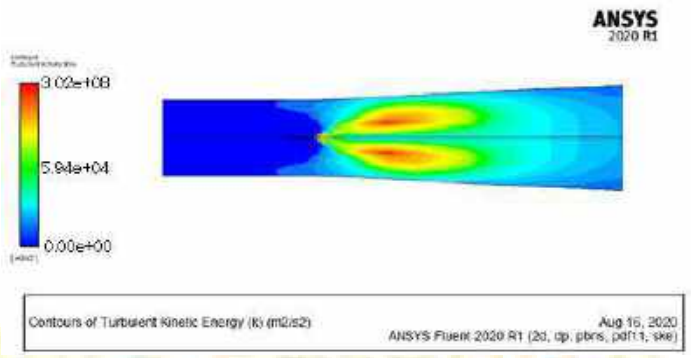

Figure 8 Contour of Turbulent Kinetic Energy in Pylon Structure

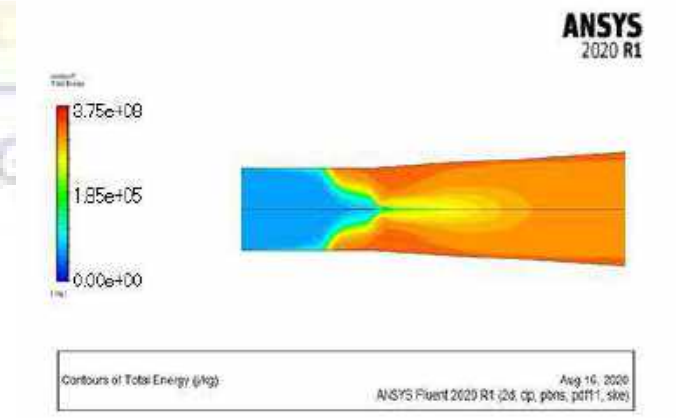

Figure 7 Contour of Total Energy in Central strut Wedge shape Injector

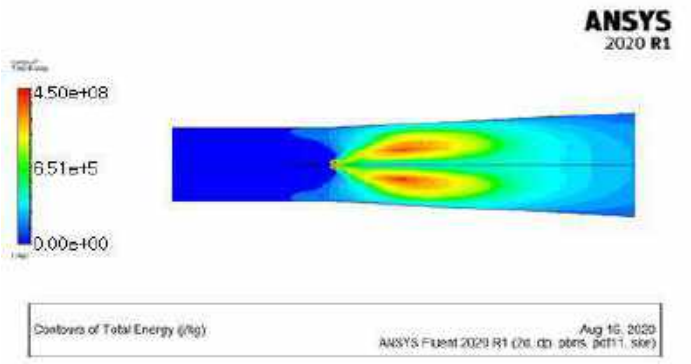

Figure 10 Contour of Total Energy in Pylon Structure

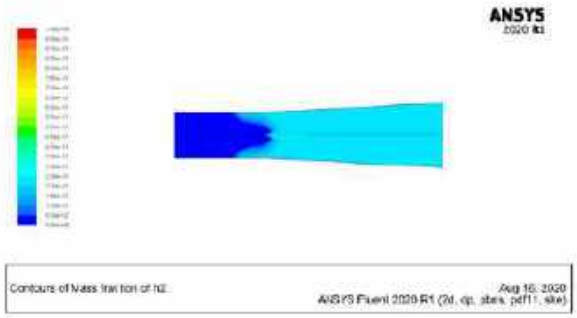

Figure 11 Contours of Mass fraction of H2

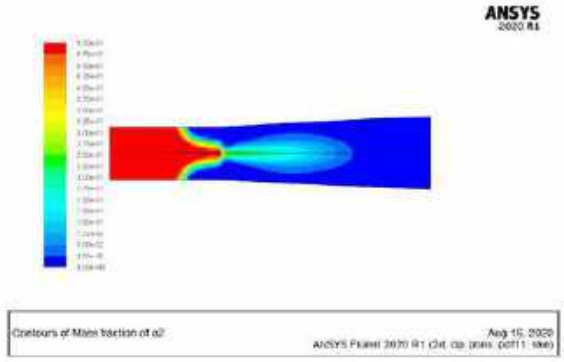

Figure 12 Contours of Mass fraction of O2

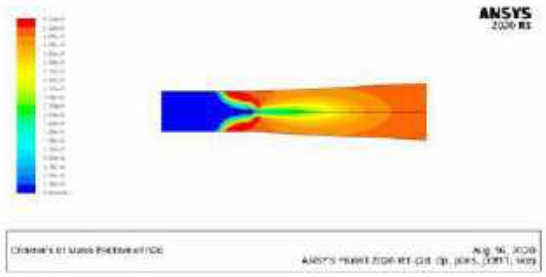

Figure 13 Contours of Mass fraction of H2O

CONCUSION

In Present Study the Simulative Analysis of Scram Jet Engine with Central Stud wedge shape and pylon geometry of injector is done based on Pressure, Temperature and Velocity variation, Turbulent Kinetic Energy, function of stream line, mass fraction of H_2o, mass fraction of O_2, mass fraction of H_2, kinetic energy, total temperature.

The obtained results show that The numerical method employed in this paper can be used to accurately investigate the flow field of the scramjet combustor with central strut flame holder, and capture the shock wave system reasonably. From simulation results we can conclude that when change

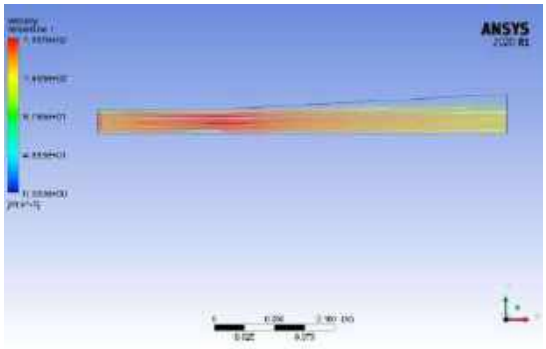

Figure 14 Velocity streamline of the final System

in the geometry from central wedge Injector to Pylon injector the Total Temperature, pressure and total energy is increased due to better mixing of Air-Fuel, higher shock wave absorbing capacity and hence the combustion rate is increased. Shock wave absorbing capacity and stability of flow field is balanced in case of Pylon Injector as per stream line flow.

From this study we can conclude that this type of injector may solve the recent problem of scramjet combustor in use and this analysis shows the solution regarding stabilized flow. From flow phenomenon we can see the stability of flow which is the major problem with planer strut injector as which provide limitation in Mach no of engine but may give continuous flow and combustion through the flight. From pressure and temperature analysis we can decide that Pylon injector provide stability in variation in pressure and temperature though the flow condition.

This work may give solution of scramjet research vehicle in terms of correction in stability of combustion and Mach no of engine. From this study we conclude that scramjet combustor using Pylon injector is more stable and increase the temperature almost 13 times to the inlet temperature which shows that this type of injector increase the rapid mixing of fuel and air and release the high amount of energy which is required in Scramjet engines

TABLE No . 1

Type of Fuel Injector	Total Temperature (K)	Total Pressure (Pascal)	Turbulent kinetic energy (k-m2/s2)	Total energy (j/kg)	Mass flow rate (Fuel) (kg/s)	Mass flow rate (Air) (kg/s)	Fuel inlet Temp. (K)	Air Inlet Temp. (K)
Central Strut wedge shape Injector	3.75e+03	4.52e+03	1.9e+08	3.50e+08	4.0	1.5	250	340
Pylon Injector	3.92e+03	5.18e+03	3.02e+08	4.75e+08	4.0	1.5	250	340

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Analysis of Temperature in Copper and Aluminum Material Dome Receiver for Dish Collector using CFD [1]

Samyak Gajbhiye,[2] Vardan Singh, [3]Arun Kumar Patel, [4]Amit Vishwakarma[1]
[1]MTech Scholar, Vidhyapeeth institute of science and technology Bhopal, India
[2]Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[3] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[4] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[1]samyakb57@gmail.com, [2]nayak.vardansingh@gmail.com, [3]patel.arun2020@gmail.com, [4]amitvishwa4@gmail.com

Abstract:- **Solar thermal energy is one form of energy and different technologies are available for harnessing solar energy to generate thermal energy for different applications. The thermal energy generation using concentrated solar power with the parabolic dish type collector is one of the important areas of focus among researchers, since higher temperature can be attained through dish collector by increasing the concentration ratio as compared to other solar collectors.**
In a dish type collector, receiver is a crucial component that absorbs highly concentrated solar energy reflected from the dish reflector and transfers it to the working fluid within the receiver. In present study the effect of aluminum and copper material is numerically tested and compared for a dome type receiver using CFD.
.
Key words:- **CFD, dish collector, dome receiver, receiver material, solar thermal, thermal efficiency,**

1 Introduction

Solar thermal energy is one form of energy and different technologies are available for harnessing solar energy and to generate thermal energy which will be used for different applications. Solar thermal collectors are used to convert the solar energy coming from sun into thermal energy, which consists of reflector and receiver. Solar thermal collectors are classified into low, medium and high temperature collectors. The collectors concentrate sunlight using mirrors or lenses. The parabolic dish, trough and tower systemsare the types of high temperature collectors. Compared to trough and tower collectors the parabolic dish collector paid the most attraction in the field of solar thermal power generation research due to its less area requirement , higher system efficiency and concentration ratio. This type is more suitable for small and medium scale applications with high temperature output

1.1 Classification Of Solar Collectors

A solar collector (reflector and receiver) is a device that collects solar radiations and converts into heat energy, then transfers the heat energyin to a fluid which is passing through the receiver. Utilization of solar energy requires solar collectors. Two types of solar collectors are available and are listed below.

- Non-concentrating solar collector
- Concentrating solar collector

In non-concentration type, the glazing (glass cover plate) area which transmit the solar radiations on to the collecting surface (absorber area) and collecting area are same (concentration ratio is 1). On the other hand, in concentrating collectors the concentration ratio is high sometimes hundred times greater than the non-concentrating (flat plate) collector. Non concentrating or stationary collectors are permanently fixed in position and donot track the sun, this type of collectors can achieve the temperature range of 30-80^{o}C (Kalogirou 2004). For higher temperature range, the concentrating collectors are more suitable than the non-concentrating collectors.

1.2 Concentrating Solar Collectors

In this type of collectors the solar radiation reflected by the reflector surface are focused on to the smaller surface (absorber) area of the receiver, only the direct radiation are reflected and indirect radiation are not reflected by reflector. The range of temperature achieved is based on the ratio of reflector area to the absorbing area (absorber) of the receiver; it is defined as concentration ratio of the collector system.

1.2.1 Types Of Concentrating Solar Collectors

There are four basic types of concentrating collector

5. .Parabolic dish collector
6. Parabolic trough collector
7. Linear Fresnel lens/ reflector
8. Central tower receiver

1.3. PARABOLIC DISH COLLECTOR

These are dish-shaped parabolic mirrors as reflectors to focus and concentrate the sun's rays onto a receiver, which is mounted above the reflector

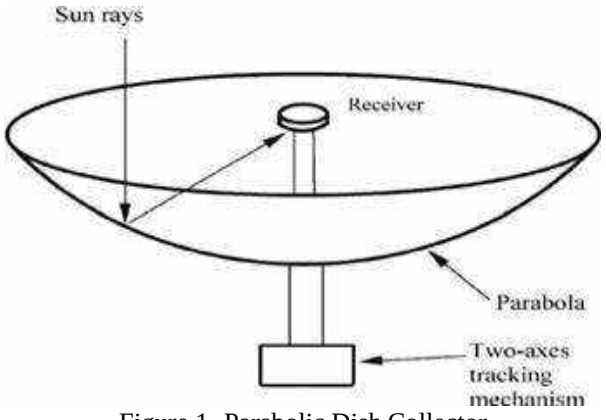


Figure.1 Parabolic Dish Collector

. It works by focusing the Direct Normal Irradiations (DNI) from the sun with a dish shaped surface onto a cavity absorber area of the receiver, which transfer the absorbed heat to the heat transfer fluid. The possible temperature ranges of heat transfer fluid is100 to 1500^{o}C (BarIiv *et al.*2011), with the concentration ratio range of 100 to 1000. More number of setups is connected in series when this type of collectors is used in larger power plants.

1.3.1 Components Of Parabolic Dish Collector

A parabolic dish collector is similar in appearance to a large satellite dish, but has mirror-like reflectors and an absorber at the focal point. It uses a dual axis sun tracker. A parabolic dish system uses a computer to track the sun and concentrate the sun's rays onto a absorbing area (absorber) of the receiver located at the focal point in front of the reflector. The receiver absorbs the reflected solar energy and transfers it into the HTF, which is circulated inside the receiver. Collector system can attain a temperature of about 1500ºC. The main components of parabolic dish collector system are dish reflector, receiver, support structure and tracking system.

Figure 2 Parabolic dish collector system

DISH REFLECTOR

A parabolic dish reflector reflects and concentrates the sun's rays to the cavity receiver which is located at the focal point of the receiver. The reflector is made upon by the parabolic dish shaped mirrors or polished metal sheets with optimum reflectivity. The glass mirrors with reflective silver layer coating on the back side of the glass is used as the reflector. A special multilayer paint coating below the silver layer protects the silver and to ensure the better performance of the reflector.

CAVITY RECEIVER

Cavity receivers are either single or multi cavity type. It absorbs or receives the solar radiations and transfers its energy into the heat transfer fluid. There are two types of receivers: tubular and volumetric. Tubular receivers are used when liquid HTF such as water, molten salt thermic oil and liquid sodium are used. The volumetric receiver's are used when air or super critical CO_2 are used as HTF. The type of receiver used is also depends upon power cycle (Rankine or Brayton) used in the system.

SUPPORTING STRUCTURE

Steel supported structure in the back of the reflector mirror provides mechanical strength to the collector to withstand the wind loads. The main emphasis is to minimize the weight of the support structure and also to reduce the deformation of the structure, which ensures exact and effective focus of the solar radiation to the absorber cavity.

TRACKING MECHANISM

A tracking mechanism of dish is usually aligned on a east-west axis to track the sun during the day time and also has the mechanism to set the track for seasonal positions of the sun. The tracking mechanism operated mechanically and controlled by computer programming. The computer control tracking system gives high accuracy in tracking and give higher efficiency.

1.4 Need For Present Study

The use of solar energy for different applications is increasing continuously; within different methods the conversion of solar energy into thermal energy has attracted many researchers due to its advantages as compared to other methods. Among all the conversion technologies the point focusing collector system has been used in different applications, this system consists of two components the reflector and receiver. The receiver is the main component of the system which will affect the overall performance ofthe collector. The analysis on solar receivers have been done through experiment, numerical methods and software tools based on the different parameters which influencing the performance of the receiver by different researchers. The important observation from literatures are the thermal performance of the collector system can be improved by minimizing the convection and radiation heat losses from the receiver through proper selection of geometry, heat transfer fluid with optimum heat transfer properties, coil configuration and material for the receiver.

2. LITERATURE REVIEW

RECEIVER MATERIAL

The selection of materials for CSP system is based on the thermodynamic cycle to be followed range of temperature and capacity of the plant, which is very much, depends up on the heat transfer properties of the material. Whatever may be the scale of the power plant the materials for receiver is selected to sustain the heat flux generated through the reflector andalso for optimum absorptivity and emissivity with efficient thermal conductive and radiative properties.

A multi-cavity volumetric receiver with silicon infiltrated silicon carbide (SiSiC) was developed and tested at Plataforma solar de Almeria, Spain to study the constructive, operational and performance parameters by Carotenuto *et al.* (1993).The maximum average temperature of outlet air was 790°C, with a maximum of 890°C from the center channels of the receiver for the maximum recorded values of wall temperature were ranged between1250 and 1300°C. Receiver efficiency of 80% was achieved for the best operational mode with the average solar heat flux and air outlet temperature of 800

kW/m^2 and 600°C respectively.

Fend *et al.* (2004) experimented with double-layer SiC foam and screen printed porous SiC material for greater efficiencies in volumetric solar receiver. Two novel porous materials of single and double layered foams were tested with concentrated solar radiations and compared for an application as a volumetric receiver. The receiver model of double layer (sandwich) silicon carbide foam of 20 and 80 ppi (pores per inch) showed improved performance over the single layered one The efficiency of the sandwich material of double layered receiver was approximately 10% higher compared to the single layered20 ppi (porous per inch) receiver, because of the larger heat transfer

surface (5400 m^2/m^3 for the 80 ppi foam compared to 1100 m^2/m^3 for the 20 ppi foam).

Agrafiotis *et al.* (2007) experimented with silicon carbide porous monolithic multi-channeled honey combs for an open volumetric receiver and achieved higher bending and compressive strength for the operating temperatures of 1400^{O}C

3. OBJECTIVE: -

The literature shows that the overall performance of the collector system can be improved by selection of proper material and geometry for the receiver, dome configuration in the receiver and the heat transfer fluid circulated in the coil to maximize the heat transfer and minimize the heat losses from the system. Less number of attempts has been carried out by researchers to improve the performance of the solar collector system by concentrating combination of these parameters on solar receiver. In this regard this work aims to analyze the effect of materials, dome geometry and heat transfer fluid on the thermal performance of the cavity receiver in a concentrated solar power system.

The main objective of this study is to analyze the effect of materials, copper and aluminum, in the dome type geometry of a cavity receiver, on the thermal perf orm ance in diff eren t mass flow rates of the working fluid in a parabolic dish collector system.

Type of mesh	Grid
Number of elements	110548
Number of nodes	124974

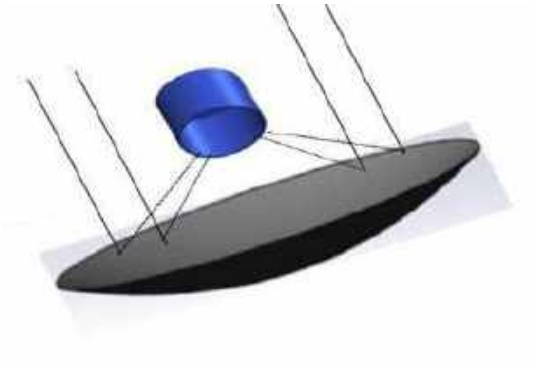


Figure 3.1 Schematic diagram of dish collector and dome receiver system.

4. METHODODLOGY

The present work is conducted in NX for modeling and ANSYS for analysis.

Following are basic steps for analysis.

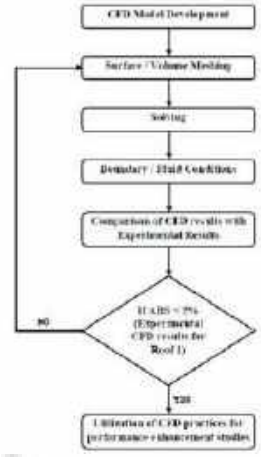


Figure 4.1 CAD Model

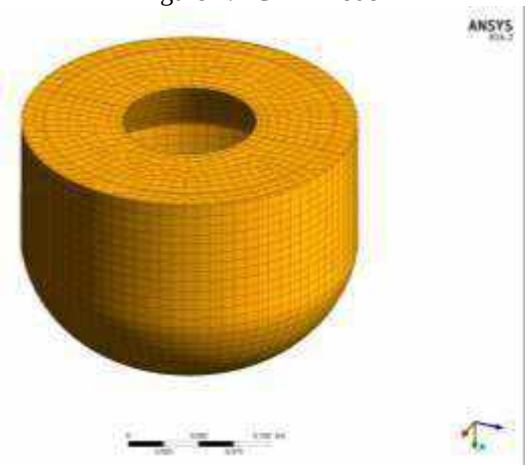


Figure 4.2 MESH

Problem Type: 3D

Type of Solver: Temperature -based solver.

Physical model: K, epsilon two equation turbulence model.

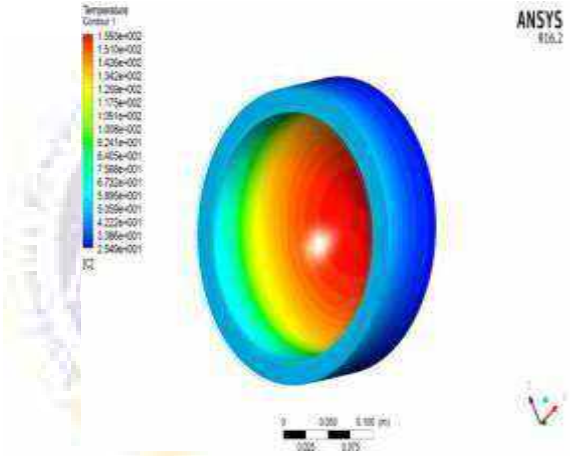
Use P1, Finite rate/ Eddy dissipation model

Material Property: Flowing fluid is water

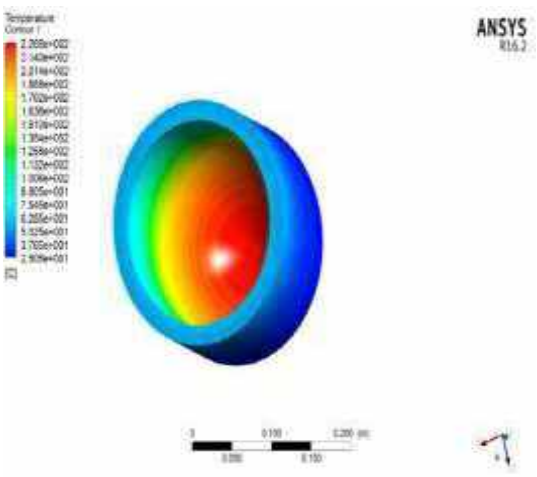
Density of water= 997 kg/m^3
Viscosity= 8.9e-04
Solution Method:
Pressure- velocity coupling – Scheme -SIMPLE
Pressure–Standard
Momentum–Second order
Turbulent Kinetic Energy (k) Second order
Turbulent Dissipation Rate(e) Second order
Solution Initialization: Initialized the solution to get the initial solution for the problem**.**
Run Solution: Run the solution by giving 5000 no of iteration for solution to converge**.**
Post Processing: For viewing and interpretation of Result. The result can be viewed in various formats: graph, value, animation etc

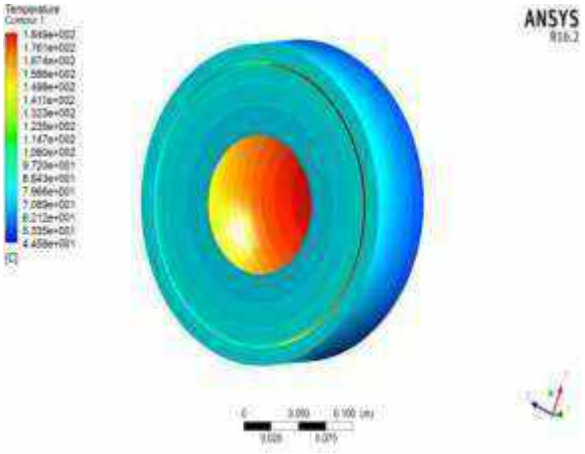
5. RESULT

CASE1:- Temperature contours of aluminum material with different mass flow rate of water

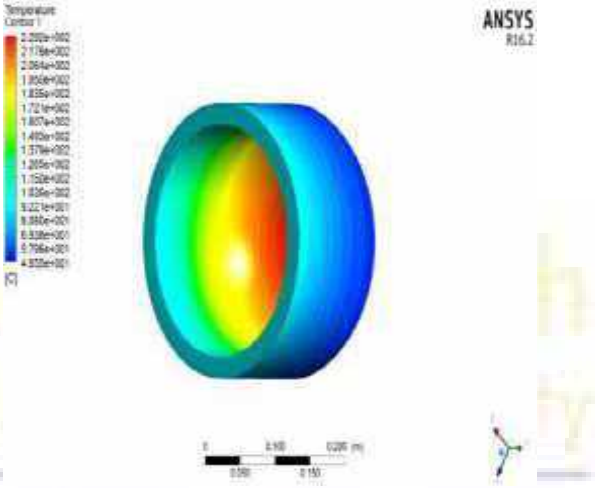


Mass flow rate 1 L/Minute



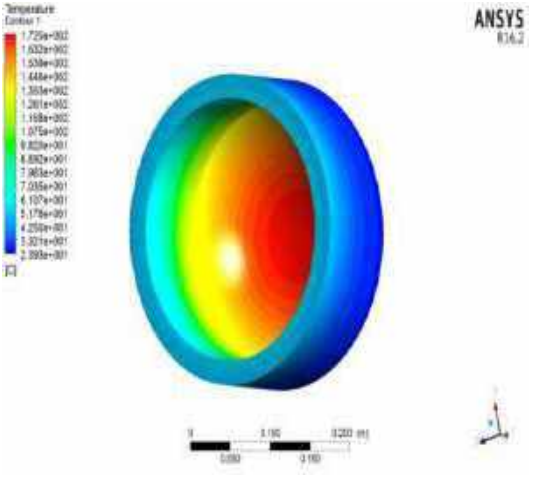


Mass flow rate 0.8 L/Minute

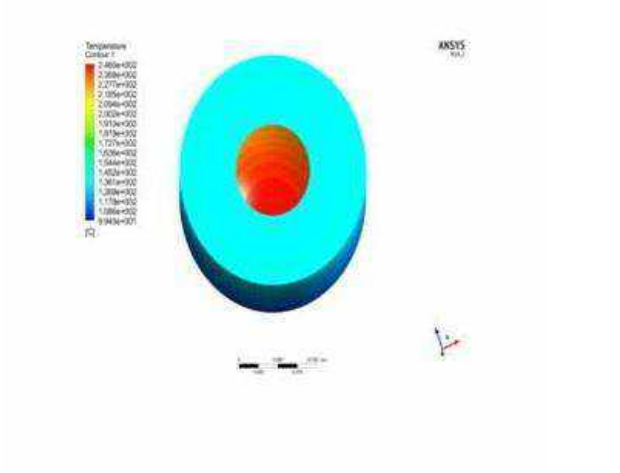


Mass flow rate 0.6 L/Minute

CASE 2:- Temperature contours of copper material with different mass flow rate of water



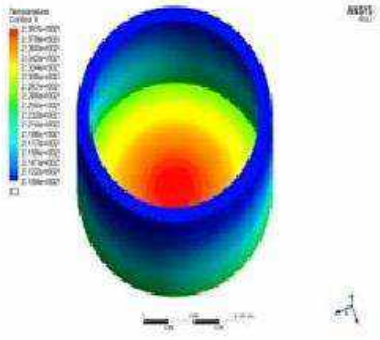
Mass flow rate 1 L/Minute



Mass flow rate 0.6 L/Minute

Mass flow rate	Temperature in Al	Temperature in Cu
1 L/Minute	1.43 e02	1.72 e02
0.8 L/Minute	1.52 e02	2.25 e02
0.6 L/Minute	2.29 e02	2.46 e02

As 0.6 L/Minute is found to be the best case in both materials, but receiving effect is better in cupper material.
One of the case studies is the bellow when receiver is made of both aluminum and copper material (where outer shell is of cupper and inner is of aluminum) bellow is temperature contours of dual material at mass flow rate of 0.6 L/Minute. The temperature found is 2.39 e02



Mass flow rate 0.6 L/Minute of Al and Cu material

6. CONCLUSION

An absorber's inlet fluid temperature was varied to test the parabolic concentrator's thermal performance at three levels of flow rate and two different materials. Increased convection heat loss to the environment and material from the absorber surface lowers the thermal efficiency of solar concentrators with an increase in absorber inlet fluid temperature.
At flow rates of 1 liters per minute, 0.8 liters per minute, and 0.6 liters per minute with aluminum receiver the outlet temperature was found to be 143^{o}C, 152^{o}C and 229^{o}C, respectively. And with copper receiver the outlet temperature was found to be 172^{o}C, 225^{o}C and 246^{o}C, respectively. Whereas the receiver with both material the temperature found to be 239^{o}C with mass flow rate of 0.6 L/minute.

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Development of a Solar Dryer for Mushroom Preservation in Rainy Season

[1]Sunil Kumar,[2] Vardan Singh, [3]Arun Kumar Patel, [4]Amit Vishwakarma[1]
[1]MTech Scholar, Vidhyapeeth institute of science and technology Bhopal, India
[2]Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[3] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[4] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[1]ersonuji05@gmail.com, [2] nayak.vardansingh@gmail.com, [3]patel.arun2020@gmail.com, [4]amitvishwa4@gmail.com

Abstract:- **Drying by solar energy is a rather economical procedure for agricultural products, especially for medium to small amounts of products. It is still used from domestic up to small commercial size drying of crops, agricultural products and foodstuff, such as fruits, vegetables, aromatic herbs, wood, etc. contributing thus significantly to the economy of small agricultural communities and farms. The present work provides solutions to M/S Kamesh Mushroom world, Jabalpur, a mushroom producing unit having monthly production of 100000 KG. in rainy season since sale is not good and production is high, mushroom being a perishable product they were facing problem of storage. For this problem a mushroom dryer is developed, able to operate in rainy and cold season, exhaust fans operate able with PV panel, equipped with evacuated-tube collector. The outcomes are then experimentally tested for weight loss V/S total weight- time- temperature- moisture etc**

Keywords: Drying mushroom, dryer efficiency, moisture content, solar energy, thermal analysis.

1 Introduction

The Sun is the star that radiates the planets of our system with a power dependent on distance. The earth is in such a position as to receive an optimal irradiation for the vital functions of the organisms present on our planet;this distance is evaluated, on average,equalto $1{,}495\times10^{11}\,m$,with variations of1,7 % over the year due to the eccentricity of the Earth's orbit. The solar energy emitted by the Sun is fundamental to making the Earth a habitable planet, however the average temperature of our planet depends on the balance between the amount of energy that the Sun sends us in the unity of time with that which our ecosystem is capable of retaining. This balance, very delicate, determines the climate of the Earth. Energy production in the center of the Sun takes place by a fusion process in which two hydrogen nuclei fuse into a helium nucleus with mass defect. Since the mass of the two hydrogen nuclei is greater than that of a helium nucleus, energy is released and radiated into space in the form of electromagnetic waves. Since the earth is located at a great distance from the Sun, it receives only a small fraction of that energy.

Due to the rotation and orbital motion of the Earth around the Sun, the apparent position of the Sun in the sky changes over time. The study of the apparent motion of the Sun with respect to the Earth plays a role of fundamental importance to use solar energy efficiently. In this section, after a brief description of the motions of the Earth, the parameters used to determine, at any time of the day, the relative position of the Sun compared to our planet and therefore incident radiation .

1.1 SOLAR RADIATION

Anybody in the universe with a temperature above absolute zero emits radiant energy through a specific wavelength range of the electromagnetic spectrum. The Sun emits energy in a wide range of wavelengths, extending from the ultraviolet section, visible, up to the infrared section of the electromagnetic spectrum. This energy is radiated into space uniformly in all directions, and its intensity decreases with the inverse of the square of the distance from the Sun. Considering the surface of an imaginary sphere centered in the Sun, of radius R equal to the average Earth-Sun distance, the average power for a unit of area of solar radiation falling on such surface takes the name, improper, of solar constant I_{CS} and assumes a value equal to 1367 W / m^2. In addition to the total energy emitted, it is useful to know the spectral distribution of extraterrestrial radiation, the radiation that one would receive on Earth in the absence of the atmosphere. The standard spectral irradiance curve was drawn up on the basis of measurements made in space and is shown in Figure (1.) compared to the typical blackbody spectrum with temperature of 5777 K.

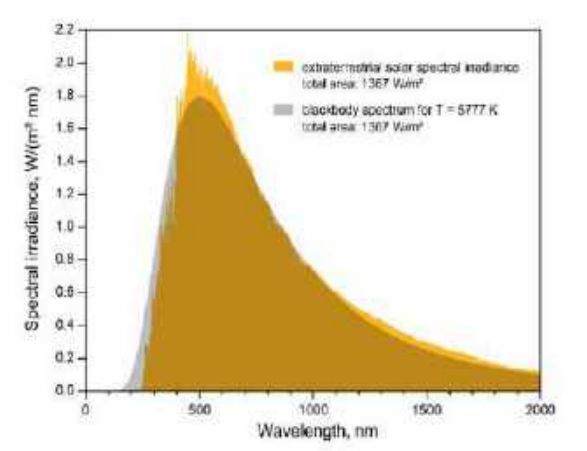

Figure 1: Comparison between the spectrum of the Sun and that of a black body

1.1.1 Solar Radiation On The Ground

The extra-atmospheric radiation, in passing through the Earth's atmosphere, is attenuated as a function of the "mass of air" crossed by the sun's rays, that is, by the length of the path traveled by the sun's rays from their entry into the atmosphere to the Earth's surface. In fact it undergoes attenuation effects in the passage through the atmosphere rich in dusts, water vapor and different gases that reflect and absorb the radiation, which can be decomposed into three components:

- Direct radiation ($I_{d)}$:reaches the surface of the earth in the direction of the sun's rays without having undergone reflections or absorption. This component arrives directly on the considered surface without being absorbed or dispersed by the atmosphere following a precise direction (Sun – object).
- *Reflected* radiation ($I_{R)}$:it reaches the Earth's soil (or the body in question) because it is reflected by the surrounding bodies. The reflection coefficient *(albedo)* of each material is defined, in its values, by the UNI 8477 standard. In many cases, especially if the albedo coefficient of the bodies surrounding the capturing surface is low or if the surface is slightly inclined with respect to the horizontal, this contribution is neglected .
- *Diffuse* radiation ($I_{D)}$:reaches the Earth's soil from all directions due to atmospheric processes of reflection and diffusion. Such radiation is always present at ground level, even on perfectly clear days precisely because such processes in the atmosphere occur in any case. On days when the sky is clear it represents about 10% of the direct radiation, while on very cloudy days it constitutes the totality of the radiant energy.

1.2 Technologies for the Use Of Solar Energy

In recent years, two different currents of thought have gradually taken hold with as many visions regarding the definition of solar energy and methods of exploitation and conversion. of that energy. In a broader vision, among the conversion methods are often also included biomass energy and wind because they are consequences of the effect of solar activity on our planet. In the present study we will use a more restrictive definition, dealing only with methods *of direct exploitation* of solar energy, i.e. methods that can be directly reported. solar radiation. This appears to us, from the engineering point of view, the only possible classification especially to make a reliable comparison between the different technologies.

A first distinction between the methods of exploitation of solar energy is made between *passive* or *active* use of such energy. In *passive solar,* used for energy saving in buildings, heat and light produced by the Sun are not converted but only collected through various methods of design and construction. The simplest conceptualization of passive solar in building design is represented by the *greenhouse,* a construction that allows sunlight to penetrate inside it preventing it then the subsequent spill, thus contributing to a rise in temperatures inside the room. Trivially also the right orientation of the building and the correct arrangement of the glass surfaces, combined with a correct management of the shielding system, can be defined as one passive exploitation of solar energy. In general, passive solar systems are divided into three categories: *direct gain* systems, *indirect* (including solar *walls). Trombe-Michel*) and *isolated*. In the former, solar energy penetrates directly into the inhabited environment, while in indirect gain systems solar radiation is received by collectors (of standard transparent surfaces) and stored in the form of thermal energy in the storage masses that give it to the interior spaces gradually over time. Finally, in isolated gain systems, the collection takes place through components independent of the building, connected to the inhabited environments through a system of ducts that transfer stored heat. Ultimately, passive solar represents a virtuous way of exploiting the energy transmitted by the Sun but it must be absolutely an integral part of the original construction project, of a *contextual design,* due to the almost total impossibility of intervening on existing structures especially if poorly oriented.

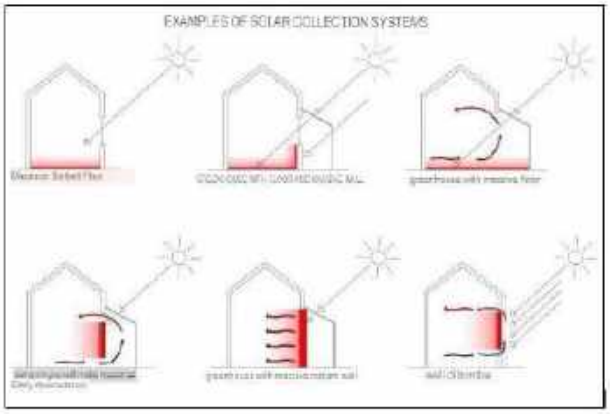

Figure.2: Passive exploitation of solar energy

Methods of *active* or *direct* exploitation of solar energy are those systems used to store or convert solar energy for use in other applications such as heating of water for sanitary or domestic uses, the production of heat for industrial uses or the production of electricity, either directly or through the use of steam turbines. These systems, which we will deepen in the following paragraphs, are further divided into *thermodynamic* or *photovoltaic systems* according to the method used to convert or transfer energy. Two further classifications are based instead on the presence or absence of an incident solar ray *concentrator* and the use of a *solar tracking system.*

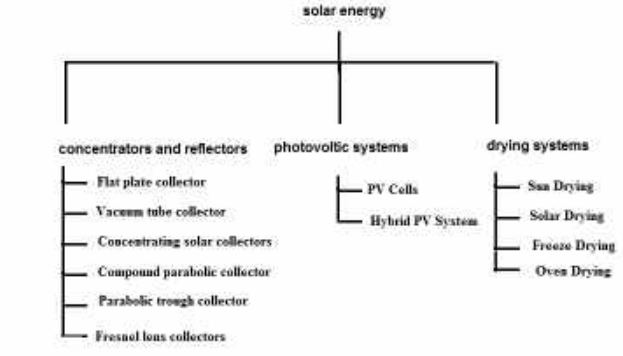

Figure .3 solar energy usage classification

1.3 Drying And Drying Technologies

Drying is the oldest method of preserving food. Throughout history, the sun, the wind, and a smoky fire were used to remove water from fruits, meats, grains, and herbs. By definition, food dehydration is the process of removing water from food by circulating hot air through it, which prohibits the growth of enzymes and bacteria. Dried foods are tasty, nutritious, lightweight, easy-to prepare, and easy-to-store and use. The energy input is less than what is needed to freeze or can, and the storage space is minimal compared with that needed for canning jars and freeze containers. The nutritional value of food is only minimally affected by drying. Vitamin A is retained during drying; however, because vitamin A is light sensitive, food containing it should be stored in dark places. Yellow and dark green vegetables, such as peppers, carrots, winter squash, and sweet potatoes, have high vitamin A content. Vitamin C is destroyed by exposure to heat, although pre-treating foods with lemon, orange, or pineapple juice increases vitamin C content. Dried fruits and vegetables are high in fiber and carbohydrates and low in fat, making them healthy food choices.

Drying Technologies

Sun Drying

The high sugar and acid content of fruits make them safe to dry in the sun. Vegetables and meats are not recommended for sun drying. Vegetables are low in sugar and acid. This increases the risks for food spoilage. Meats are high in protein making them ideal for microbial growth when heat and humidity cannot be controlled. To dry in the sun, hot, dry, breezy days are best. A minimum temperature of 86 o F is needed with higher temperatures being better. It takes several days to dry foods out-of-doors. Because the weather is uncontrollable, sun drying can be risky. Also, the high humidity in the South is a problem. Humidity below 60 percent is best for sun drying. Often these ideal conditions are not available when fruit ripens. Fruits dried in the sun are placed on trays made of screen or wooden dowels. Screens need to be safe for contact with food. The best screens are stainless steel, teflon coated fiberglass or plastic. Avoid screens made from “hardware cloth”. This is galvanized metal cloth that is coated with cadmium or zinc. These materials can oxidize, leaving harmful residues on the food. Also avoid copper and aluminum screening. Copper destroys vitamin C and increases oxidation. Aluminum tends to discolor and corrode. Outdoor drying rack most woods are fine for making trays. However, do not use green wood, pine, cedar, oak or redwood. These woods warp, stain the food or cause off-flavors in the food. Place trays on blocks to allow for better air movement around the food. Because the ground may be moist, it is best to place the racks or screens on a concrete driveway or if possible over a sheet of aluminum or tin. The reflection of the sun on the metal increases the drying temperature. Cover the trays with cheesecloth to help protect the fruit from birds or insects. Fruits dried in the sun must be covered or brought under shelter at night. The cool night air condenses and could add moisture back to the food, thus slowing down the drying process.

Figure 4 sun drying

Solar Drying

Recent efforts to improve on sun drying have led to solar drying. Solar drying also uses the sun as the heat source. A foil surface inside the dehydrator helps to increase the temperature. Ventilation speeds up the drying time. Shorter drying times reduce the risks of food spoilage or mold growth.

Figure 5 solar drying

Freeze Drying

Freeze-drying is a dehydration process typically used to preserve a perishable material or make the material more convenient for transport Freeze-drying works by freezing the material and then reducing the surrounding pressure to allow the frozen water in the material to sublimate directly from the solid phase to the gas phase.

Figure 6 freeze drying

Oven Drying

Everyone who has an oven has a dehydrator. By combining the factors of heat, low humidity and air flow, an oven can be used as a dehydrator. An oven is ideal for occasional drying of fruit leathers, banana chips or for preserving excess produce like celery or mushrooms. Because the oven is needed for every day cooking, it may not be satisfactory for preserving abundant garden produce. Oven drying is

slower than dehydrators because it does not have a built-in fan for the air movement. (However, some convection ovens do have a fan). It takes about two times longer to dry food in an oven than it does in a dehydrator. Thus, the oven is not as efficient as a dehydrator and uses more energy.

Figure 7 oven drying

1.4 THE PRESENT WORK

It is observed that radiation energy in sunlight is a vast source of thermal energy which is utilized to develop a solar dryer for mushroom able to operate in rainy seasons.

2. LITERATURE REVIEW

Solar drying technology is one of the renewable energy resources particularly for low temperature heating and is a very attractive option for the small scale and resource poor enterprise. Studies undertaken so far have clearly indicated that while the initial cost of solar dryers are high, the life time cost of drying is only a third of dryers based on conventional fuels (Chavda and Kumar, 2009). Using a solar dryer, the drying time can be shortened by about 65% compared to sun drying because, inside the dryer, it is warmer than outside; the quality of the dried products can be improved in terms of hygiene, cleanliness, safe moisture content, colour and taste; the product is also completely protected from rain, dust, insects; and the payback period for such dryers ranges from 2 to 4 years depending on the rate of utilization (Sacilik et al., 2006).

The attractiveness of solar drying is further enhanced by its low capital and drying energy cost (Tunde-Akintunde, 2011). Many tropical countries receive on average 325 days per year of bright sun light (Yansane, 2007). In Tanzania, solar energy resource is abundantly available almost throughout the year (GTZ, 2007). Being in a “solar belt”, Tanzania receives between 2800-3500 hours of sunshine per year and has a global solar radiation between 4-7 kWh/m2/day. The average solar flux based on 24 hours can be as high as 300W/m2 or more

(Kimambo, 2007). With such a high level of solar energy resource, Tanzania is naturally suitable for application of solar energy as viable alternative sources of modern energy supply like mechanical dryer for drying agricultural produce especially in rural area (GTZ, 2007). Solar drying technology produces better quality products and is considered to be an alternative for drying agricultural products in developing countries (Gurlek et al., 2009). It is often differentiated from ‘‘sun drying’’ by having and using designed structure to collect and enhance the solar radiation in order to harness the radioactive energy for drying applications. The advantages of solar dryers over sun drying include; generation of higher air temperatures and consequently lower relative humidities, which are, both conducive to improved drying rates and lower final moisture content of the drying crops, energy and labour saving and environmental protection. Other advantages are less spoilage and less microbiological infestation, thus leads to improved and more consistent product quality (Tunde-Akitunde, 2011). However, dependency on weather for drying operation is one of the setbacks in solar drying technology. Considerable efforts have been made to design and use hybrid dryers which can perform better under adverse weather conditions.
The size of solar collector required for a certain size of dryer depends on the ambient temperature, amount of sun, and humidity (Green and Shwartz, 2001).

By increasing the collector size, more heat energy can be added to the air to improve overall efficiency. Larger collector areas are helpful in places with little solar energy, cool or cold climates, and humid regions. The size of solar collector required for a certain size of dryer depends on the ambient temperature, amount of sun, and humidity (Chavda and Kumar, 2009). Tilting the collectors is more effective than placing them horizontally, for two reasons. First, more solar energy can be collected when the collector surface is more nearly perpendicular to the sun's rays. Second, by tilting the collectors, the warmer, less dense air rises naturally into the drying chamber.
Work has been done to study the optimum angle for capturing sun’s energy. According to FAO (2008), the angle should be greater than 15 to allow rain water to run off and the collector should be angled at 90° to the mid-day sun facing south in the Northern hemisphere and north in the Southern. Also, the dryer should be sited away from shadows from trees or buildings. A 90 degree angle is the highest angle of incidence and represents the angle at which the most energy can be captured from the sun (Stadler, 2011). The sun penetrates equator at a 90 degree angle on average topographically, and it passes twice a year, making it an area that receives the most amount of light energy from the sun (Stadler, 2011). Solar dryers use one of two types of airflow systems; natural and forced convection. The convection utilizes the natural principle that hot air rises, and forced convection dryers force air through the drying chamber with fans (Vargas et al., 1996).

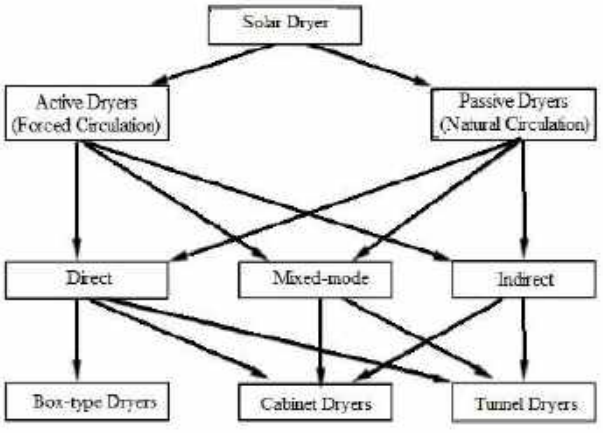

Figure 8 Classification of solar dryers and drying modes

The effects of natural convection may be enhanced by the addition of a chimney in which exiting air is heated even more. Additionally, prevailing winds may be taken advantage of (Green and Shwartz, 2001).

According to Green and Schwartz (2001), the use of forced convection can reduce drying time by three times and decrease the required collector area by 50%. The summarized classification of solar dryers and drying modes are indicated in Fig. 2.1:

3. OBJECTIVE: -

The present work provides solutions to M/S Kamesh Mushroom world, Jabalpur, a mushroom producing unit having monthly production of 100000 KG. In rainy season since sale is not good and production is high, mushroom being a perishable product they were facing problem of storage. For this problem a mushroom dryer shall be developed, able to operate in rainy and cold season, exhaust fans operate able with PV panel. The outcomes shall be then experimentally tested for weight loss V/S total weight- time-temperature- moisture etc

4. Construction Of Model

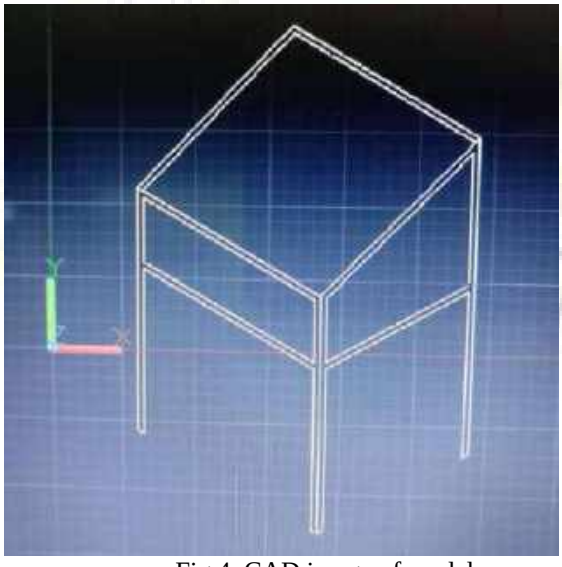

Fig 4. CAD image of model

Major components of dryer are as follows:-

- Dryer structure
- Drying chamber
- Drying plate
- Exhaust blowers
- PV panel
- Insulation
- Thermo meter
- Weighing machine

Fig 5 fabricated structure of model

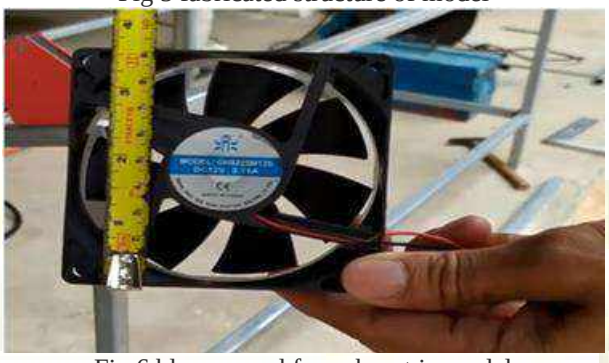

Fig 6 blower used for exhaust in model

Fig 7 Final assembled model

5. EXPERIMENTATION AND OBSERVATION

The experiment is done in moderate rainfall and moisture climate.

Fig 8 Final setup during test

The bellow three images are temperature readings taken at different intervals as shown in table, it can be observed that the temperature inside dryer is more than ambient temperature

The bellow four images are weight readings taken at different intervals as shown in table, it can be observed that the weight is gradually decressing.

As seen in above all pictures mushroom of 200 gm weight is reduced to 124 gm and temperature found is 20 degree above ambient also it is operated in modrate rain fall, in almost total mosturus atmosphere.

From the above observations following tables of temperature v/s time v/s weight is made

Observation 1 Date 1.08. 22 place VIST Bhopal

S N	WEIGHT			TEMPRATUR		TIME		CLOUR	BLOWER	
	NET	DRY	REDUCTION	IN	Ambient	FROM	TO	P.W	ON	OFF
1	182g	151g	31g	37.5T	30.3T	11:30	13:10	White	ON	
2	151g	140g	11g	39T	30.6T	13:12	13:42	Creem	ON	
3	140g	124g	16g	36.8T	30.3T	14:38	14:38	Creem	ON	
4	124g	111g	13g	37.7T	32.8T	14:40	15:40	Pale yellow	ON	

Observation 2 Date 2.08. 22 place VIST Bhopal

S N	WEIGHT			TEMPRATUR		TIME		CLOUR	BLOWER	
	NET	DRY	REDUCTION	IN	Ambient	FROM	TO	P.W	ON	OFF
1	185	160	25	36.5	32.5	11:30	12:30	White	ON	
2	160	145	15	38	33	12:30	13:30	Creem	ON	
3	145	134	11	39	27	13:30	14:30	Creem	ON	
4	134	110	24	42	28	14:30	15:00	Pale yellow	ON	

6. CONCLUSION

Drying by solar energy is a rather economical procedure for agricultural products, especially for medium to small amounts of products. It is still used from domestic up to small commercial size drying of crops, agricultural products and foodstuff, such as fruits, vegetables, aromatic herbs, wood, etc. contributing thus significantly to the economy of small agricultural communities and farms.

The present work provides solutions to M/S Kamesh Mushroom world, Jabalpur, a mushroom producing unit having monthly production of 100000 KG. in rainy season since sale is not good and production is high, mushroom being a perishable product they were facing problem of storage.

For this problem a mushroom dryer is developed, able to operate in rainy and cold season, exhaust fans operate able with PV panel, equipped with evacuated-tube collector. The outcomes are then experimentally tested for weight loss V/S total weight- time- temperature- moisture etc and found that the dryer when working in wet climate can produce upto degree centigrade temperature more than ambient also during experiment the weight of product is reduced by 50% in duration of 4 hours.

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Designing Efficient Morphological Segmentation Methodology for Kidney Stone Detection

Prof. Atul Kumar Mishra, Prof. Vishakha Tomar, Prof. Namrata Gurung
Email: www.atulkmishra@gmail.com, vishakhatomar09@gmail.com , nansgurung02@gmail.com
Vidhyapeeth Institute Of Science & Technology, Bhopal (M.P.)

***Abstract*— The kidney Sstone (KS) is a serious problem in peoples beyond 45 years of age. Presence of stone may disturb urinary system and cause excruciating discomfort in abdomen. The major goal of this study is to use sequence of image processing algorithms to determine the presence of kidney stone within a digital ultrasonography images. However, because of a lack of contrast as well as the existence of speckle noise, the captured KS images by ultrasonography techniques is not appropriate for further processing. Thus paper initially proposed CLAHE enhancement for contrast improvement. In order to eliminate the speckle noise study proposed image de-noising approaches using median filter to achieve improved the visibility of the ultrasound scan. Finally morphological processing and thresholding sequence is used for the precise location of the stone is determined using the improved ultrasound imaging. The outcome of stone detection is qualitatively evaluated.**

***Keywords*—Adaptive Filter, Neural Network, BPNN, ADALINE, Amplitude Modulation, AWGN Noise, Filter Design.**

11. Introduction

A variety of kidney disorders exist, including the growth of stones, cysts as well, urinary obstructions, genetic disorders, including malignant cells. As a solid fragment of material develops within the urinary system, the most common of these conditions is kidney stone disease [1].

The tiny stone fragment could pass with no creating any symptoms. When a stone is larger than 5 centimeters, it may clog the urinary bladder and cause excruciating discomfort in the lower abdomen or the belly. Therefore, in order to prevent from these conditions or from further health problems, it is required to design an efficient method to find the kidney stone in images [2].

The major goal of this study was to create a simple, uncomplicated method for locating kidney stones. Any normal person can check using ultrasound regarding a kidney stone as well as dissolve it at the early stages by performing this procedure is executed using the MATLAB software...

Prof. Atul Kumar Mishra : prof. VIST Bhopal dept CSE
: www.atulkmishra@gmail.com
Prof. Vishakha Tomar,
vishakhatomar09@gmail.com
Prof. Namrata Gurung
nansgurung02@gmail.com

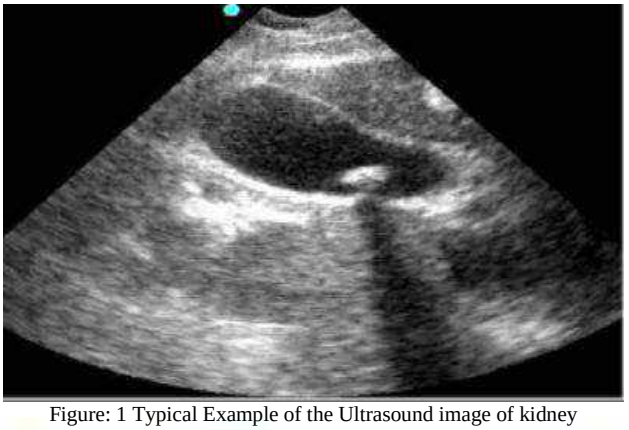


Figure: 1 Typical Example of the Ultrasound image of kidney

According to the size and placement of the stone, these approaches primarily assist the doctor for further treating the patient

A typical example of the kidney stone image captured using ultrasonography is shown in the Figure 1. The presence of KS is not clearly visible and if then its size and shape is not clear form captured images. Therefore in this paper prime concern is to detect the KS using improved contrast and image morphology.

the Pink, crimson, or brownish urine; cloudy or as foul-smelling urine; discomfort that extends across the lower abdomen as well as groyne; pain that occurs in waves and varies in severity; and pain when urinating are the major kidney stone symptoms. High-frequency sound waves used in ultrasound cause the body to reverberate. It does not involve radiation, generally non-invasive, as well as painless. The most common application of ultrasound usually to detect blood clots and also to detect kidney stones, a Baker's cyst behind the knee, or even a torn rotator cuff in the shoulder.

12. KS detection system

The KS detection system diagram is shown in the Figure 2/ it can be seen that initially the KS image is load to the MATLAB environment then converted to gray image for further processing. The Contrast enhancement is achieved, than initial threshold estimation is formed. Based on the observation the morphological processing is applied to smoothen the connected regions and final segmentation is applied. This process is common in any KS detection but methods are different. In this paper the combination of adaptive filter and opening and closing is proposed to segment the KS images. Various preprocessing stage may be used for improving the segmentation efficiency.

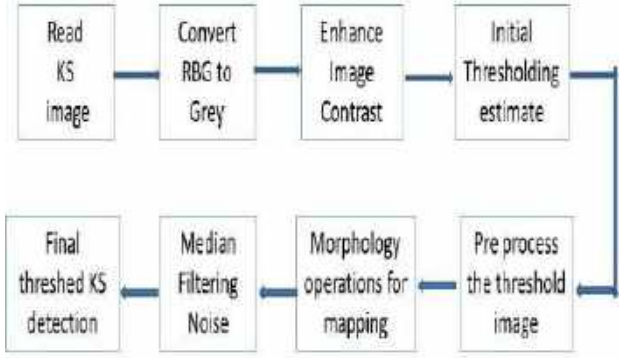


Figure 2 Example of Modulated data and noisy data generation

3. Review of Related Works

Huge research has been already done to identify and detect the KS in the ultrasound images. Although, The KS detection may be performed in CT images and MEI images too. But ultrasound is preferable because of no radiations losses. Thus this section sequentially reviewed the contributions of the research in these domains Dominik Vilimek et al [1] studied to suggest a completely automated hybrids technique for identifying and extracting kidney stone features. The kidney's stone area is segmented and approximated using a multiregional approach in the model. Methods utilize the active contour idea, which is centered on the extraction of geometrical features. The technique impressively enables an impartial evaluation and categorization of the renal stones. These findings might help replace currently employed clinical techniques in which doctors manually designate kidney stones without receiving software feedback. The best course of action for treating kidney stones will mostly rely on the position, size, and makeup of the stones as well as the patient's overall health.

Rohith Annameti [2] have employing the median filters to detect kidney stones in ultrasound pictures will increase the detection rate's sensitivity and accuracy. The performance and sensitivity of the rank filter (n=114) and median filter (n=114) were tested. In ultrasound pictures, the median filter is used to find kidney stones. The sample size chosen with a p-value of 0.8 was 114, and it was utilized to increase the accuracy and sensitivity of the MATLAB simulation tool's kidney stone detection rate. Results are based on the results, the median filter has an accuracy of 86.4%, the rank filter has an accuracy of 82.2%, and both filters have a sensitivity of 87.7% and 82.5%, respectively. The Median filter outperforms the rank filter with regard to of detection rate.

Jyoti Verma and other [3] have studied to begin by using the median filter, Gaussian filter, and un-sharp masking to enhance the image. The examination of kidney stone pictures then employs morphological procedures including erosion and dilation, followed by entropy-based segmentation to identify the area of interest and KNN and SVM classification approaches. This operation's goal is to identify the best quality so that identification is made simpler. Because they are utilized in a more delicate field, namely the medical field, and because they must be correct, medical photography is one of the essential imaging disciplines.

Monika Pathak and others [4] proposed automated object detection in ultrasonic images is a hot one, and current research is moving in the same direction. We've created a tool that makes it easier for doctors to spot the stone location in an ultrasound image. It is a semiautomatic method in which the user must choose the area to be examined for the presence of stones by the suggested system. Application of the feature removal is made to cropped areas that may contain stone. Different features are used, including contrast to that, angular second moment, entropy, and correlation. The KNN classifier is employed to categories data sets of training images. Around 91% of the time, the classification system is accurate. The suggested system's complexity and accuracy are also examined using the confusion matrix.

Angshuman Khan et al [5] proposed a most prevalent condition affecting the urinary tract is kidney stones. Due to the nature of living, kidney stone problems affect every human being on a regular basis. A kidney stone, also known as a renal calculus, is a hard piece of substance that develops inside the kidney when elements usually discovered in the urine are concentrated to an abnormally high level. The main goal of segmenting medical images is to decrease the time a radiologist must spend reviewing an image in order to locate the areas of renal calculi.

Akkasaligar, Prema and others [6] describes an ultrasonic speckle suppression technique for locating kidney stones in humans. The first step in improving an image is to adjust its intensities using image enhancement techniques. Next, noise is removed and the image is smoothed using median filters. Segmenting preprocessed photos is done by holding the threshold. Impulsive noise is separated from salt-and-pepper noise via the median filter.

Wan Mahani Hafizah, among others [7] study and suggests a method for extracting features from renal ultrasound images based on 19 GLCM features (grey level co-occurrence matrix) and five intensity histogram features. Four different categories of kidney ultrasound images were created: normal (NR), bacterial infection (BI), cystic disease (CD), and kidney stones (KS). The photos were initially preprocessed in order to preserve interesting pixels before feature extraction. Techniques for preprocessing have been used, such as region of interest trimming, contour detection, image rotation, and background removal. According to the test's findings, cluster shades, cluster prominence, skewness, and kurtosis take precedence over other factors

Back Propagation Network (BPN) technology is used by Riya Mishr et al. [8] to classify kidney stones automatically using images and data process methods. It is not possible to generate results for big amounts of datasets using human inspection and operators. There is an excessive amount of noise produced by CT scans and MRIs, which causes errors. Neural network approaches used in artificial intelligence have shown to be quite important in this area. As a result, the Back-Propagation Network (BPN) is being used in this project. GLCM is used to extract the features, while BPN is used to classify them. In order to detect kidney stones in their early stages, this study provides a segmentation

technique called the Fuzzy CMean (FCM) clustering algorithm for computing tomography images.

M. S. Uddin et al [9] have also preseted KS study on ultrasound images. Yingpu Cui and others [10] A deep learning and reinforcement learning-based model for automated stones in the kidney detection and scoring using stone nephrolithometry is being developed and validated. Procedures: From February 2018 to April 2019, abdominal non-contrast computed tomography (NCCT) images were back-archived for three sections: a segmentation dataset (n = 167), a Classification dataset for hydronephrosis (n = 282) and test data set (n = 117). The prototype included comprises four actions. The 3D U-Nets for segmenting the kidneys and renal sinus came first. The development of deep 3D dual-path network for hydronephrsis grading came next. Third, stone in the kidney sinus area were found and segmented using thresholding approaches. The segmented stone region was used to calculate the stone size, CT attenuation, and tract length. The stone's location was discovered in the fourth step. Consequently, the algorithm for detecting stones achieved a sensitivity of 95.9% (236/246) and a PPV of 98.7% (236/239).

M. Kavitha and others [11] worked on production of physiochemical compounds in the urinary system is the primary cause of kidney stones. The primary cause of the stone is the highly concentrated urine that contains salts. When these salts are oversaturated, they precipitate and crystallise.

Because of the stone-promoting or stone-inhibiting chemicals, the crystals might be expelled or develop into stone. Proteins mixed with a variety of organic and inorganic compounds such calcium, uric acid, cysteine, struvite, and ammonium acid can result in kidney stones. Of these, calcium compounds such calcium oxalate and calcium phosphate make up 80% of the stones. Kidney stone development may occasionally be influenced by metabolic alterations, hyperparathyroidism, distal renal tubular acidosis, malabsorptive syndrome, obesity, and the severity of diabetes.

In other work of, kidney stone identification employing image processing methods using CT scans was thoroughly analysed. Felix Alberto Caycho Valencia et al. [12] One of the most significant problems in the world is locating kidney stones in their right location. Two kidneys in the human body are crucial for filtering and recycling water. In this study, four stages—image preprocessing with a median filter, segment with a k-mean clustering technique, kidney stone detection, and classification—were all studied. Information was gathered from 40 hospital patients utilising a CT scanner to diagnose kidney stone illnesses. This study investigates a cutting-edge method to identify boundaries, segmented areas, and improve kidney stone location identification. This study aids in pinpointing the location of a stone using pixels. It also counts the amount of patients who have stone-related issues. According to the investigation, this research has a 92.5% accuracy rate with a reliable stone identification method.

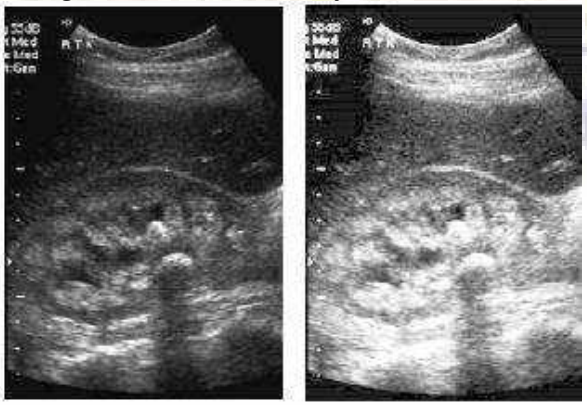
Cunitz, Bryan et al [recent years have proposed optimum Doppler imaging approach for detecting the KS in images. Overall very complex or versatile approaches are available and preprocessing has to be added.

4. Proposed Methodology

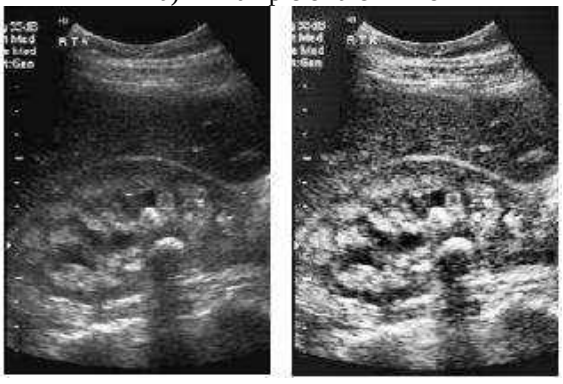
In the paper first CLAHE is proposed for contrast enhancement. Since it may sometimes makes it more difficult to segment the KS due to overlapping intensities. Thus it is required to design the morphological processing for further clearly segment the desired region. The morphological opening and closing is sequentially implemented for reducing the degree of closeness. The final stage of proposed stage is to use the thresholding to segment the desired kidney stone reigns. The system diagram representation was already shown in Figure 2.

4.1 Contrast Enhancements

In this paper standard contrast limiting adopted histograms equalization (CLAHE) method is used for preprocessing stage**.** The case of contrast enhancement is shown in the Figure 3. Figure 3 a) also compared the performance of Contras enhancement with the simples histogram equalization approach (HE) it can be observed that the CLAHE out perform in terms of enhancement over HE for KS images. The histogram is representation of the values of grey levels in terms of probability. It is required to stretch the histogram by any SDE method. The comparison of the histograms is shown in the Figure 4. a) to c). It is clear form Figure 4 that the CLAHE out performs over HE and has much closer brightness to original image also it is capable of enhancing the contrast too. HR may lose the information.

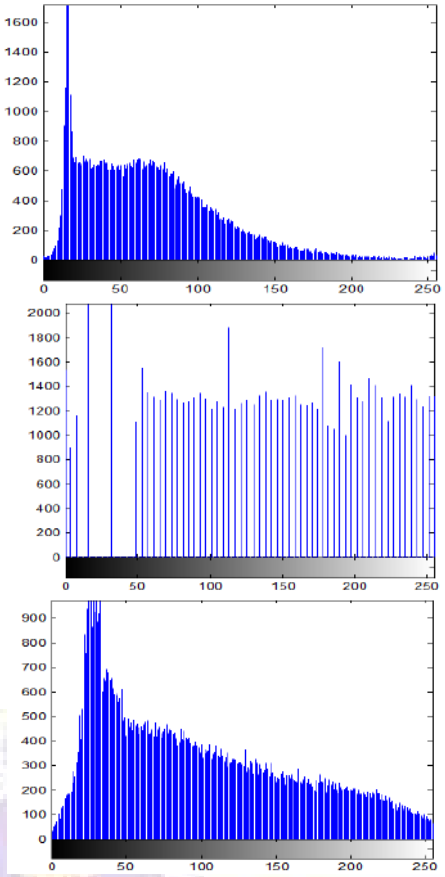


a) Example of the HE fo



b) With CLAHE enhancement

Figure 3 Example of the CLAHE contrast enhancement for KS image

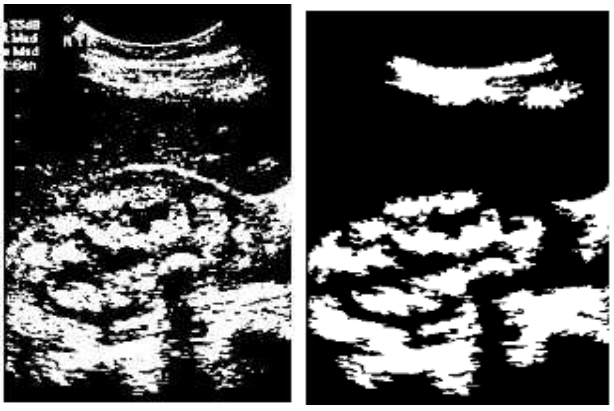


a) Original b) for HE c) for CLAHE

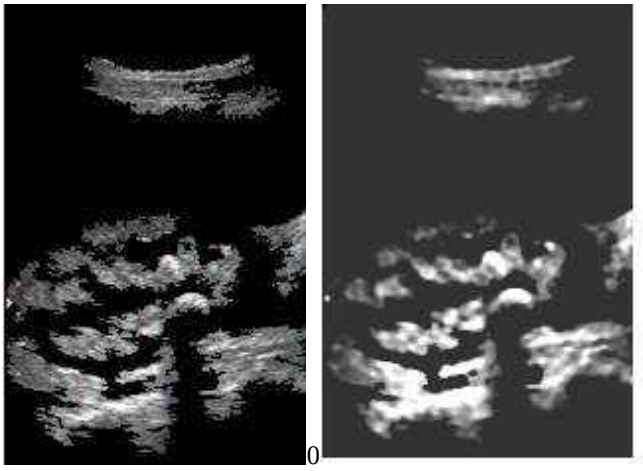
Figure 4 comparisons of the histograms

4.2 Median Filter adoption

The median filter is used for the noise elimination from the KS images. This issue is related to the fact because the error signals detected at the multiplayer perceptron's output layer are partially caused by the hidden neurons [13]. Since such neurons are physically unattainable The results of the example for median filtering and the segmented and masked in morphological domain is shown in the Figure 5 for KS image1. It can e clearly observed that after the filtering significant object information is obtained. The may connected regions are rejected by the preprocessing of the images. Also masking may convert the gray outcomes again.



a) Threshold image b) morphological opened image



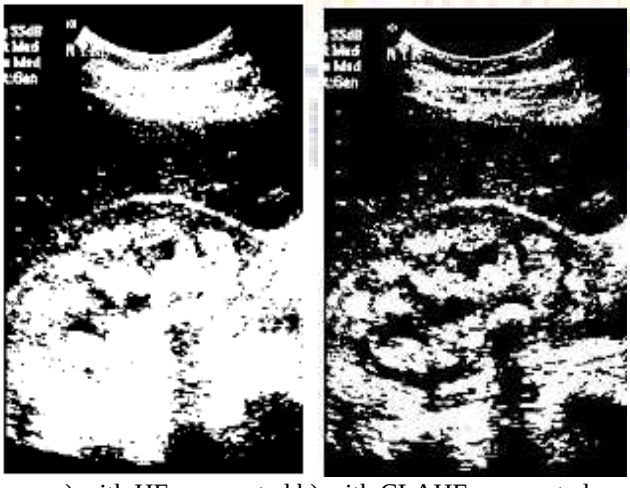
c) gray maped image f) median filtered region

Figure 5 Median Filtered image with preprocessing

5. Results and Evaluations

In this section outcomes of proposed KS detection and segmentation stages are presented. The most basic results of the KS detection with two contrast enhancement methods is shown in the Figure 6. It can be observed that he CLAHE enhancement at the front end may offer the less connected regions in the threshold images. This this paper has first conclusion to adopt CLAHE over HE for front end enhancing.

With HE With CLAHE

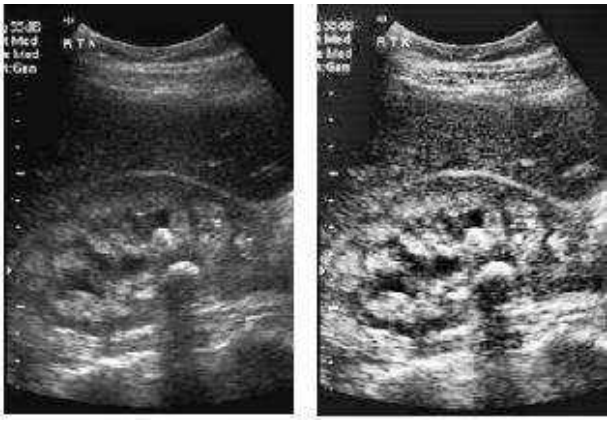


a) with HE segmented b) with CLAHE segmented

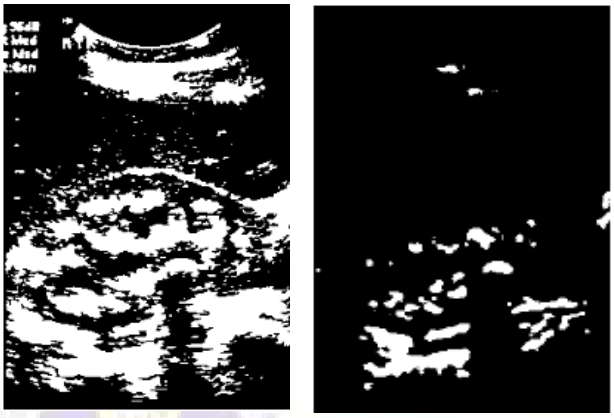
Figure 6 KS image segmentation using thresholding without morphology for HE and CLAHE methods

Sequential results of the proposed KS segmentation methodology are preseted and shown in the example of Figure 7 for the KS image1. These results offers the initial contrast enhancement using CLAHE image and then morphological thresholding is offered as combination of opening and closing followed by thresholding.

Figure 7 preseted the thresholding result with and without morphology processing.



a)) original KS image b) Enhanced processed image



c) Segmented without Morphology d) with Morphology

Figure 6 Sequential results of the proposed KS segmentation methodology.

Finally it can be concluded that the using the proposed essential combination may efficiently segment and detect the KS in the ultrasonography images. The

6. Conclusions and Future Works

The purpose of this work is to employ a series of image processing algorithms to detect the presence of kidney stones in digital ultrasound pictures. However, because to usually lack of contrast and the presence of speckle noise, the KS pictures acquired by ultrasonography techniques are not suitable for further processing. As a result, the study initially proposed CLAHE enhancement for contrast enhancement. To reduce speckle noise, the study offered picture de-noising algorithms based on the median filter to improve the visibility of the ultrasound scan. Finally, morphological processing and thresholding sequences are employed to detect the specific location of the stone utilizing enhanced ultrasound imaging. It is concluded that CLAHE out performs for KS detection. And morphology is required to eliminate the connected regions. In future optimization method may improve the performance.

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The Regression based Stock Market Closing Cost Predication Approach

[1]Sourabh Jain [2]Dr.Navdeep Kaur Saluja [3]Dr. Mohd. Shahnwaz Ansari
[1,2,3]Eklavya University Damoh India
Sourabh Jain: Research Scholar in Eklavya university Damoh Madhya Pradesh, India
Sourabhjain1788@gmail.com

Abstract:-Predicting the stick market price is a critical area of study for accurate investing. Stock market prices can be learned and predicted using regression models. The goal of this project was to use regression modeling to build a mathematical relationship involving an underlying opening stock price along with independent parameters like closure costs and company earnings and revenues. The final goal is to establish manufacturing accuracy using regression models and rising polynomial orders. It is necessary to identify the most optimal regression order as well as the highest R2 measures. The modeling may aid in establishing fundamental relationships between dependent as well as independent cost components. With diverse orders, paper provides significant accuracy ranging from 70% to 88%.with training phase and 99% with testing phase model with data sample.

Keywords: **-Image Watermarking, Spatial Domain, Transform domain methods, DWT, SVD, Attacks**

1 Introduction

The prediction of market prize is the essential step for the stock marbles. There are may learning based methods available for accurate cost prediction. But most of the users are not technologically sound. Thus, it is required to design a simple and accurate mathematical model for stock market prediction (SMP). The reliability of a regression based SMP algorithms is determined by several parameters, notably quality of data, complexity of models, as well as training interval length. More complicated models are generally accurate, however they also demand more data and training time. .

There are numerous types of regression which might be applied when predicting the stock market, includes linear [1, and 2] and polynomial regression [3, and 4], as well as logistic regression. The linear regression (LR) is the most basic sort of regression since it requires a linear modeling amongst the independent and dependent elements. Polynomial regression offers an even more adaptable sort of regression which allows for non-linear associations [5]. Logistic regression is employed for predicting the direction of an identifiable variable, for instance whether a stock's price will raise or fall.

[1]Sourabh Jain : Research scholore Eklavya Unv Damoh reserch in the field of Macine lerning
Sourabhjain1788@gmail.com

Dr.Navdeep Kaur Saluja : working as prof. and guide to Eklavya Univ. Damoh.

[3]Dr. Mohd. Shahnwaz Ansari: he is Prof at the eklavya Unv. Damoh M.P.

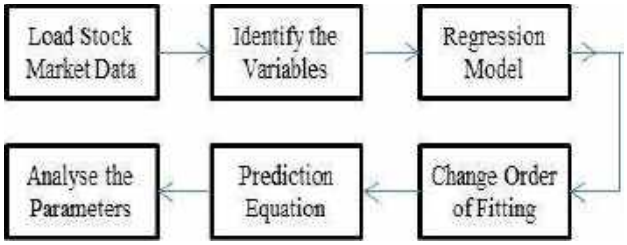


Figure 1 Systematic research methodology adopted for propped SMP prediction model

It is vital to highlight since no regression model may forecast stock market values accurately. The stock market gets a complicated system which is impacted by several variables; therefore a regression model cannot adjust for every one of these elements. Regression, on the other hand, may prove beneficial for recognizing the patterns and trends underlying stock market prices in addition to making informed investing decisions.A stock is a sort of the commodity that represents ownership within a corporation and comprises a claim over the firm's holdings including revenues. Other abbreviations for stocks are stakes, which signify equality. An investor's entitlements included the opportunity of trading shares, attend meetings with shareholders, and earn incentives. A person might indirectly affect a company's activities by having more voting power if they hold more shares, increasing their ownership. Nevertheless, the amount of a stock is the most important consideration for the stock trader**.**

2. Recreation Methodologies

Regression modeling may emphasize the importance of the link between several independent factors as well as a dependent variable in additional to displaying a significant relationship amongst many different variables. This might have proved to be an important consideration in the statistical analysis of regression done for this research. As input, we use stock data, news items, connected stocks, and market data. As standalone and stock-specific traits go, they are now all relevant variables, or at very least, they are.

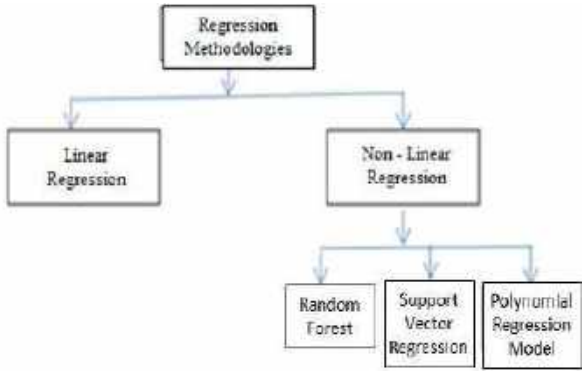


Figure 2 Classifications of Regression Models

Several of the popular regression-based SMP algorithms as regression techniques that have more frequently used include incremental regression, probabilistic regression, regression using polynomial, and support vector regression. As a result, given their nonlinear nature, it might be beneficial for analyzing as well as predicting predictive models with stock price predictions. A modeling approach suggested is polynomial regression. The classification is shown I the Figure 2 and discretion is preseted below.

Linear Regression: The most fundamental type of regression approach is linear regression, which makes the assumption that the association amongst the two groups of variables is linear mathematically given as.

$$y = x * p_1 + p_0$$

Polynomial Regression: Regression models that are more adaptable and might be employed for fitting nonlinear interactions are polynomial regression.

$$y = x^n * p_{n-1} + \cdots + x^2 * p_2 + x * p_1 + p_0$$

Where $p_n, p_{n-1}, p_{n-2} - - - p_1, p_0$ are the coefficients of the regression model? The major task of the any regression based analysis is the optimal finding of the best possible order and the coefficients.

Logistic Regression (LR): A method known as LR can be used to forecast a continuous variable, such as when the price of a stock will rise or fall.

Support vector regression (SVR): Employing a non-parametric regression methodology may be used to deal with outliers or noisy data.

Stepwise regression, stochastic regression, polynomial regression, and linear regression are regression methods that are more widely utilized. As a result, it may be a useful tool for analyzing as well as predict regression models for stock price predictions given their nonlinear character. Polynomial regression is suggested as a modeling technique.

3. Polynomial Regression

The polynomial regression is based on the method of weighted least-square for fitting the nth order polynomial model to fit over the data Usually the linear fitting methods are suitably fits over the data scatter linearly with more correlations between them. The mathematical function generally used for fitting the polynomial curve over data is given in the equation below.

4. Review of Stock Prediction

This paper has given a general review of several regression based SMP estimation techniques. Singh, T et al. accurately predicting the potential price of commodities traded on exchanges is the main difficulty in empirically price determination of assets. It is not shocking that artificial intelligence (AI) methods have demonstrated announcing results in forecasting and significantly outperformed conventional regression techniques. Results for CAT bond premia projections in the primary marketplace were in line with expectations. It is not apparent, though, if the findings of initial market investigations can be extended to the second-hand market since second marketplace information sets contain a panel data format.

Berk et al [2] have proposed to use the statistical learning approach for the SMP using regressions modeling.Dash et al [3] adjusted variation on a support vector regression model is used in this research to offer an innovative machine learning (ML) method for SMP using time series data. The grid-based search approach is performed for optimum training of dataset. Optimizing parameters results in a model that is more accurate overall and uses less memory and computation time.ParshvChhajer et al [4] provided the summary of machine learning and artificial intelligence, as well as SMP analytics techniques in this article. They discuss the benefits and drawbacks of prediction methods/They focused on research that uses deep learning technologies using artificial neural networks (ANN), in the prediction of movements in the stock market.

Abdullah Bin Omar et al. [5] havesolved the difficult mathematical issue to resolve is stock market forecasting. Covid-19 has adversely impacted the stock markets around the world for two years in a row, which resulted in significant issues for shareholders. This study's main goal is to use ML to predict stock index prices accurately over three time periods: The recommended ML models self-regressive neural network models with deep learning (AR-DNN for the whole time frame, for the period prior to Covid-19, and during the Covid-19 period.

Cheng Zhang et al. [6] proposed time series forecasting a difficult issue that have evolved dramatically with recent advances in models based on deep learning, and these changes are frequently challenging to keep up with. In order to provides a thorough evaluation of the most recent studies.Shen, J et al [7] uses deep learning to forecast the price of stocks and trends has grown much more famous compared to earlier in the age of big data. Chinese stock market study provided a thorough customization of a feature-engineered and deep learning-based model.

Zubair M et al. [8]stated an effective way of considering risk and reward is through SMP trends. The information gleaned from sources is typically of a limited scope. Additionally, the predictor variables chosen are poorly chosen, which ultimately lowers the effectiveness of the forecast model.Shukla et al [9] created the most intricate and cutting-edge way of collaboration, which is most likely associated with the securities or the stock exchange. This body is employed to produce money and fill openings by small enterprises, corporations, including the financial industry; this is a very intricate notion. This article offers employing AI calculations to anticipate the ultimate stock cost for trading employing free software as well as prior computations to make this chaotic company setup a bit less alarming.

Chandola et al. [10]studied, innovative deep learning model that combines the Word2Vec along with LSTM algorithms is proposed. The goal is to create a smart tool that uses time series data from stock markets and news headlines as inputs to forecast the direction of stock value shifts. The recommended algorithm's binaries predicted result would help investors make better decisions. The proposed model's efficiency is measured by how effectively it forecasts the pattern of changes in the share prices of five companies from distinct industries.

The primary challenge in empirical asset pricing is that tze et al [11] successfully forecasted the potential worth of the commodities traded through financial markets. It's comprehensible that machine learning approaches have outperformed traditional regression techniques in terms of announcing forecasts. This is because equipment learning

approaches can use complicated, non-linear, more/or non-parametric structures to simulate linkages between clarifying and relying aspects. Caterpillar bond premier predictions in the primary market performed as expected.

It is not apparent, from the review of literature that if the findings of initial market research can be extended to other markets because secondary market information sets contain a panel data format and required efficient prediction and learning.

5. Data base used

This paper has considered the data base of the Meta Platforms, Inc. formally named as the FaceBook (FB). The company is IT based Mata data Management Company and is growing on the continuous basis. For the evaluation the Closing cost and the opening cost are considered for the evaluation.

The calculation for Closing Stock price additionally referred to as closing assets, is defined as

$$Opening\ cost + Purchases - Cost\ of stocks\ sold.$$

The cost regarding opening stock, additionally referred to as the starting point asset cost, should be encompassed in the total purchasing costs for the time frame. This is the cost of the items that will be reimaging for sale on next day.

The plot of the small data of the Closing and opening cost for the 60 random days for the FB stocks 2017 is shown in the Figure 3. It can be observed that red colour with closing cost I most of the time is below opening cost blue mark. This signifies the relative sell is good for the stocks.

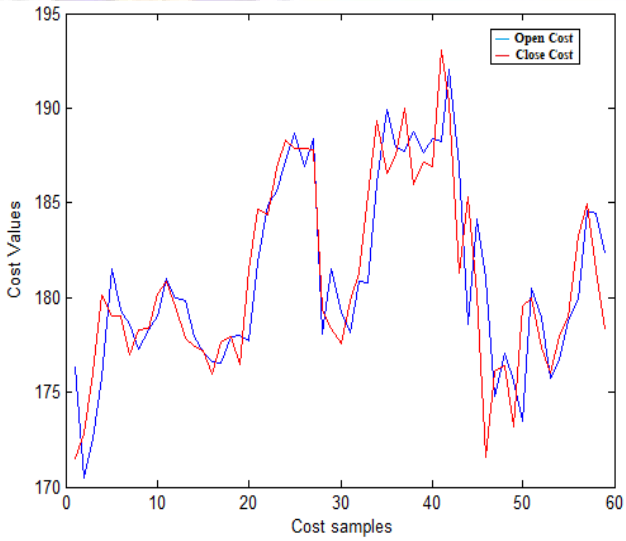


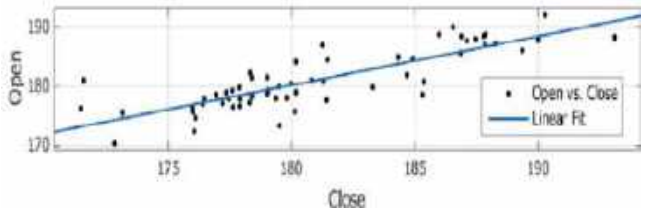
Figure 3 Data of the Closing and opening cost for the 60 random days for the FB stocks 2017

6. Results and Prediction

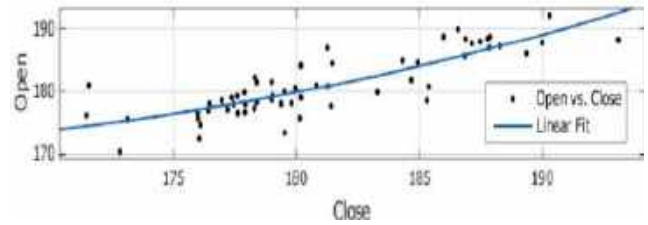
In this section some of the expected prediction results for regression models are repressed for the stocks of the FB Inc.

Experiment 1:

The regression models are tested for the full length of the closing cost and opening cost data. The linear and second order regression is evaluated. The order is resected as after word data is badly contaminated. It can be observed that the simple regression single phase has less efficiency due to variations on the mate data. The R^2 value is just 70.06 % and due to less data correlation.



a) Linear regression



b) Second order Polynomial Regression

Figure 4 experiments using the full data length of 60 simples for regression models.

Experiment 2

Therefore in the second experiments sample size is considered to be small thus 65 % length fata is used for the training and Full data is used for the testing phase. The training on 65 % data is carried out with bad condemnation and the 6th order regression equation is proposed as the solution and the predicted the mathematical model.

The regression model fit is shown in the eq form as below and the coefficient of Fit at=re shown as P1 to P7.

Linear model Poly6:

f(x) = p1*x^6 + p2*x^5 + p3*x^4 + p4*x^3 + p5*x^2 + p6*x + p7

Coefficients (with 95% confidence bounds):

p1 = 4.997e-05 , p2 = -0.05466 , p3 = 24.91 , p4 =-6050

p5= 8.265e+05, p6=-6.019e+07, p7 = 1.826e+09

The training fit model is shown in the Figure 5.Fro the 6 h order regression.

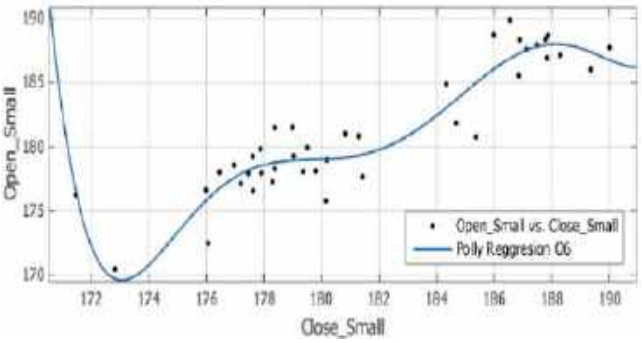


Figure 5 RegressionTrailing fit model order 6 for 65 % initial data

The accuracy and R^2 values are compared in the table 1.

It can be clearly observed from the Table 1 that the considering the reduced filtered 65% data samples may offers the higher R^2 values and gives nearly 18 % hick to the accuracy of the production during the training phase.

Table 1 comparison of parameters

Models	R^2 Values	RMSE
Linear Regressions	**0.69645**	**2.7413**
Ploy Regressions O2	**0.7045**	**2,7287**
Ploy Regressions O6	**0.8852**	**1.828**

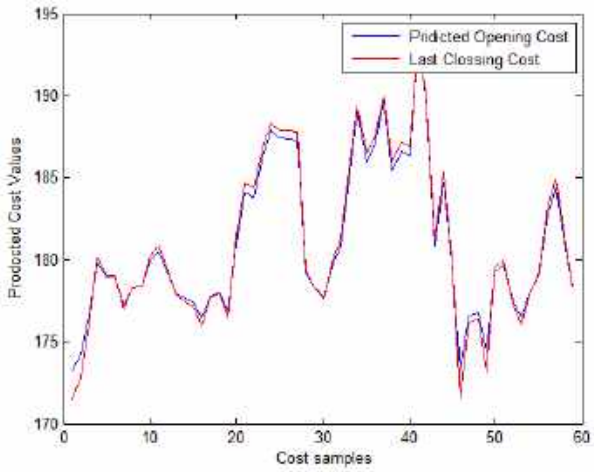


Figure 6 the prediction model Tested on the full length of the data and the compared to closing cost

Linear model Poly2:
f(x) = p1*x^2 + p2*x + p3
Coefficients (with 95% confidence bounds):
p1 = -0.01676 (-0.01766, -0.01586)
p2 = 7.193 (6.863, 7.522)
p3 = -571.4 (-601.4, -541.3)

Goodness of fit:
SSE: 0.3548
R-square: 0.9998
Adjusted R-square: 0.9998
RMSE: 0.0796

Figure 7 testng accuracy for 2 degree model.

The testing model is remodeled as mathematical equation after testing phase as shownin Figure 7

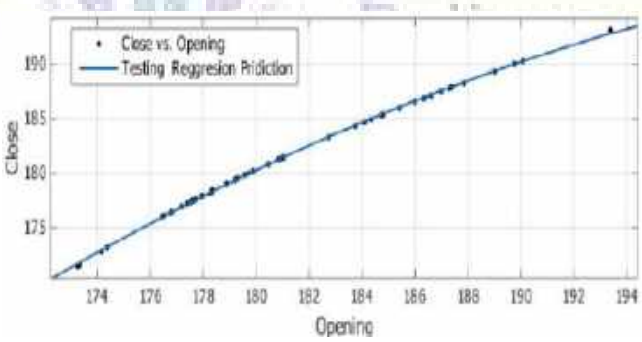


Figure 8 represent the 99.9 % accurate prediction based on proposedtraining + Testing approach.

7. Conclusion and Future scope:-

This project's purpose was to apply regression modeling to create a mathematical relationship including an underlying opening stock price as well as independent parameters such as closing costs and corporate earnings and revenues. The ultimate goal is to achieve manufacturing precision through the use of regression models and increasing polynomial orders. It is vital to determine the best regression order as well as the highest R^2 values.

The modeling could help establish fundamental links between dependent and independent cost components. Paper delivers significant accuracy ranging from 70% to 88% with training phase model and 99% with testing phase model with data sample with diverse ordering.

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Evaluation of Fuzzy Based Route Sorting Algorith for Wide Area WSN

ATUL KUMAR MISHRA, HITESH RINHAYAT, YASH ARYA
Vidhyapeeth Institute of Science & Technology Bhopal MP, [3] CSE with Cyber Security VIT Bhopal
Email: www.atulkmishra@gmail.com Email: hiteshrinayat11@gmail.com

***Abstract*— Wireless sensor networks (WSN) are widely used, hence new strategies must be developed to assure their continued good operation. Wide-area WSN networks have historically employed traditional performance evaluation and improvement methodologies. For WSN routing, the fuzzy set-based routing approaches are often employed. Therefore in this Paper, a modified fuzzy logic-based route sorting technique was created in order to assess the time and effort required to create the network. This prime objective is to build and assess the wide-area network (WAN) configurations for such a sensor network. The suggested methodology has increased the network's dimensions by around 2 to 4 times along with design contains in order to improve the efficiency of wide-area WSNs in terms of total energy ration energy and packets delivery time.**

Keywords—component; formatting; style; styling; insert (key words)

1. Introduction

Sensor network quality enhancements in a dense wide area network environment have received little attention. Many sensor networks are already using a significant portion of the spectrum. As a result, network density is likely to improve in the future. As a result, the purpose of this paper is to evaluate IOT-based wide area sensor networks (WASN) from the standpoint of wide area deployment. The power source of the sensor nodes is one of the major constraints when designing such a large WSN. Allowing only some nodes to interact directly with the base station (BS) will reduce the amount of energy used. The creation of a fuzzy network can help to improve network performance by gathering random data transmitted from each cluster node, compressing it, and then transferring the combined data.

Automatic routing protocols must be designed to improve WSN performance. The Fuzzy set of rules or influence systems (FIS) may be used to meet the automation requirement. This is the primary focus of this paper's research. The majority of current protocols seek to improve the WSN's energy and life efficiency. (Adaptive Clustering Hierarchy Based on Low Energy) LEACH [1 and 3] is a fundamental routing protocol. Fuzzy logic-based modified LEACH protocols for cluster head (CH) selection have recently been proposed [2, 4, and 5].

Many routing methodologies have been developed in the past. Figure 1 depicts a broad classification of these routing protocols based on network structure. The initial classification is based on the structure of a flat and hierarchical network. The hierarchical design of network protocols improves energy efficiency and network life. This paper's primary goal is to design and evaluate the performance of fuzzy logic-based WSN routing. Paper considered the four difference case of wide area WSN network for evaluation with increased area of network.

ATUL KUMAR MISHRA, : is prof. at VIST Bhopal and research interest in the field of machine lerning
hiteshrinayat11@gmail.com
HITESH RINHAYAT : is prof. at VIST Bhopa
www.atulkmishra@gmail.com

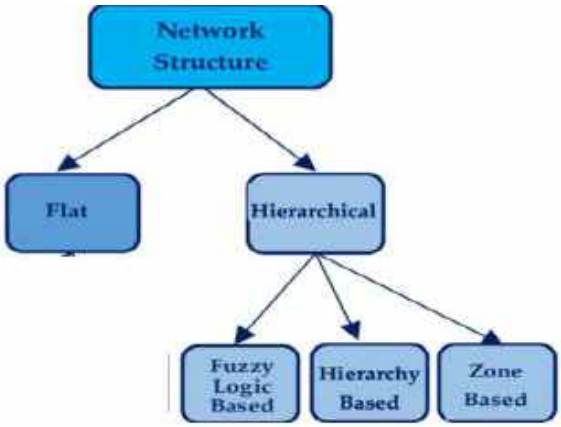


Figure 1 Classification of WSN routing protocol based on Network Structure

. There are some zone-based routing approaches, such as one proposed by S. Faisal et al [6]. They have proposed a novel zonal SEP protocol that is expected to improve the Network life based field division in zones. Certain protocols are classified as hierarchical based on the energy levels of the nodes. The most basic clustering-based hierarchical routing protocol, low energy uses for adaptive clustering based hierarchy (LEACH) [7], is widely used. This category includes the stable election protocol (SEP [8).

Contribution of Work

The issue of WSN's excessive energy consumption has yet to be resolved. To address this issue, the paper describes a fuzzy logic-based routing strategy for WSNs. The main contributions of this paper are the design and evaluation of the performance of a modified LEACH protocol based on fuzzy logic in a highly dense wide area WSN. The goal is to extend network life by improving the route selection process with fuzzy descriptor rules or variables. The paper validates the basic LEACH protocol first, and then compares fuzzy based routing. Energy and node position are used as fuzzy descriptors to improve performance. The node architecture, packets sent to the BS, and alive nodes are used to evaluate the results.

Fuzzy based Routing

WSNs are the most rapidly evolving technology, and they are used in a wide range of networks. The combination of fuzzy and WSN has resulted in the creation of a massive network system. Improving energy conservation is also critical for increasing WSN lifetime.

The fuzzy routing protocols are created to increase the longevity and energy efficiency of the WSN design. Fuzzy logic is a method based on degrees of truth. The most energy-efficient logic is used to operate fuzzy logic systems. An algorithm based on maximum energy is used to obtain a fuzzy systems-based routing technique. The real-time route selection decisions made by fuzzy logic control can be made even with insufficient network data. There are a lot of issues

with choosing the route simply based on the local data of the nodes. First off, because each path must be determined probabilistically in order to be selected or not, there may be situations where the incorrect route is chosen for transmission, thereby wasting energy over the entire network. As a result, it is rhe energy usage metric, E, in this study's fuzzy set can be defined as

$$E = Fuzzy\ set\ (\{Sn, s\}, \{En, u\}, \{Ms, v\} \quad (1)$$

Where, s stands for status constraint, u for energy of nodes, and v for message transmitted. These constraint and based Fuzzy influence system (FIS) is shown in the Figure 2.

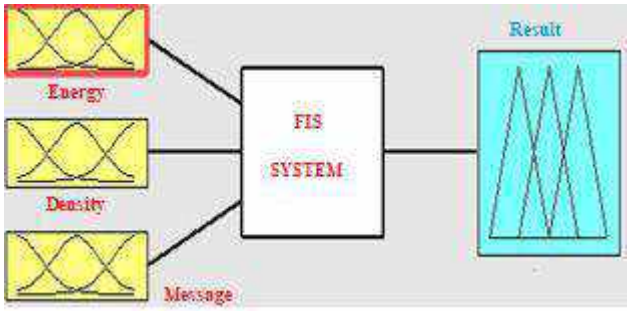


Figure 2 Set of WSN Fuzzy Influence System (FIS)

2. Literature review

Many researchers have worked for performance enhancement of WSN routing protocols. Artificial Bee Colony Method, a novel technique introduced by S. Rizwana et al. [1]. it is an energy-dependent algorithm used to improve network node efficiency. This extends the network's lifetime by increasing energy consumption, either directly or indirectly. When sensor nodes are used densely, according to P. Nayak et al. [2], battery life is decreased, and the LEACH protocol performs worse. In order to improve performance in terms of first node deaths and better lifetime, they proposed a super clustering head (SCH) based protocol.

Fuzzy logic was used in the WSN design process by D. Pal et al. [3] to extend battery life and improve transmission efficiency. Fuzzy CH's election has also been implemented to extend battery life. It can be used in upcoming work for efficient wireless communication to improve security objectives. To enhance and research the lifetime of the network, S. Bagga et al. [4] present a FLBCR protocol that uses fuzzy logic to analyze an appropriate node as CH. By using these cluster protocols, the network is distributed, and information is sent directly from clusters to base stations. This decreases the amount of energy used while also minimizing delay times and system delays. It also comprises the node's density, its distance as from sink, or its energy to weight ratios.

To address the issue of node energy limitation and energy usage, T. Wen et al. [5] offer a fuzzy based LEACH protocol. Secondly, the lifespan of the network could be enhanced and prolonged by using Cluster Head (CH). Thus, the results demonstrate that CH-based protocols enhance not only from the nodes centrality, nodes concentration, and node energy of the system, but also the network longevity. A LEACH-FIS, which was presented by Y. Zhou et al. [6], is an enhanced LEACH variation that can be utilized to increase the mobility of WSNs. The FIS comprises the density, speed, and direction of the nodes' leftover energy.

To choose CHs and create clusters, a new FIS is employed. A modified CH technique is suggested by L. Zhao et al. [7] to reduce excessive energy use. To maximise the CH threshold equation, the residual energy and network addresses of nodes are taken into consideration. This strategy of cluster head competition boosts energy effectiveness and profitably restores network burned.

To get over LEACH's drawbacks, A. K. Dwivedi et al. [8] suggest the FEECA protocol. Four parameters are used by FEECA based on CH nodes to produce an effective result. All non-CH nodes use FIS to choose their CH during cluster formation. This protocol is used to move base stations around. For creating healthcare IoT applications, M. Nasri et al. [9] suggest fuzzy based routing protocol and cross layer routing protocol. These algorithms support a paramedical architecture and provide a variety of cloud-based services. In order to address these issues and improve wireless IoT network performance, a fuzzy logic-based energy-efficient routing protocol is examined.

3. Proposed Fuzzy Logic Based LEACH Protocol

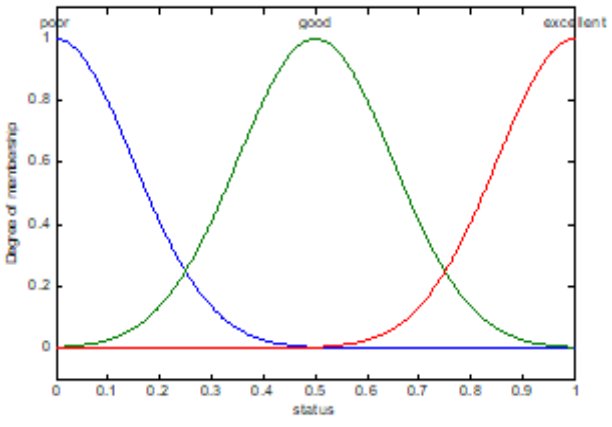
This fuzzy route sorting technique operates in two sets, each of which includes an initialization and steady state phase. The fuzzy decision for route sorting and packet insertion is arranged after the fuzzification process is completed the round during the setup phase using fuzzy knowledge processing. The cluster gathers the aggregated data during the steady state phase and carried out signal processing operations to combine the data into a single message. Destination node receives this composite signal after path selection. The fuzzy descriptors rules are used to express specialized knowledge:

- Message strength: is the input amount of message strength that is available within every node and is represented by fuzzy descriptor message.
- Node energy status: the input status of nodes energy in defined area is indicated by a fuzzy descriptor status.
- Decision: denoted by the fuzzy output constraint and has a value that categorizes routing paths decision according to single or multi path to the cluster.

The respective FIS I.O are shown in Figure 3.

The Proposed Fuzzy Set of Rules

1 1. If the communication is routine and the status is bad, the decision is to discard= (1)
2. If both the status is bad and the message is important, the decision is multiple= (1)
3. If status is bad and the message is flash, the result will be a flood =(1)
4. If the status good and the message Routine, then decision is Single=(1)
5. If the situation is favourable and the message is urgent, multiple decisions will be made=(1)



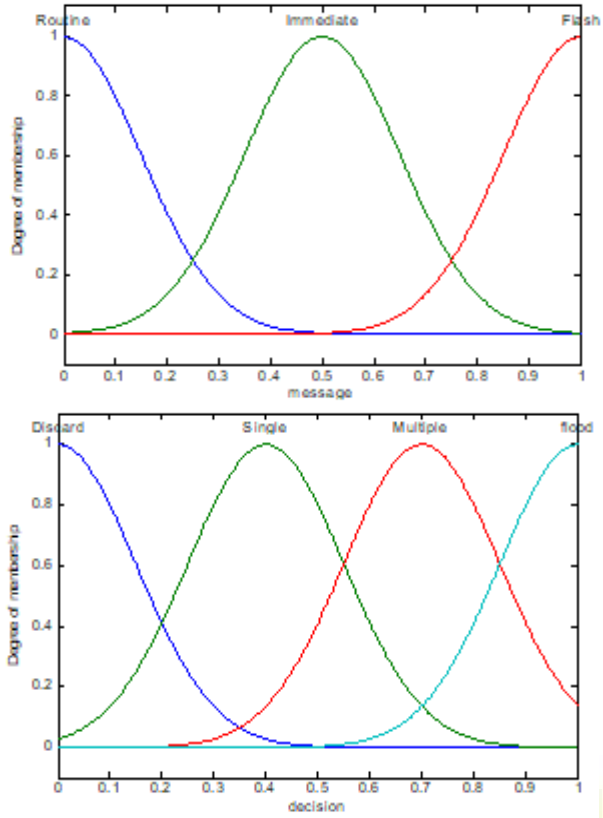


Figure 3 Input and output constraints of proposed Fuzzy system

If both the status and the message are Flash, then (decision is Multiple) (1)

7. If the status is excellent and the message is routine, only one decision will be made (1)
8. If the status is excellent and the message is urgent, just one decision will be made (1)
9. If the message is Flash and the status is outstanding decision is set to Multiple

4. Results and Discussions

Paper proposed to evaluate the performance of fuzzy logic based The results of the basic shortest path routing for WSN design are validated and implemented first. The random allocation of 50 new nodes considering the dense wide 100x100 sq m area deployment the mesh estimation is shown in Figure 4.

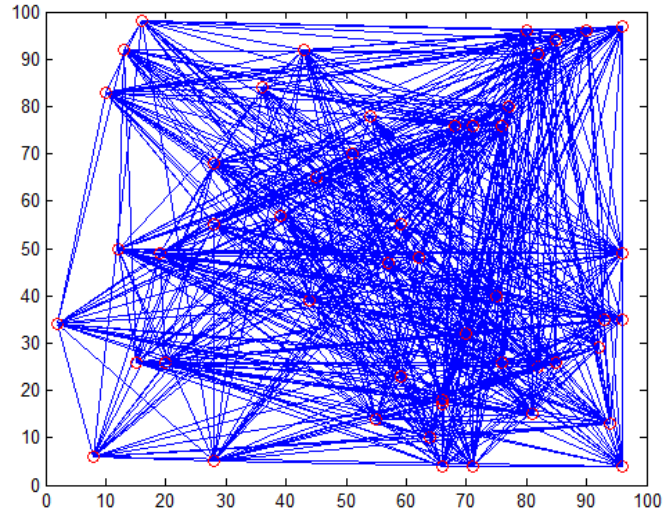


Figure 4 Routing paths estimated among the mesh network of 50 nodes

In the proposed WSN the each node is expected to connect to other network using the dedicated link and the routing path is also sorted based on the calculation of estimated energy and time of dilevery.

Results of the Wide Area Networks

In this paper the experimentation is performed to evaluate the performance of the Fuzzy logic based route sorting under the consideration of the wide area networks. It is proposed to estimate the total energy consumption and message delivery time.

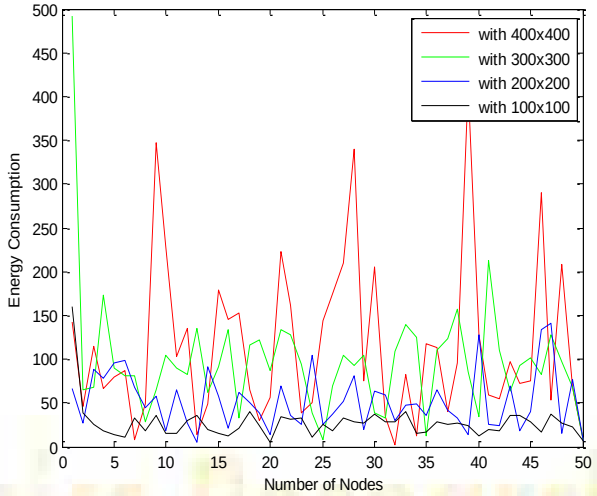


Figure 5 the comparisons of the energy consumption for Fuzzy based route sorting

The comparison of the estimated energy consumption among the various paths of mesh networks for 50 nodes evaluated for various size of the WSN network are shown in the Figure 5. The network dimensions are varied from 100 to 400 at an interval of 100 nodes and the communication energy consumption is estimated for fuzzy based routing.

It can be observed from the Figure 5 that increasing the dimension may leads more distance and less dense nodes, thus the consumption of energy required to communicate data among nodes increases significantly.

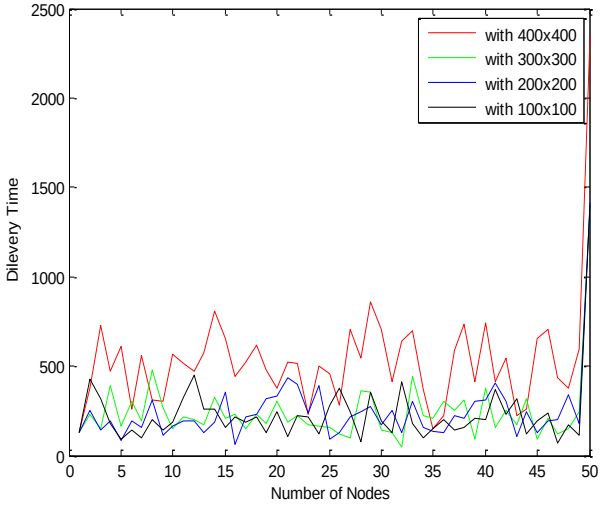


Figure 6 the comparisons of the Time delay for Fuzzy based route sorting

It can be observed from the Figure 6 that time delivery to communicate data among nodes increases significantly as network dimension increases, It can be observed from the

Figure that the variations in time for neigh our nodes differ significantly for larger network dimensions.

The relative extension ratio of the data packets Delivery time and the total sum of the energy consumption from source to destination nodes in the network are given in the Table 1. It can be noted that the delivery time and the energy requirement scaled up with the increased network dimensions. The energy is scaled by around 8 times when network is scaled by 16 times.

TABLE I. THE RESULTS OF TIME AND ENERGY RELATIVE RATIOS

Parameter	**100 x 100**	**200 x 200**	**300 x 300**	**400 x 400**
Total Energy Rario	1.8593	2.1420	2.2254	2.3441
Delivary Time Ratio	1.1088	1.394	5.4361	8.4031

5. Conclusions anuture Work

In this paper the Fuzzy set of rules are used to form the FIS system for estimating the WSN paths. This study's objective is to build and assess the wide-area network (WAN) configurations for such a sensor network. The suggested strategy is to change the network's dimensions and design characteristics to improve the wide-area WSN's energy and time performance using a fuzzy set of rules. The status and the message are considered as input parameters of the FIS to take the decisions of path selection. There is a possibility of single path or multiple paths in the network from a node. Performance is evaluated for wide area network keeping node density fixed.

The random allocation of 50 new nodes is considered for the dense wide 100x100 Sq m area deployment. It is concluded that increasing the dimension may result in more distance between nodes and less dense nodes, which increases the amount of energy needed to convey data among nodes.

It is also concluded that time delivery to communicate data among nodes increases significantly as network dimension increases,

In the future it is proposed to design the mesh fuzzy network using the various clustering based routing protocols. Also, the optimization techniques like ACO may be use future for performance improvement

Acknowledgment

Authors acknowledge every one contributing to make the research a success. .the valuable contribution of every individual associated to research is admirable.

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THE AD-HOC ROUTING PROTOCOL - DSR SIMULATION

Anni U. Gupta
Assistant Professor, Department of E&Tc, MET'S BKC IOE, Nashik, India.
anniugupta@gmail.com
Dr. Mangesh D. Nikose
HoD , Electrical & Electronics Engineering, Sandip University, Nashik, India
drmdnikose@gmail.com

Abstract- Ad hoc networks are characterized by multi-hop wireless connectivity, frequently changing network topology and the need for efficient dynamic routing protocols plays an important role. A detailed simulation model with MAC and physical layer models is used to study the interlayer interactions and their performance implications. All aspects of the protocol operate entirely on-demand, allowing the routing packet overhead of DSR to scale automaically to only that needed to react to changes in the routes currently in use. This paper evaluated the operation of DSR through detailed simulation on a variety of movement and communication patterns and through implementation and significant experimentation in a physical outdoor ad hoc networking test bed, constructed and demonstrated the excellent performance of the protocol. Also describe the design of DSR and provide a summary of some of our simulation and test bed implementation results for the protocol.

Keywords−Ad hoc networks, Routing, DSR

1. INTRODUCTION

The Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure or administration. Network nodes (computers) cooperate to forward packets for each other to allow communication over multiple "hops" between nodes not directly within wireless transmission range of one another. As nodes in the network move about or join or leave the network, and as wireless transmission conditions such as sources of interference change, all routing is automatically determined and maintained by the DSR routing protocol. Since the number or sequence of intermediate hops needed to reach any destination may change at any time, the resulting network topology may be quite rich and rapidly changing. The DSR protocol allows nodes to dynamically discover a source route across multiple network hops to any destination in the ad hoc network. This paper describes the design of the DSR protocol and provides a summary of some of our current simulation and test bed implementation results for DSR. Also discusses assumptions in the design of DSR, then the description of DSR Protocol, summarizes some of simulation observations for DSR. The development packages investigated for the development of the research application was QUALNET.

2. ASSUMPTIONS

Assume that all nodes wishing to communicate with other nodes within the ad hoc network are willing to participate fully in the protocols of the network. In particular, each node participating in the network should also be willing to forward packets for other nodes in the network. Packets may be lost or corrupted in transmission on the wireless network. A node receiving a corrupted packet can detect the error and discard the packet. Each node selects a single IP address by which it will be known in the ad hoc network. Although a single node may have many different physical network interfaces, which in a typical IP network would each have a different IP address, we require each node to select one of these and to use only that address when participating in the DSR protocol. This allows each node to be recognized by all other nodes in the ad hoc network as a single entity regardless of which network interface they use to communicate with it.

3. DSR PROTOCOL DESCRIPTIONS

The DSR protocol is composed of two mechanisms that works together to allow the discovery and maintenance of source routes in the ad hoc network are Route Discovery, and Route Maintenance. Route Discovery and Route Maintenance each operate entirely on demand. In particular, unlike other protocols, DSR requires no periodic packets of any kind at any level within the network. The operation of Route Discovery and Route Maintenance in DSR are designed to allow uni-directional links and asymmetric routes to be easily supported. DSR allows such uni-directional links to be used when necessary, improving overall performance and network connectivity in the system. DSR also supports internetworking between different types of wireless networks, allowing a source route to be composed of hops over a combination of any types of networks available.

The key distinguishing feature of DSR is the use of source routing. Dynamic Source Routing (DSR) is a reactive protocol i.e. it doesn't use periodic advertisements. It computes the routes when necessary and then maintains them. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which the packet has to pass, the sender explicitly lists this route in the packet's header, identifying each forwarding "hop" by the address of the next node to which to transmit the packet on its way to the destination host.

4. DSR EVALUATION

This section summarizes some of our experiences evaluating DSR through detailed studies using discrete event simulation, and through implementation and actual operation and experience with the protocol in an ad hoc networking test bed environment.

Random way point mobility model*:* The random way point mobility model is simple and is widely used to evaluate the performance of MANETs. The random way point mobility model contains pause time between changes in direction and/or speed. Once a Mobile Node(MN) begins to move, it stays in one location for a specified pause time. After the specified pause the minimum speed and maximum speed and travels with a speed V whose value is uniformly chosen in the interval (0, Vmax*)* where, Vmax is some parameter that can be set to reflect the degree of mobility. Then, the MN continues its journey toward the newly selected destination at the chosen speed. As soon as the MN arrives at the destination, it stays again for the indicated pause time before repeating the process time is elapsed, the MN selects the next destination in the simulation area and chooses a speed uniformly distributed between the minimum speed and maximum speed and travels with a speed V whose value is uniformly chosen as (0, Vmax*)*.

Then, the MN continues its journey toward the newly selected destination at the chosen speed. As soon as the MN arrives at the destination, it stays again for the indicated pause time before repeating the process. This simulation has been carried out using the Qualnet 4.5 simulator.

Steps Carried Out To Perform The Experiment*:*

1. In order to place 15 nodes in a chain topology, we need to change the default values of the co-ordinate system. For that, the Inspector -> Config Settings -> General -> Terrain -> Co-ordinate System - >Dimension -> 4000 x 4000.
2. All the nodes are placed at a distance of 200 meters from each other.
3. After placing the 15 nodes in chain topology, set the parameters for the nodes in the following way:

Node Configuration -> MAC protocol -> 802.11 Node Configuration -> Radio/Physical Layer -> Radio type ->Auto rate fallback -> No Node Configuration -> Radio/Physical Layer -> Radio type -> Data Rate->11 Mbps

In the Node Configuration -> Radio/Physical Layer -> Radio type,

Change the parameter of Transmission Power from 15 to 6 dbm. This change is required to ensure that the packets from one node are able to reach only the adjacent nodes. The value was derived through the method of observation of the simulation.

4. Now, in order to change the routing protocol to DSR, change the following parameters:

Node Configuration -> Routing protocol -> Routing policy -> Routing protocol for IPV4 -> DSR.

In order to ensure that there is no loss of packets due to packets being dropped, set the Buffer Packets parameter to an arbitrary value say, 5000 and accordingly also set the Buffer size. (E.g. 5000 x 4096 (pkt size).

5. For the CBR UDP link which goes from node 1 to node 2 (and eventually till node 15 as go on increasing the hop counts), set the following parameters:

Config Settings -> Wireless Settings -> Channel -> Path loss model -> Free Space

Config Settings -> Wireless Settings -> Radio Physical Layer -> Noise Factor-> 0 Config settings -> General -> General -> Simulation time -> 200 seconds

7. In order to set the mobility parameters for the second part of the experiment, set the following parameters:

Node Configuration -> Mobility -> Position Granularity -> 0.5

Node Configuration -> Mobility -> Mobility Model -> Random Waypoint

Node Configuration -> Mobility -> Pause -> 10 seconds

Node Configuration -> Mobility -> Min. speed -> 1 meters/sec

Node Configuration -> Mobility -> Max speed -> 10 meters/sec

8. The results of the simulation for the different hop counts measuring Initial delay, Average total delay and Throughput are as follows:

Table 1: Initial Delay

No of hops	Initial delay (seconds)
1	0.15
2	0.20
3	0.26
4	0.27
5	0.36
6	0.40
7	0.49
8	0.58
9	0.68
10	0.68
11	0.70
12	0.75
13	0.79
14	0.85

The initial delay of the packet has been calculated using the tracer facility of the Qualnet simulator.

For Eg.: the initial packet delay for a hop count of 13 (the message sequence no. = 0 and source node = 1 (originating node) and destination node = 14 (tracing node)) is 1.78557877-1.0 ~ 0.79

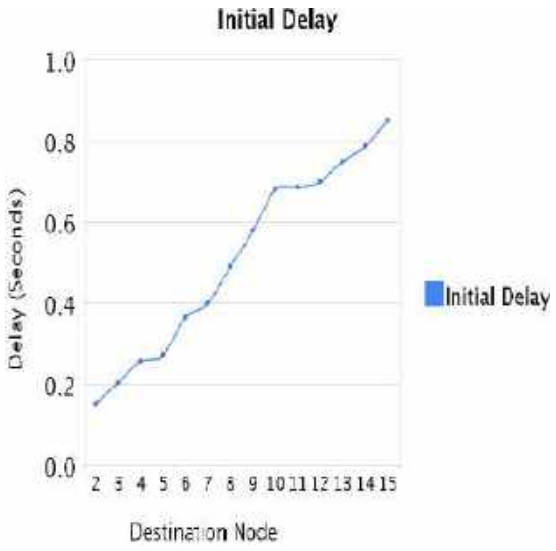


Table 2: Average total Delay

No of hops	Average total delay (seconds)
1	0.15
2	0.35
3	0.57
4	0.80
5	1.73
6	2.14
7	2.25
8	2.33
9	2.34
10	2.36
11	2.36
12	2.36
13	2.36
14	2.4

The qualnet service provides the values for the Average End to End delay for the different hop counts through the means of graphs. So just exported the values for each of the hop counts into text file and built a graph using the same.

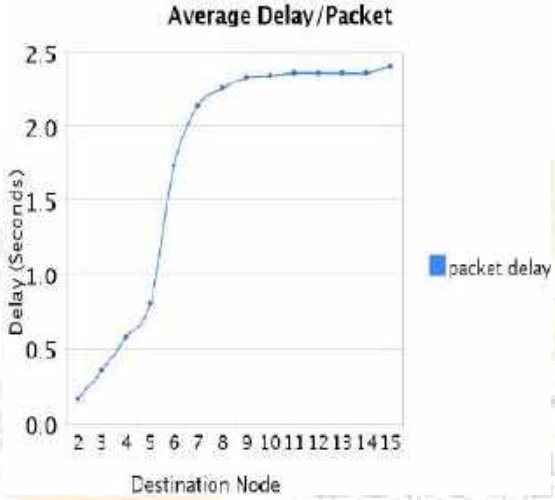
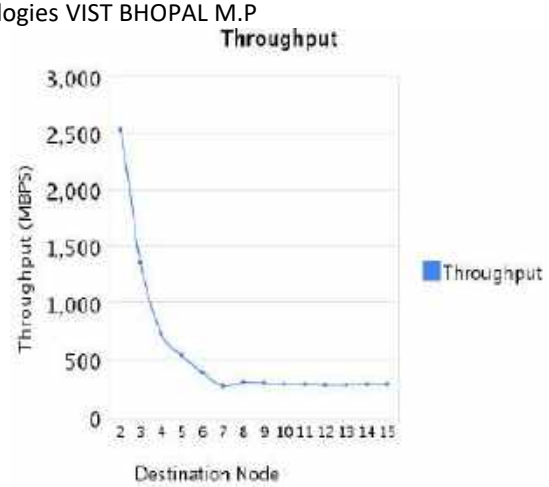


Table 3: Throughput

No of hops	Throughput
1	2530
2	1360
3	729
4	539
5	385
6	263
7	301
8	291
9	279
10	275
11	268
12	270
13	275
14	270

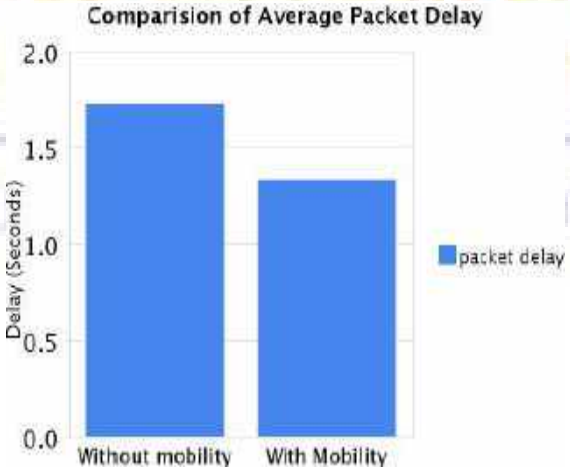
The graph is constructed using the same Procedure as described in the above section .

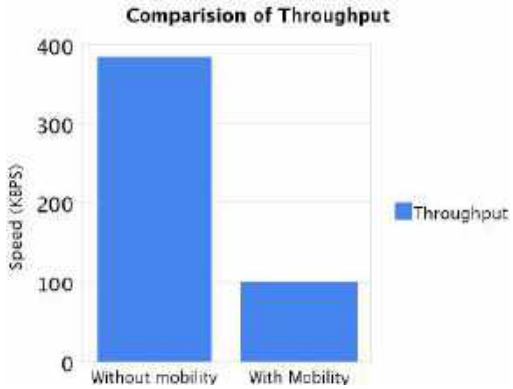


Simulation with mobility enabled for hop count of five:

After setting the mobility parameters as described in the first section, we got the following results from the simulation.

Parameters	Without Mobility	With Mobility #
Average total delay (seconds)	1.73	1.32
Throughput (Kbits/sec)	385	103





5. OBSERVATIONS

Impact of mobility on Throughput and Delay:

From the above results, due to mobility there has been a significant decrease in the Throughput of the data. But at the

same time also observe a decrease in the Average total delay of the packets. The reason for this is that as the nodes start moving randomly, there occurs a change in the topology. Some nodes that were not within the radio range of each other previously, may come into contact now while some who were in touch with each other previously, may lose their radio contact.

As a consequence of this change in topology, it may happen that the sender and the receiver may come closer to each other during certain duration of time. During this period, the data transfer between the sender and the receiver will be much faster than when they were distant. Hence, there is drop in the average total delay. But as soon as the sender and the receiver start moving away from each other, and the sender is also not able to find a route to the receiver via any of its adjacent nodes, the receiver is unable to receive packets from the sender. Hence, there is drop in the throughput.

6. CONCLUSIONS

Thus after performing the simulations for the objectives stated in the experiment, the following are the conclusions:-

The initial packet delay increases almost linearly as the number of hops increases.

The average total packet delay initially increases very rapidly as the number of hops increases but then it stabilizes after a certain number of hops (in our example, it starts stabilizing after hop count 9).

Similarly, for Throughput, it first decreases very rapidly as the number of hops increase, but it starts to settle down at almost a constant value after a certain number of hops (e.g. It stabilizes at around 270 kbps after hop count 9).

Due to mobility, there is a decrease in the Average total delay of the packets but at the same time, there is a significant decrease in the throughput also.

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Processing and Validation of Peak Detection for the Analysis of the ECG Disease Patterns

MukeshAsati, Research scholar Deptt of computer Science, Eklavya University Damoh M.P.
Dr.Navdeep Kaur Saluja Asst.Professor IMEC Sagar M.P
asati.mukesh@gmail.com, navdeep.saluja2000@gmail.com

Abstract: Electrocardiogram, ECG signals, which have been records of heart electrical activities, had lately been employed to categories heart illnesses patterns. Paper first process the raw ECG data using Pan Tompkins standard filtering algorithm for artifacts removal. Then Data on the QRS wave peaks that have been identified and utilized as a criterion for further classification. In ECG HRV variability scenarios. The idea of research is to utilize machine learning (ML) to identify various ECG illness patterns using the chosen QRS feature set detection. The basic suggested method successfully identifies the ECG signal peaks for the Q, R, and S peaks. The visual outcomes show QRS detection efficiency of ECG without artifacts case. Peak detection for the ECG APB pattern is also confirmed.

Key words: ECG, ECG artifacts, Pan Tompkins, Peak Detection, Machine Learning, QRS Complex, HRV

1. Introduction.

For the identification and treatment of various diseases, electrocardiogram (ECG) information analysis is critical. Varied heart conditions cause different heart rates variations (HRV) therefore, as a response, various ECG patterns. Among the most crucial processes inside the processing of ECG recordings is the understanding and retention of the QRS complex [1]. That R wave is crucial for the assessment of variation in standard heart rate as well as the identification of abnormal cardiac rhythms (HRV).

. The temporal time - series data characteristics are extracted and used the simple peak detection method. Inside this explanation, it is proposed to apply machine learning (ML) to recognize different ECG disease patterns that use the selected feature set. The details of the detected peaks of the QRS waves are extracted and used as features for further classification. The description of QRS ECG pulse function and the capturing process ifs showman Figure 1

Re-polarization, ventricle depolarization, and ventricular reversed polarisation can all be seen in the QRS property's ECG waveform. Figure 1 depicts a comprehensive QRS wave in great detail. Here all steps may result mismatch and cas te artifact in the ECG data or the variation in ECG features.

This paper proposed to study the ECG peak detection algorithm over the two types of the ECG data. The data considered here is the ECG of normal person without any disease. And the second case is consider as the atrial premature beats (APB)

Mukesh Asati, Research Scholor Eklavya Univ. Damos MP.
asati.mukesh@gmail.com
Dr.Navdeep Kaur Saluja: she is Prof. And guide at the Eklavya Univ. Damoh and research interest in machine lerning
navdeep.saluja2000@gmail.com

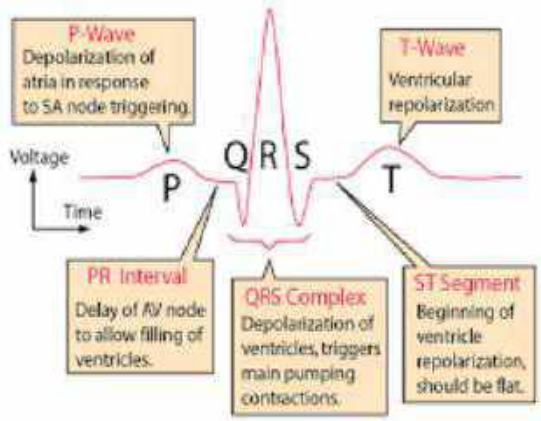

Figure 1 The description of the QRS ECG pulse for the Function

It is obvious that in the presece of cariation in heart ECG data the PQS and T waves part with the lower amplitudes may disturbed and the time interval of the lower features are changed.

2. ECG and Heart Functioning

In reaction to electromagnetic pulses, human heart will contract and widen to circulate blood around the body. Heart disease, rapid heartbeat, and other heart problems can affect these communications. Through the use of an ECG, doctors can identify heart conditions and detect problems with your heart's electrical system. The ECG signals show the rhythm of the heart's electrical activity during the course of a ventricular contraction graphically.

Initially, the first step of processing is using the data's provided ECG patterns, ECG peaks are determined and confirmed for QRS peak identification.

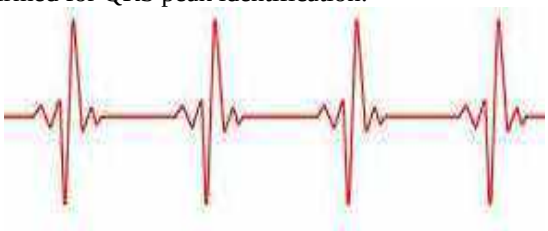

Figure 2 examples of standard EGG signal waves as applicable to healthy human heart

The wave description of typical ECG signal samples as they relate to a healthy man's heart is shown in the Figure 2. It can be observed that for the healthy human the rhythm of the ECG signal is fixed and all the QRS waves have the same time. But in the presence of the HRV the pattern and features of these waves varied. Thus are required to study further.

3. Review of Related Works

For such ECG illness categorization, a variety of extracting the features and classification models has been used. The research done here was set in motion by the summary. Karpagachelvi, S. et al. It is explained in the research schemes how to remove characteristics out of an ECG signal using a range of approaches and modifications that have already been previously published in the literature. Furthermore, this article compares various methods developed by scientists to eliminate characteristics from ECG signals.

AfseenNaaz et al. [2] examined and discussed a number of important ECG extraction of features strategies that have already been previously disclosed [2]. It is plainly clear first from conversations that one of the key techniques for eradicating the QRS complex and other characteristic of ECG datasets is the mathematical transformation. One of the extra features suggested by SumantaKuila et al. [3] is an ECG-based fingerprint recognition system that evaluates the raw ECG signal. The technique is aided by a variety of noise-reduction filters including waves that also have undergone time-domain evaluation to identify ECG features. An ADALINE neural network of four distinct neurons or one output unit can distinguish R-peaks in ECG continuously with a good accuracy of more than 99%, according to investigation by Kim, Jeong-Hwan et al. Gorav Kumar Malik et al. [5] in their study make the suggestion to develop an autonomously arrhythmia classification technique using a number of ECG signal parameters.

They discussed how well the SVM classification result suggests that the Electrocardiogram feature might be used as a reliable indication of cardiac problems. In order to determine the applicability of the MATLAB Phone or tablet for mobile applications and if it can function on any phone network, VadimGliner et al. [6] integrated an authentic Electrocardiogram R peak detector in the MATLAB Mobile application to low false positive and instead minimal false rejection proof of identity in the presentation of the most popular common arrhythmia, atrial fibrillation.

In their study, Dr. M. AntoBennet et al.[7] describe how to set up a wireless Wearable monitoring program and a strategy for classifying heart disorders. Reviewing several techniques and transformations that had previously been mentioned in the literature for such collection of characteristics out of an ECG signal was the main objective of Mayank Kumar Gautama: et al. [8].

Additionally, a comparison of different methods for erasing the characteristic from such an ECG signal is included in this paper. Apurva Kulkarni et al. [9] suggested conducting research on R clarification regarding that use the Pan Tompkins approach. A evaluation of transformations came next. According to Carlos Lastre-Domngue et al. [10], unconstrained response to bounded impulses (UFIR) filtering should be smoothed out. They have designed this filtering to have an adaptable aggregated horizon, which is perfect for sluggish ECG movements and minimal for the fast excursions.

One-dimensional learning based 1-D system has been proposed by Mohammad Mahmudur Rahman Khan et al. It is advised to use CNN to automatically classify five different types of ventricular tachycardia from an ECG. In order to improve performance, the ECG data went through a number of pretreatment procedures (de noising, peak detection, and heartbeat segmentation). [R12] A novel Long Short-Term Memory (LSTM)-based ECG classification algorithm is proposed by Saeed Saadatnejad et al. [12] research, outperforming past attempts in terms of classifying efficiency.

Azmi Shawkat Abdulbaqi et al. [13] provide a full explanation of the Dual-Tree (CWT) technique for de-noising an ECG signal. The article also discusses how to extract several elements from the suggested defined and rebuilt signal, including time interval measurements, anatomical, and object recognition pinpoint location. Najlaa Jannah et al[14] .'s studies used multi-lead observations followed signal decompression in the fourier domain to show the superiority of CSVM over classical SVM in simultaneously distinguishing distinct arrhythmia kinds. The methodology was created by using MATLAB as well python.

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4. **Summary of Work**

The various researches in the field of ECG peak detection and classification are summarized and is stabulated in the Table 1.The various featuresof ECG are mentioned in Table.

Table 1 Summary of the ECG Survey and Methodologies

S.No	Author's Name	Methodology	Evaluation Parameter
1.	S. Karpagachelvi et. al [1]	Presented various Feature extraction methodologies from ECG data. Such as SVM and ANN.	Performance is measured based on the range of Simplicity Accuracy and Productivity
2.	SumantaKuilar et al [3]	The proposed to perfrom the biometric recognition system based on feature extraction on P-QRS-T signal ECG which processes the raw ECG signal.	Accuracy achieved 95.245%, Specificity, true positive 81.361%, Recall, Precision
3.	Jeong-Hwan kim et al [4]	Propose R-peaks in ECG can be automatically detected with the high accuracy of more than 98% with the NN use of ADALINE network.	Accuracy, Specificity, true positive. True negative's
4.	Gorav Kumar Malik et al [5]	proposed detection of arrhythmias in ECG signals using feature Extradition as well as SVM learning	The clinical decision accuracy must be on as high as possible. The features are based on the PR Interval, ST Interval D,. QT Interval, TP Interval, HRV, and Energy
5.	Dr. M. AntoBennet et al [7]	The creation of a cardiac diseases classification method and real-time portable ECG monitoring system	Using time and frequency based features set. As low frequency component (LF) index ratio LF/HF Power Spectral Density (PSD), time domain HRV

6.	ApurvaKulkarni, et al [9]	The Pan Tompkins method was used to detect R peaks..	For both pathological and normal cases, several statistical as well as morphological features were identified..features used are R-R interval, HRV, mean, variance, median, skewness, and kurtosis
7.	Carlos Lastre-Dom-nguez et al [10]	Have used unbiased finite impulse response (UFIR) filter	The performance is evaluated using P-wave, QRS-complex, and T-wave, Accuracy of SVM is used as performance measure. SNR and MSE estimation is used for parameter performance
8	Jannah N. et al [14]	The proposed work provides a useful methodology for multi-lead ECG analysis and classification of arrhythmia conditions based on CSVM classification following DFT signal pre-filtering.	The advantage of CSVM over standard SVM in simultaneously detecting different types of arrhythmias on the basis of multi-lead recordings following signal compression in the Fourier domain. Implementation of the algorithms was performed in MATLAB. The CSVM classification algorithm provided.

5. Proposed Peak detection

The QRS peak detection is essential for the diagnosis of diseases as well as the estimation of heart rate variability (HRV) (HRV). Its proposed to detect the peaks for recognition of HRV is significantly influenced by the temporal record analysis; The ECG heart rhythms of the aberrant ECG readings are categorized using the MIT-BIH standardized Arrhythmia ECG mattresses dataset.

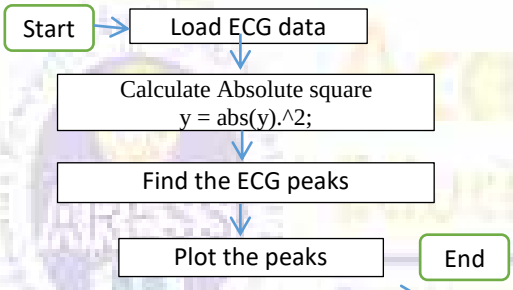
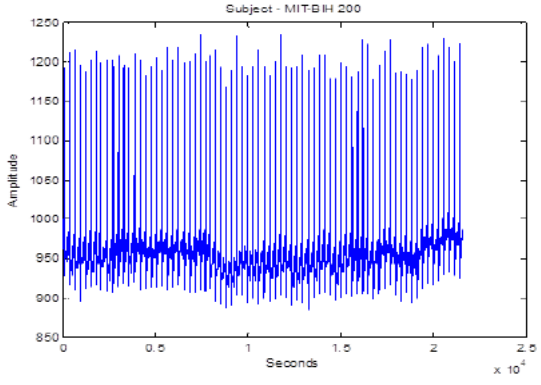


Figure 3 ECG peak detection flow chart

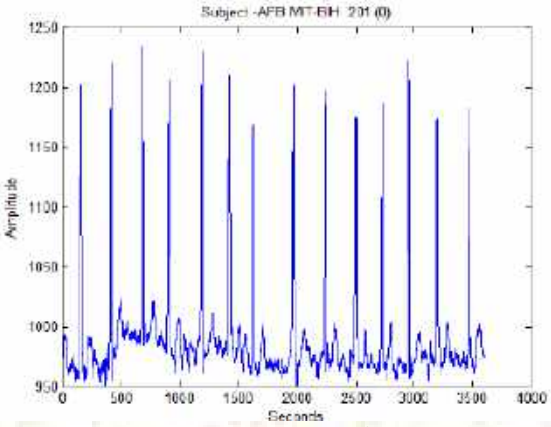
The flow chart of the basic process of the ECG peak detection is shown in the Figure 3. The peaks are detected for the absolute square ECG signal option for efficiently.

6. Expected Result of EEMD Decomposition

The validation of results for the ECG peak detection and the outcomes are presented in this section. Using the suggested method, the Q, R, and S peaks of the ECG signal can be detected effectively in all four cases.The results of .ECG of normal rhythm and the ECG with HRV for AFB pattern are evaluated and plotted for the QRS peak detection. Figure 4 shows the input ECG data. While the Figure 5 represents the respective results of the ECG peak detecting using the standard find peak function option.

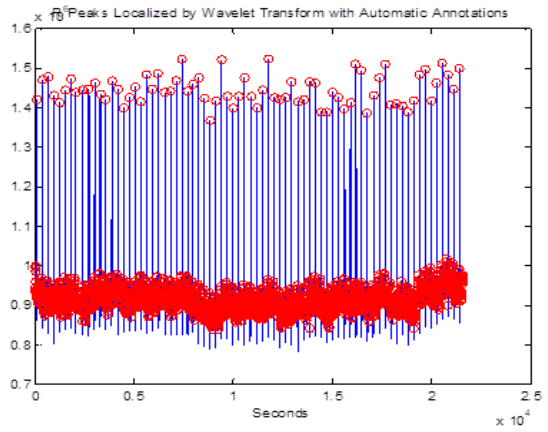


a) ECG or=f normal rhyhm

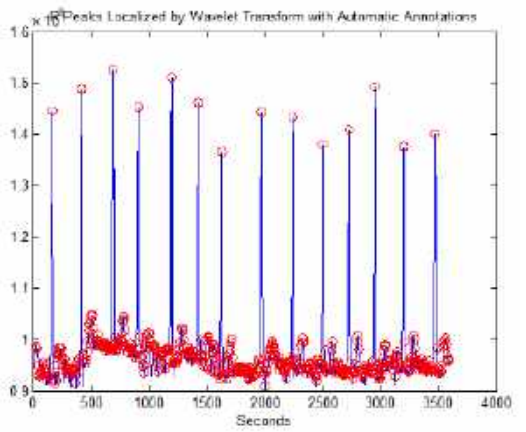


a) True ECG without HRV for AFB pattern

Figure 4 input ECG patterns plots



a) Result of Peak detection for normal ECG



b) ECG Peak detection over the AFB pattern

Figure 5 Results of peak detection for ECG data

7, **Conclusions and Future Scope**

In this study, a brand-new method for classifying and detecting QRS peaks in ECG data is provided. In this paper the basis of the arrhythmia database, it is suggested to create and evaluate ECG signal classification algorithms for the categorization of cardiac disease. The proposed method for classifying and detecting QRS peaks is straightforward and appropriate for usage in real-time applications..

The results of .ECG of normal rhythm and the ECG with HRV for AFB pattern are evaluated and plotted for the QRS peak detection. In the future research an sequential efficient methodology will be designed for accurate disease detection from ECG data.

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Global Positioning System Principal, Applications and Simulation of Gold Sequence

Mohd Wasif Azeez Khan Susheel Kumar Gupta
Assistant Professor (Department of CSE) Assistant Professor (Department of CSE)
Trinity Institute of Technology & Research Bhopal LNCT Bhopal
wasifazeez@gmail.com susheelkg@lnct.ac.in

Abstract:- this paper is aimed to preset the survey of the various technological advancements in the field of global positioning systems and there applications. The paper aimed to address the various recent developments in the field of global positioning system (GPS) and there west uses. Various constraints for navigation system are considered for discussion. Application including earth rotation, earth quack studies, Navigation, for civil surveying, and deformation of Dams, vehicles monitoring and tracking etc. are explored in the paper. Paper also discuss concept like differential GPS (FGPS), Global navigation satellite systems (GNSS) and Aviation's, this paper has preseted the study of the Golf sequence generation and correlation analysis for the GPS navigation.

Key Words: Global Positioning System, Gold Sequence, Satellite communication, GPS segments, GPS Applications, Aviation, Navigation, Surveying

1. Introduction

The gold sequences are most frequently being used for the signaling in the GPS based navigation and the correlation radars applications. There are various forms of the gold sequences have been developed in the past. The paper primarily aimed to preset the study of various GPS applications and followed by the Gold sequence simulation. Paper has also preseted review of arioso sequences used for GPS systems in past.

1.1 BACKGROUND

The main function of GPS systems is as a localization framework for location detection. This paper discusses a number of recent developments that have increased the rate of success of object localization. The Global Positioning System (GPS) was developed by the Department of Defence (DoD) of the United States during the early 1970s, employing satellites as the navigational framework. At first, GPS was developed as a military technology to suit the demands of the American military.

But after being made available to civilians, it has evolved into a multifunctional system that is usable for both military as well as civilian users. The GPS constellation, which is comprised of 24 active low-Earth elliptical satellites, delivers worldwide navigation services. As depicted in Figure 1, these capabilities, also referred to as the first operational capability (IOC).

Mohd Wasif Azeez

Khan Susheel Kumar Gupta

wasifazeez@gmail.com
susheelkg@lnct.ac.in

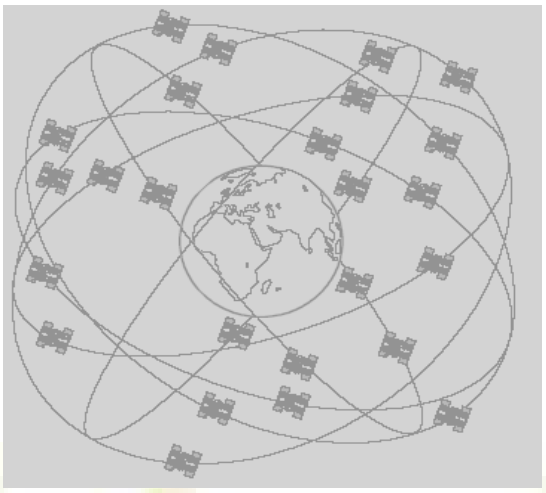

Figure 1 GPS satellites placement in orbiting planes

With this arrangement of geometry, 4 to 10 GPS satellites were accessible from any part of the world. The orbits of GPS satellites are almost circular (elliptical with a maximum variation of about 0.01) and incline at a 55° angle from the equator. The semi-major axis of a GPS orbital is roughly 26,560 km, which corresponds to the satellite's elevation of 20,200 km beyond the flat surface of the earth. Around 12 sidereal hour eleven hours and 58 minutes) make up the GPS orbital interval. The GPS system has been deemed as having reached full operational capability (FOC) upon July 17, 1995, guaranteeing the presence of no fewer than 24 functioning, uncontrolled GPS satellites [1]. At an average frequency of 1575.42 MHz, each of the satellites sends to Earth both its precise inbuilt clock and its geographical position.

2. GPS SEGMENTS

GPS consists of three segments: the space segment, the control segment, and the user segment (Figure 1.2) [1].

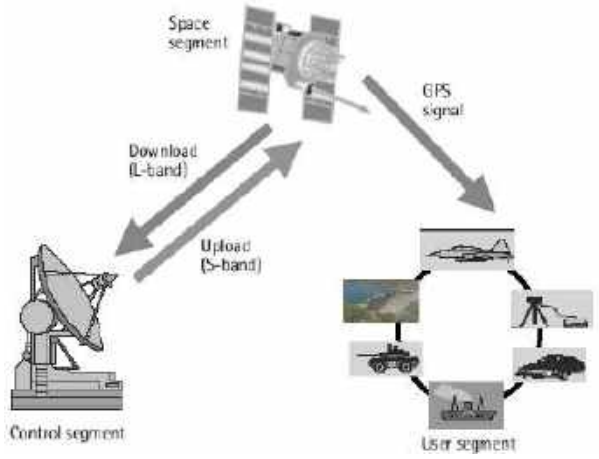

Figure 2 various major segments used in GPS localization and monitoring system

The 24-satellite configuration described above in the preceding paragraph makes up the space segment. A signal is transmitted by each GPS satellite that consists of a navigation information, two sine wave signals (also referred to are carrier frequencies), including two digital codes. Binary bi-phase modulations are used to add codes as well as the navigation signal to the carriers. The major purpose for the carriers as well as codes is to calculate the separation between the user's receiver when the GPS satellites. The spatial coordinates of satellites being a function of the time are one piece of data in the navigation signal. Gold code in this paper is generated and simulated as digital pulses for such applications. The correlation is measured under the noisy environment.

3 GPS Applications

A GPS can be used in a variety of situations, including aviation and maritime operations. According to some, GPS is to positioning what the clock was to timing. Among the typical uses for a GPS system is shown in the figure 3

Figure 3 Most Frequent Applications of GPS Systems

Navigations

The most frequent applications of the GPS include in marine negation and air traffic monitoring and aviation systems. Recently the GPS based tracking is incorporated I the all mobile devices for location tracking. The automobile system has also the recent example of tracking the vehicles. Some other GPS applications are;

- Creation of zero with great precision for GPS stations.
- Employing GPS stations to strengthen, density, and reposition the current primary control networks.
- Geodetic control and connections linking remote islands to the mainland.
- Creation of the precise geoid employing GPS data.
- Studies of earth rotation as well as polar motion using GPS signals.
- Employing GPS to calculate gravity anomalies.
- Location of oceanographic stations, buoys, etc.
- GPS for Earthquake monitoring:

4. GPS Transceivers Block Diagram

Figure 4 below illustrates a block schematic of the signal's transmission in a satellite based vehicle tracking.

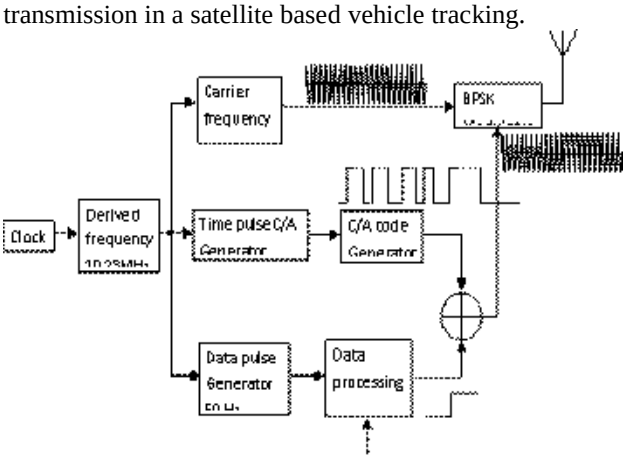

Figure 4 GPS signals generation system diagram

A satellite derives its fundamental frequency, 10.23 MHz, from the resonance frequency among one of its four atomic clocks. From this fundamental frequency, other frequencies such as the frequency of carrier, data frequency, PRN or golf sequence generation timing are derived. Data is dispersed throughout a 1MHz bandwidth in this way. Employing bi-phase shift keying (BPSK), information is modulated using the gold code modulates its L1 carrier in turn. The L1 carrier phase changes by 180 degrees for every change of the modulated data. Figure 2.2 displays the waveforms for the various signals.

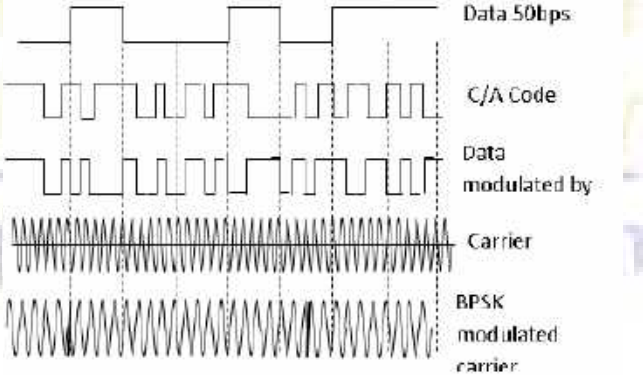

Figure 5 Conventional GPS control signals waveforms

A respective streamlined GPS receiver is depicted in the Figure 6 below.

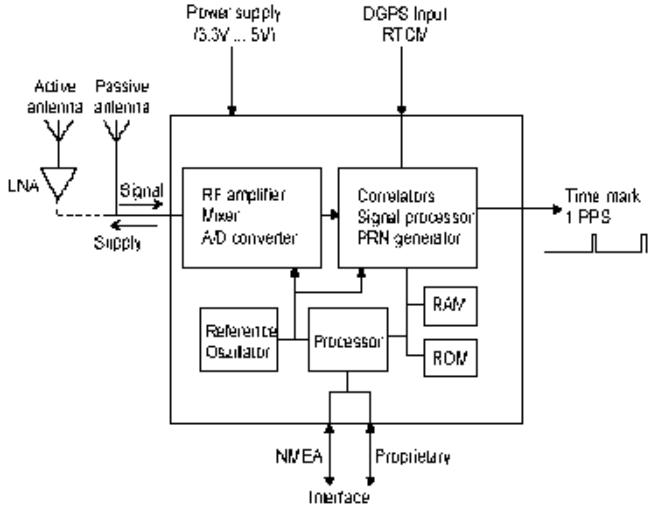

Figure 6 System diagram of respective GPS receiver

MINHUCK PARK study suggested a way for wide-area drone protection employing GNSS (global positioning satellite system) interference signals. In order for the signal tracking loop to track the defensive signals and direct the drones to a safe area, the defensive GNSS signals produced by a single signal generator sweep the genuine GNSS signals. By modifying the signal generator's temporal offset, the suggested algorithm executes a sweep in the measurement domain, allowing it to cover a larger area. In this fundamental study, we looked at the signal generation technique for the transition of signal tracking locks from authentic to defensive signals in circumstances where a signal generator does not exist to confirm the viability of wide area protection.

P. Lu and co. Designed L1 civil (L1C) signal of the global positioning system (GPS) uses a novel code concept. L1C codes are generated in a very different way than conventional range codes. To open the door for future research, a technique for the right generation must be discovered. Only one Legendre sequence, made up of Legendre symbols, serves as the foundation for L1C codes.

S. N. Reddy and others presented design and implementation of PRN code on Spartan-II FPGA hardware is also demonstrated in this work. The output of the created SPS PRN code is accepted by hardware, and simulation results and analyses of the PRN codes' properties show positive results. The execution analysis and simulation of the auto-correlation function (ACF) and cross-correlation function (CCF) features for PRN sequence are also demonstrated in this article. SPS PRN codes were successfully simulated using the Xilinx ISE test system and MATLAB tools. The results of the test simulation fall within the theoretical bounds. S Cho et al. have study, a dynamic localization strategy for a mobile robot with changing speed is proposed. Since the time-of-flight of the ultrasonic signal is used to determine the distance to the beacon, localizing a mobile robot equipped with active beacon sensors takes a fair amount of time. When the mobile robot moves slowly, the measuring time does not result in a significant amount of error. The localization error, however, increases with the speed of the mobile robot and is then unusable for precise navigation.

Bernhard Hofmann et al. suggested using a distributed Kalman filter (DKF) based on stochastic reachability (SR) to compute secure global positioning system (GPS) time across a network of receivers. We estimate the stochastic reachable set of GPS using SR, which is parameterized by the probabilistic zonotope (p-Zonotope). We created a two-tiered strategy that calls for known measurement error bounds in only non-spoofed circumstances. By deviating from a measurement innovation's anticipated p-Zonotope, we first accomplished measurement-level spoofing mitigation. Yang, G., He, X., and others propose GPS receiver links with many antennas in the GPS multi-antenna device that the authors created, and the experimental findings are described in this work. The effectiveness of GPS as a tool for tracking slope stability and dam deformation has already been established. In comparison to other surveying methods, it gives more precision. When used for slope and dam monitoring, GPS does have some drawbacks. The main disadvantage has been the high expense because monitoring sites need to implement GPS on a big scale.

Radars are common tools for defense, survey, and vehicle steering systems, according to Kumar et al. However, the delicate nature and high cost of these tools prevent them from being used in everyday situations. Several additional options will be added thereto, such as vehicle signature reading, which will be used to determine the type of car, such as a delivery or emergency vehicle. We tend to projected associate degree approach to creating the device easier, cheaper, & to form the device abundantly compatible for vehicles so it will be used for machine-controlled vehicle driving system as well as collision shunning system. Khaled Rouabah and others we suggest a more straightforward and quick Gold codes generator that may quickly and effectively initialize to any required code. Its basic idea is to create just one sequence (code number 1) from which all other signal codes can be created. This is achieved by simply shifting this sequence by various delays that are carefully chosen utilizing the properties of the bicorrelation function.

5. Result and simulation of Gold Sequence

In this section some of sequential simulations of the GPS signals generation using PRBS and gold codes are preseted.

Table 1 Simulation parameters

Variable range	description
K=16	quantity of signals
aoa = [50 80 -45 -10 0 0 0 0]	Array of the k signals' angles of arrival
f = 1575.42*10^6	GPS signal's frequency
T = 0:0.01:10	Sampling time
d = 0.002	distance among the antennas
A = []	Empty steering matrix
c = 3*10^8	EM wave velocity

This paper has presented the basic evaluation of the C/A code and the gold sequence generation of the GPS trans recovers used in the navigation.

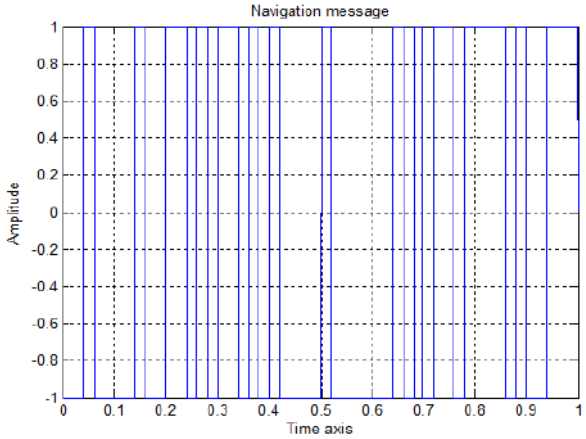

Figure 7 simulation of the Navigation signal

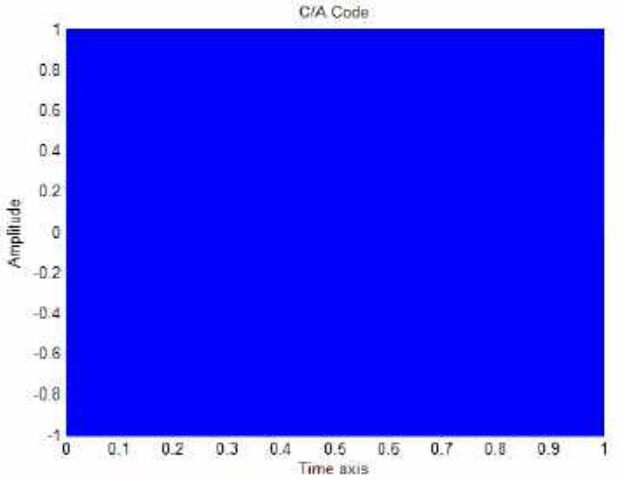

Figure 8 the C/A signal generation for message

As part of our main project, the research discussed in this paper is centered on the development of an anti-jamming and anti-spoofing technique using GPS signals. We opt for the MATLAB simulation and implementation programmer.

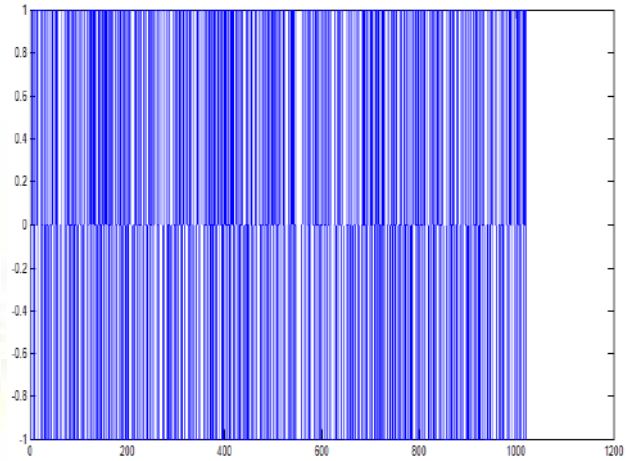

Figure 9 An Example of the Gold code generation for the GPS satellites

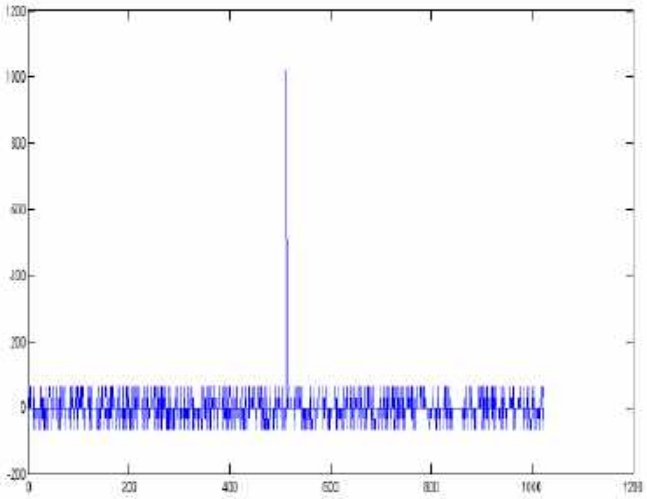

Figure 10 Calculated correlation between gold code for 4 and 8 satellites

6 CONCLUSION

The Global Positioning System (GPS) has proven to be a great asset in a variety of civilian applications. The purpose of this study is to provide a summary of the main technological developments in the area of global positioning systems and their applications. The purpose of the paper was to discuss the different recent advancements in the global positioning system (GPS) and their western applications. Different navigational restrictions are taken into consideration and discussed. The study examines several applications, such as earth rotation, earth quake investigations, navigation, civil surveys, dam deformation, vehicle monitoring and tracking, etc. The research covered in this paper is focused on the creation of a GPS signal anti-jamming and anti-spoofing technique. We decide to use the simulation as well as implementation programmer for MATLAB.

This work has established the study of the Gold sequence formation and correlation analysis for the GPS navigation. It also discusses concepts like differential GPS (FGPS), global navigation satellite systems (GNSS), and aviation.

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SEGMENTATION OF MEDICAL IMAGES: ADAPTIVE CONTRAST ENHANCEMENT AND FUZZY C-MEANSCLUSTERING

Sadaf Hussaini, Deepti Gopal. Vandana Rai
Computer Science & Engineering Sagar Institute of Science, Technology & Research (Bhopal)
sadafhussaini1@gmail.com.; deeptidhairyagopal2017@gmail.com/; vandana.rai2113@gmail.com.

Abstract: **The efficient segmentation of medical images remains a challenging field of research. Medical images encompass various modalities and originate from different parts of the human body, rendering segmentation methods difficult to apply. Typically, medical images suffer from poor contrast during capture, making the task of segmenting and recognizing objects in these photographs particularly challenging. In this paper, we propose a sequential combination of enhancement and segmentation approaches. For contrast improvement, we suggest histogram-based methods. As for segmentation, we propose a three-level thresholding-based Fuzzy C-Means (FCM) segmentation technique for three different types of medical images. We qualitatively assess the performance of contrast enhancement and FCM-based segmentation on MRI brain cancer images, electrocardiography images, and brain scalp images.**

Key Words: Image Segmentation, Medical images, Contrast Enhancement, FCM, K mean Clustering, Thresholding

I. INTRODUCTION

Huge numbers of medical imaging data have been acquired in the last three years. With the advancement of technology over the past two decades, the processing of digital images has become a crucial component of medical science. Different scanning technologies now capture a wide range of images of human and animal anatomy. X-ray images [1], ultrasound images, computed tomography (CT-scan) images, brain MRI for cancer diagnosis, brain scalp images, and electrocardiographic medical imaging technologies are among the most common.

With the help of these technologies, we canpeer inside the body's concealed organs, fully measure, examine, and manipulate them. The process of extracting the different components of incoming medical data, known as medical imaging segmentation [2], is a key aspect of this field.

(Corresponding Author)- Sadaf Hussaini Sagar Institute of Science, Technology & Research (Bhopal)
sadafhussaini1@gmail.com

Deepti Gopal
Sagar Institute of Science, Technology & Research (Bhopal)
deeptidhairyagopal2017@gmail.com

Vandana Rai
Sagar Institute of Science, Technology & Research (Bhopal)
vandana.rai2113@gmail.com

A. Overview of Segmentation Methods

Segmentation is an essential stage in any medical diagnosis, disease detection, and treatment. Researchers have proposed various segmentation strategies, including pattern recognition [1], histogram-based thresholding [3, 4, 5], segmentations based on local image domains or regions [6], split-and-merge techniques [7], and region-expanding techniques [8].

Just like the three-level thresholding proposed in [9] and [15], there are numerous FCM-based techniques. Image enhancement techniques are described in [11] and [12], while fuzzy-based K-means and C-means clustering methods are discussed in [13] and [14]. Due to the wide range of potential medical imaging objects, achieving responsive segmentation has remained a challenging and complex problem. Participatory fuzzy image segmentation has thus become increasingly popular among researchers in recent years.

In the realm of segmentation, image thresholding techniques are most commonly used. Otsu's adaptive thresholding methodhas been in use since the 1970s [9 and 15]. However, it is not sufficiently effective for the segmentation of medical images. New strategies are needed to address various medical classification challenges. Thresholding-based approaches have been applied in many areas of medical imaging, such as tissue segmentation, background elimination in MRI, bone extraction in radiation therapy, and skin cancer detection. Thresholding is a common approach for immediate image segmentation, found to be efficient and quick for segmenting well-defined areas. However, due to its sensitivity to noise in medical photos, it can lead to errors in the segmented image. Therefore, the efficiency of this thresholding method must be improved.

Medical images are constantly affected by dominant and erratic color casts as well as various artifacts. Processing medical photos is therefore more challenging than processing regular, aerial, or consumer images [5]. Medical images are crucial for doctors, physicians, medical professionals, and medical facilities to assess patients for evaluation and treatment. Radiologists rely primarily on their visual assessment for the study and examination of these medical images. However, this process often takes a long time, and its efficiency depends on the radiologist's experience. Hence, it is crucial to implement and develop computer-aided systems to overcome these limitations. Digital image processing methods are particularly useful in medical imaging when combined with other algorithms like artificial intelligence, fuzzy logic, pattern recognition, and machine learning [9, 14, and 15]

II. REVIEW OF WORK

Bhargavi et al. [1].research on threshold approaches in picture Segmentation is described in the current paper. One of the fundamental methods used in digital image processing is picture segmentation. Many applications make heavy use of image segmentation. For picture segmentation, a number of general-purpose algorithms and methods have been developed. Applications for segmentation include feature detection, recognition, and measurement.

Basar et al. [2] solved the segmentation problem of color photographs by addressing it with the classic K-means method in this study, using a unique and adaptive initialization approach to find the number of clusters and initial central points of clusters. The given methodology employs a scanning method of the RGB color-channel histograms to identify the most prominent modes in each histogram. Bezdec et al. [3] have proposed a segmentation algorithm presented in this research that is totally automatic and is based on the geometrical and local properties of color images. With this approach, any general segmentation algorithm whose segmentation sensitivity may be adjusted by parameters will integrate a hierarchical assessment scheme. To generate various segmentation levels in the hierarchy, the parameters are changed.

J. Singhai and P. Rawat [4] have presented various histogram- based enhancement methods for different image types. Silver, B., et al. [5] used a histogram equalization approach which has some drawbacks; hence, in this study, we present an image improvement strategy based on utilizing histogram data obtained from transform domain coefficients. The inherentdynamic range increase of conventional histogram equalization has historically caused various issues. Standard histogram equalization can over-enhance many photographs with data that is strongly grouped around specific intensity values, resulting in artifacts and a general change in the tone of the image. Karthick et al. [6] have used region-based segmentation. Kelkar, D. and Gupta, S. [7] (2008) suggested an improved quad-tree method (IQM) for split-merge, introduced as the neighbor-naming based image segmentation method (NNBISM). It combines top-down and bottom-up approaches of region-based segmentation techniques. The key components of IQM are image splitting, initializing a neighbor list, and combining the splatted regions.

Lin et al. [8], in order to acquire precise and topologically preserved surface structures of anatomical objects of interest, offer a hybrid 3D picture segmentation method that combines region growth and deformable models. The suggested method begins by employing a region-growing algorithm to determinea crude but reliable estimate of the objects. Khandelwal and others [9] stated that medical input data can be examined and extracted in various parts using the segmentation of medical images. To increase the effectiveness of these segmentation algorithms, several strategies have been developed. The primary objective of the suggested approach, based on the three-level threshold methodology, is to quickly and effectively create a three-level FCM clustering algorithm. The newly developed method acquires the threshold more quickly than the conventional way because it uses a pseudo- random number generator that produces initially fuzzy estimates that are normally distributed.

Menon, Neeraja [10], initially proposed an FCM-based segmentation approach and adopted Bee colony optimization for segmentation. Dwivedi et al. [11] research compare two widely used enhancement techniques and conclude that each technique creates two independent image sets from the initial low- contrast image. Fuzzy-based clustering techniques can effectively be used with these sets to segment objects. Enhancement using the global contrast adjustment approach and contrast-limiting adaptive-based histogram equalization (CLAHE) is presented in the paper. Gupta et al. [12] proposed a hybrid segmentation algorithm for ILD images that included superpixel and K-means clustering techniques. Superpixel images that have been segmented effectively adapt an uneven local and geographic neighborhood, which helps enhance the effectiveness of K- means clustering-based ILD image segmentation.

Hnin Mar Lar Win et al [13] study describe a strategy to perform image segmentation and edge detection tasks that combine k-means and watersheds segmentation techniques. In order to acquire the primary segment image into several intensity regions, we first used k-means algorithms to inspect each pixel in the picture and assign it to one of the clusters based on the minimum distance. According to Dwivedi and colleagues [14], underwater image segmentation is a tough subject to examine due to limited lighting. As a result, this study addresses a number of issues and concerns based on recent studies in the field of underwater segmentation. Since underwater photographs have numerous applications in everyday life, including marine engineering, study and observation of underwater organisms and vegetation, and oil well monitoring. As a result, the segmentation of underwater objects is a hazy challenge. The fuzzy clustering approaches for image segmentation are therefore reviewed in their study.

III. CHALLENGES

The following challenges may be derived from the review of the literature:

- The segmentation output of the present FCM-based clustering algorithms is a monochrome or binary image. To create a color-segmented image, it is necessary.
- Clustering is less successful when a large number of diagnostic photos are used, especially when the level of brightness is not uniform, as in pictures of the body. Thresholding might be utilized to boost the effectiveness of FCM-based techniques.
- Using contrast enhancement could make FCM-based segmentation algorithms more effective.
- Achieving completely adaptable and automatic segmentation of images is an ambiguous challenge and a difficult area for medical image segmentation.

A Summary of Segmentation Techniques

When segmenting an image, thresholds are utilized for creating uniform sections within the image based on a set of minimum parameters. T. Assume that we possess a photograph like the one in Figure 1 that is made up of dark items that have various grey levels on a light backdrop with varying grey levels Figure 1.

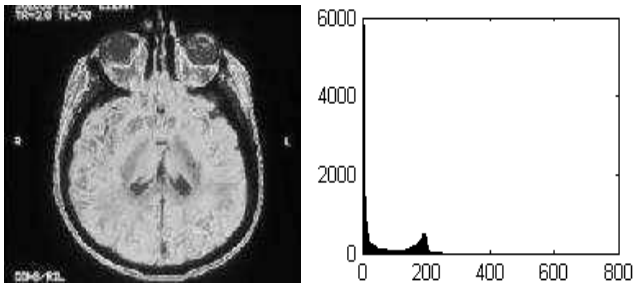


Figure 1: Histogram and medical magnetic resonance imaging (MRI) of a brain cancer

Choosing a threshold T which spans the two zones is an apparent technique to distinguish the items from the backdrop. A point (x,y) is then referred to as an object point if f(x,y)T, and a background point if f(x,y)>T.

$$T= T[x, y, A(x, y), f(x, y)] \quad . \quad (1)$$

Where A(x,y) stands for some local attribute of this image in the vicinity of this image and thef(x,y) is the grey degree data of the image value. The definition of a threshold image is given by

If f(x,y)>T at 0 if f(x,y)T,

then g(x,y)=(1 if f(x,y)>T@0) (2)

Because of this, pixels labeled 1 (or every other practical grey level) represent objects, while pixels labeled 0 (or some other practical grey level not allocated to objects) relate to background.

4. Proposed segmentation using FCM

This research proposes an effective image segmentation approach that makes use of the benefits of dynamic three level thresholds for categorizing the medical items utilizing the fuzzy C means arranging of medical images in order to increase the effectiveness in the segmentation of medical images. Figure.2 displays the block architecture of the suggested segmentation approach.

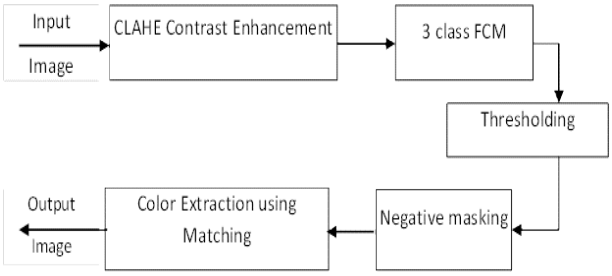


Figure 2 Block diagram of the suggested segmentation approach

It is recommended to use CLAHE-based expansion at the front end to boost image contrast before to segment in order to enhance segmentation quality. For the majority of the photos, classification based on CLAHE functions is effective. The FCM and thresholding are combined to increase segmentation efficiency. The suggested method also uses the matching matrix's logical segment output from the usual three-class threshold method to provide cultured segmented outputs.

Due to its simplicity, fuzzy c-means (FCM) grouping is regarded as a desirable clustering approach for picture segmentation. The suggested segmentation method uses FCM with the three class thresholds idea [10] to organize the pixel data. By average the greatest value in the group with the largest center and the lowest in our group with the middle center, the proposed method's threshold is determined [10]. These are often situated where the first and third peaks of the histogram's demarcation line meet. One way to think about this is as a trade-off between local and global traits. It is not possible for edge information recorded in uses sufficient past knowledge to direct course of the curve. Furthermore, because it is derived from the range, it is highly noise-sensitive.

4. Findings and Conclusion

This section describes few of experimental findings for development of suggested segmenting of medical images. Figure 3 depicts data underlying input actual medical pictures.

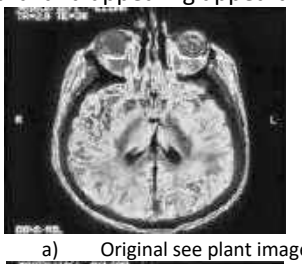
a) brain-cancer-MRI weather b) MRI of the brain

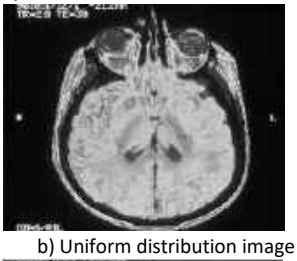
h) electoral chartography_2

Figure.3 enter a database of medical images

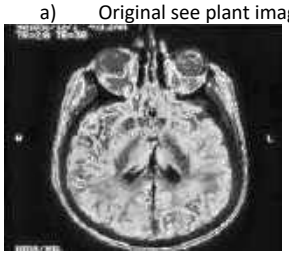
5 The impact of contrast enhancement,

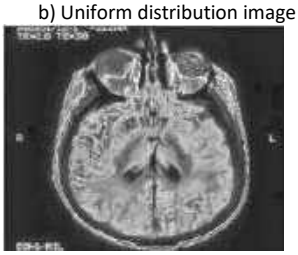
A contrast of the several CLAHE distributes is provided in this section. Although it is evident from Figure.4 that the distribution of Rayleigh angles offers medical photos a more natural and appealing appearance,





a) Original see plant image b) Uniform distribution image



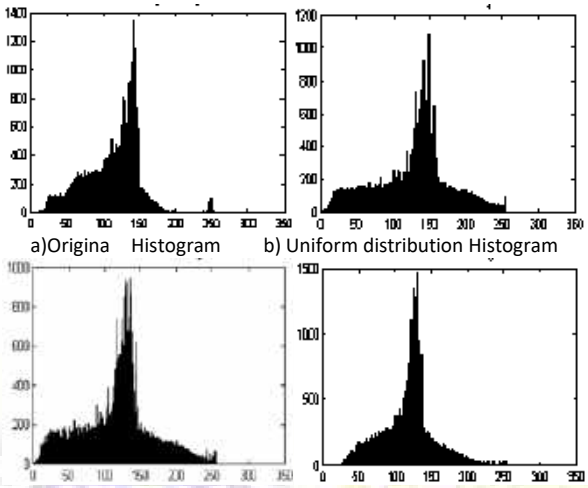


c) Exponential distribution d) Rayleigh distribution image

Figure. 5 Comparison of CLAHE Results

The reaction of the equalized histogram to the consistent distribution is significantly flat. Therefore, it is suggested that a standard distribution be used in this study. Medical image segmentation using the CHALE approach is compared in Figure 5.

The results are comapred for the three histogram distributions using the CHAHE enhancement resoectvlly uniform, rehaigh and exponential distirbution of contrast. For segmentation uniform distribution is prefered for the unifirm brigthness pattern.. The respective Histogram comparison of CLAHE based econtrast ehnamcnet results for MRI brain cancer image are shown in the Figure 6



a)Origina Histogram b) Uniform distribution Histogram

c) Exponential distribution d) Rayleigh distribution Histogram

Figure. 6 Histogram comparison of the CLAHE based enhancment for MRI cancer iamge

5.2 Results of the Suggested Segmentation

This section highlights a few of our experimental findings related to the development of the suggested strategy for segmenting medical images. For input medical photos, some findings of FCM employing three class thresholding based segmentation are shown in this section.

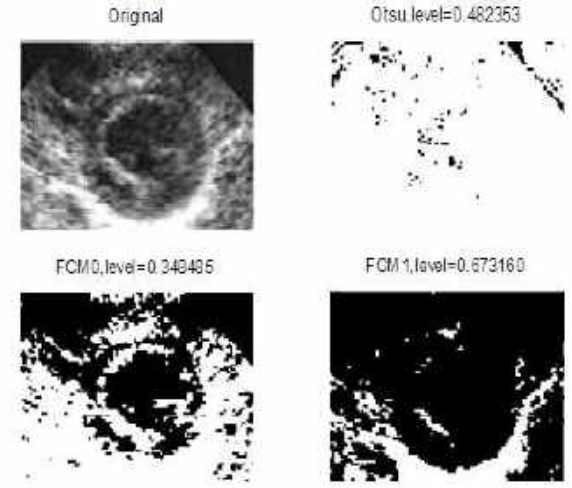
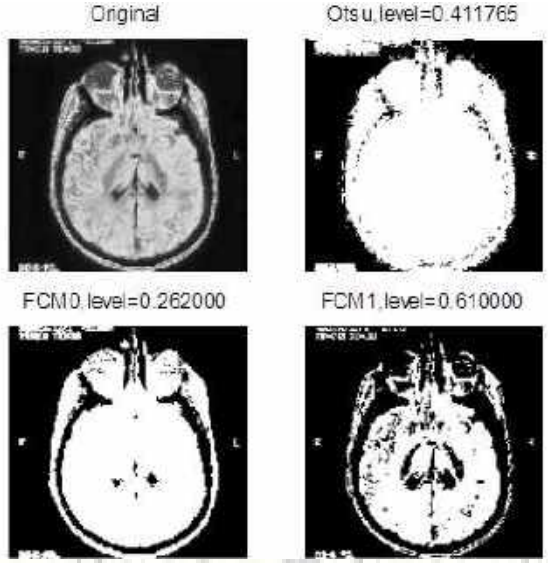


Figure 7 The outcome of the proposed three-class thresholding FGM with CLAHE enhancement (electorcordiograghy_2)

The outcome of the proposed three-class thresholding FGM with CLAHE enhancement for electrocardiography images is shown in the Figure 7.

It can be seen that the desired region may belongs to any of the two segmented class and the otsu's adaptive threshold is unable to segment the desired region individually. Thus proposed approach out perform on otsu method of thresholding. The outcome of the proposed three-class thresholding FCM with enhancement for MRI cancer image is shown in the Figure 8. And the outcome of the segmentation for the Brain image for proposed method is shown in the Figure 9 respectively. The qualitative evaluation of the result makes it clear that proposed combination of processing for is capable of biter segmenting the desired regions.



.Figure 8 outcome of proposed three-class thresholding FGM with CLAHE enhancement (weather_cancer_MRI_brain)

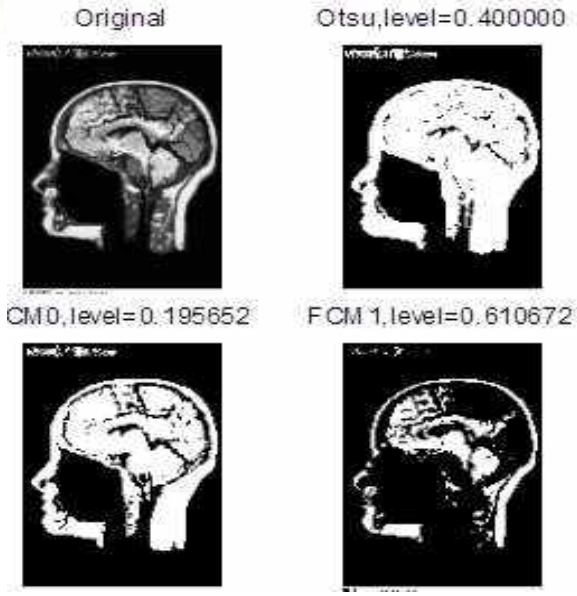


Figure Result of proposed 3 class thresholding FGM with CLAHE enhancement (MRI_Brain_Scan)

6 Conclusion and Future Scope

This project sought to determine whether suitable image processing techniques can be used to process medical images, allowing the detection of objects within these images for use with further scientific analysis applications. In this project, a novel enhancement method is proposed which can yield the optimal equalization in the sense of entropy maximization, under the constraint of the contrast improvement, called Contrast Limited Adaptive Histogram Equalization (CLAHE). Experimental results show that CLAHE can enhance the image quite well when preserving the mean brightness and improves the contrast with flat histogram distribution

The comparison of the segmentation result for original and CLAHE enhanced image are presented. It is clear that CLAHE gives better result for same threshold T. The results are also analyzed for the different threshold segmentation

.The time and wavelength analysis can also be included in it. The depth analysis can be done in the future. Use of the adaptive thresholding may improve the performance of the segmentation method. Various adaptive threshold methods can be analyzed in future.

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Medical Image Enhancement Based on Design of Adaptive Wavelet fusion

Dr Kavita Burse
TIT Group of Institutes
Email kavitaburse14@gmail.com

Abstract: Medical image processing has become an essential tool to process and analyzing the internal and external disease of human body parts. Since medical images are captured from different sensors so they suffer from low contrast. Therefore, Image fusion methods are widely used for improving the visual quality of these images by merging images acquired from different sensors or electrodes.. Using fusion based enhancement may improve the performance of medical image segmentation or object recognition tasks. Different fusion rules works differently for different type of medical images. Therefore it is require designing an adaptive fusion method capable of choosing write rule for improved information. This dissertation proposes to design the adaptive wavelet fusion for enhancing the quality of medical images taken under different environment. There are various fusion rules designed based on distinguish between pixels, features or symbol level. This dissertation adapts pixel based fusion method in 2-D discrete wavelet transform domain. Pixel fusion is having advantage of processing every pixel for contrast improvement thus fused images preserves original information. In addition these methods are easy to implement and computationally less costly.

1. Introduction

Wavelet analysis is widely being used for processing the medical images in past. In many applications medical image fusion is used for performance improvement and feature enhancement. Multi-resolution characteristic of discrete wavelet transform (DWT) have made it popular for wavelet based fusion methods. DWT decomposed the medical images into several sub-images each of different frequency bands. Then pixel based fusion rules are applied on these sub-bands coefficients to fuse the images. Finally, the fused image is obtained by implementing inverse discrete wavelet transform (IDWT). Different fusion methods perform differently for different medical images. Therefore the prime concern of dissertation is to design an adaptive fusion method which can work efficiently for different medical images.

Medical image fusion represents a broad range of methods of image fusion to address medical challenges reflected from internal images of human body parts, organs, and cells and tissues. There is tremendous application of the image fusion techniques in the medical diagnostics, and analysis of areas Multimodal means images of different modalities: Viz. PET, CT, MRI, infrared [1, 9], visible, or ultraviolet, etc are fused for digenesis.

These dissertations have proposed to adapt the optimum pixel level fusion rule or method based on the entropy analysis in discrete wavelet transform domain.

1.3 Wavelet based Fusion

The fused image should be more useful for human visual or machine perception. The block diagram of wavelet fusion method is shown in Figure 1 below.

1.4 Wavelet Based Fusion Methods

The hybrid fusion techniques are widely used. The hybrid fusion method which integrates various pixel level fusion rules in a single fused image. A hybrid algorithm based architecture combining the advantages of both. Wavelet fusion architecture is shown in Figure 2. The results and the performance of the hybrid fusion and the wavelet filters [8] are needed to be analyzed on the basis of the Signal to Noise Ratio (SNR) and the mean square error. Instead of hybridization it is rather required to implement the fully adaptive wavelet based pixel level fusion methods.

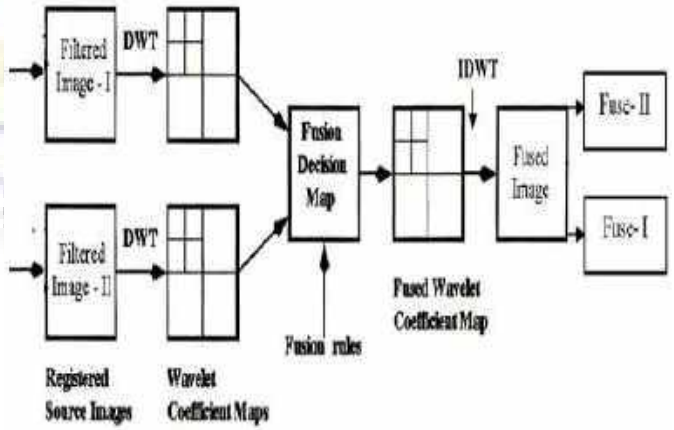


Figure 1 Block diagram of wavelet image fusion

2 Literature Review

Image fusion can be performed at different levels viz. signal, pixel, feature and symbol levels. Almost all image fusion algorithms developed nowadays fall into pixel level fusion. in this dissertation review of the wavelet based fusion for medical imaging application is presented.

2.1 Review of Medical image Fusion

Nayera et al. [1] have proposed to use discrete wavelet transform (DWT) and the pixel level fusion rules but the performance is not consistent for different medical images. They have used the concept of multimodality to fuse CT and MRI images. Bhavana. Et al, [16] have presented a brief survey of multi modality fusion techniques for medical images. The survey has concluded the advantages and

advantages of different fusion methods for such images. This alloy selecting the best fusion methods for specific application. Bhavana. Et al, [6] have proposed a method of medical images watermarking they have observed the utility of fusion for multi model images. They have fused the CT scan and MRI images together to improve the features. But method was specific and limited to the multi model images. In most of the case these images are not available and only single medical image is given.

Peng et al. [9] have proposed the medical image fusion method for multi-modal images using the Multi wavelet and Non-sub sampled directional filter banks and in the transform domain. Maruturi et al. [10] have proposed to fuse the MRI and FDG-PET medical images using wavelet fusion.

2.2 Challenges and Motivation

After going through the review following gaps are identified.

1. Wavelet based fusion is widely used for enhancing the image quality. But it is required to analyse the performance of various fusion rules.
2. Medical image fusion is a burning field of research but no fusion method works uniformly for different medical modalities.
3. Pixel level fusion is the simplest method but it needs to improve the performance under non uniform illumination as in the case of medical images. Therefore it is required to design an adaptive fusion method capable of opting the fission rule for better performance.

Motivation

Based on the study the following major motivations for the current research can be stated:

- In last two decades the image fusion has been used for the many applications as in remote sensing, night vision, military and civilian avionics, in vehicle navigation systems, in medical imaging and surveillance systems applications.
- The medical images are captured in various noisy environments using the multi sensors. Therefore it is required to enhance the visual quality
- Pixel based wavelet fusion methods are widely used due to their simplicity for enhancing the image qualities. But there performance is not consistent with different kind of medical imaging environments. \

It is required to develop the adaptive fusion method which is environment independent. It is also require preserving the information content after being fused by wavelet domain.

3. Fusion Rules

Image fusion is proved to be very advantageous in medicine for medical imaging applications and computer visions. This is because of use of different medical equipment for accusation and extraction of futures. The simplest and efficient method is to use pixels values for image fusion. The pixel level fusion has therefore become popular way of data enhancement. In this dissertation the first three and simple fusion rules are considered for the analysis.

3.1 Pixel Based Fusion Rules

Let two input images as A (x, y) and B (x, y) are to be fused. The decomposed low frequency sub images corresponding to A (x, y) and B (x, y) are defined as $lA_J\,(x,y)$ and $lB_J\,(x,y)$. Decomposed high frequency sub images corresponding to $A(x,y)$ and $B(x,y)$ are $hA_{j,k}(x,y)$ and $hB_{j,k}(x,y)$. Where j and k is the parameter of resolution, where j varies from j=1,2,3….*J* , and k varies from k=1,2,3 … *K* There are different pixel level fusions methods like as:

3.1.1 Pixel Averaging (*Method1*)

All the four sub bands of the fused image F is simply acquired by averaging the wavelet coefficients of source images A & B.

$$F_{j,k} = (A_{j\,k} + B_{j,k})/2 \;\&\; F_J = (lAj + lBj)/2 \quad (1)$$

3.1.2 Pixel Level Maximum (PLM) (Method 2)

All four sub bands of the fused image F are simply formed by considering the wavelet coefficients from both source images having maximum value hence named PLM.

$$F_{j,k} = \max (A_{j,k}\, B_{j,k}) \;\&\; F_J = \max (lAj, lBj) \quad (2)$$

3.1.3 Pixel averaging / absolute (Method *3)*

This method uses averaging to fuse low frequency sub bands and selects the absolute maximum value for high frequency bands.

$$F_{j,k} = \max (\text{abs}\,(A_{j,k}), \text{abs}\,(B_{j,k})) \;\&\; F_J = (LA_j + LB_j)/2 \quad (3)$$

In case of image fusion using pixel level fusion since all the pixels are used thus efficiency of image registration is higher. Since different image fusion rules account for different medical images thus selection of the proper pixel level fusion rule is still a challenging problem

4 **Paper Contributions**

Some of the main objectives of the image fusion are as follows:

- To test the parametric performance of adaptive fusion method for different image enhancement.
- To reduce the artifacts or inconsistencies such as contrast which will distract quality of the fused medical images
- Implement adaptive image fusion using 2-D discrete wavelet transform to improve the performance of the existing pixel level fusion method working efficiently for medical images.
- To analyze the performance of the various wavelet fusion rules for better fusion performance and preserve the brightness and maximize the entropy
- To analyze the performance of the pixel based fusion rules and taking adaptive decision of optimum rule.

5 Proposed Entropy Efficient Adaptive Fusion

The proposed adaptive fusion method adopts the best pixel level fusion rules for enhancing the medical image quality based on entropy maximization concept

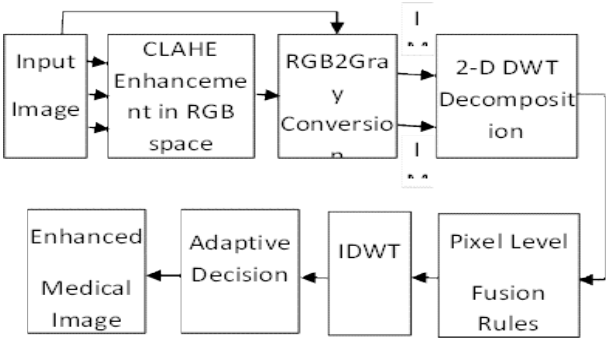


Figure 3 Proposed Wavelet based Fusion methods

4, Proposed Methodology

In this adaptive method, first input medical image is enhanced using the Contrast Limited Adaptive Histogram Equalization (CLAHE) method but implemented in RGB colour space separately. Both enhanced image and the input image are converted ot gray level image then wavelet decomposition of the input source images is performed up to level N. The Low pass and high pass sub-bands are then fused using different pixel level fusion methods is implemented for generating multiple enhanced images. Then the inverse wavelet transformation is performed to get full size fused images. The results of pixel level fused images are compared based on the entropy analysis. The results of maximum entropy are finally selected as the final enhanced image having maximum information.

Pre Enhancement

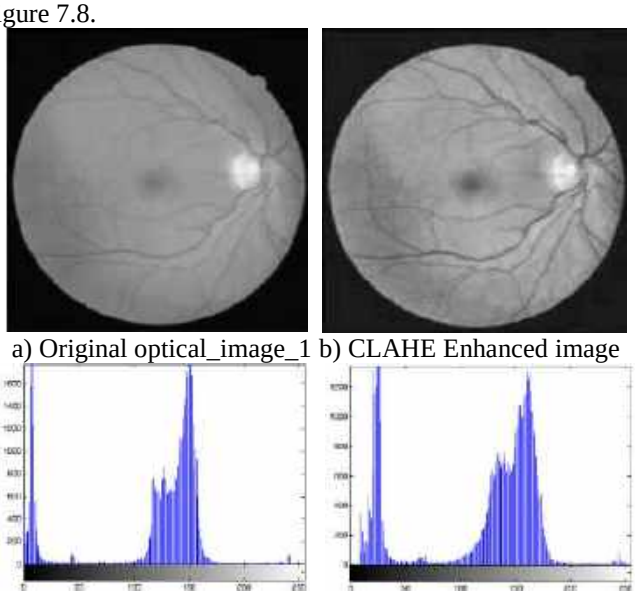
The color medical images are separately equalized in the RGB color spaces individually using standard CLAHE enhancement method. In this dissertation color medical image is enhanced to generate multiple focused medical images for implementing fusion from single image. The mathematical expression for transformed gray levels for standard CLAHE method with Uniform Distribution can be given as;

$$g = [\, g_{max} - g_{min} \,] * P(f) + g_{min} \quad (1)$$

Where g_{max} is defined as maximum pixel value, g_{min} is defined as minimum pixel value and g is the finally computed pixel value.

Wavelet Decompositions

In the proposed enhancement method, the wavelet decomposition of the input medical image is performed up to second level using 2-D discrete wavelet transform (DWT). The four decomposed sub bands for input patient_2_CT_image images and MRI image are shown in Figure 7.8.



a) Original optical_image_1 b) CLAHE Enhanced image

c) Histogram of original image d) Equalized with CLAHE

Figure 7.4 Results of CLAHE Enhancement for the optical_image_1

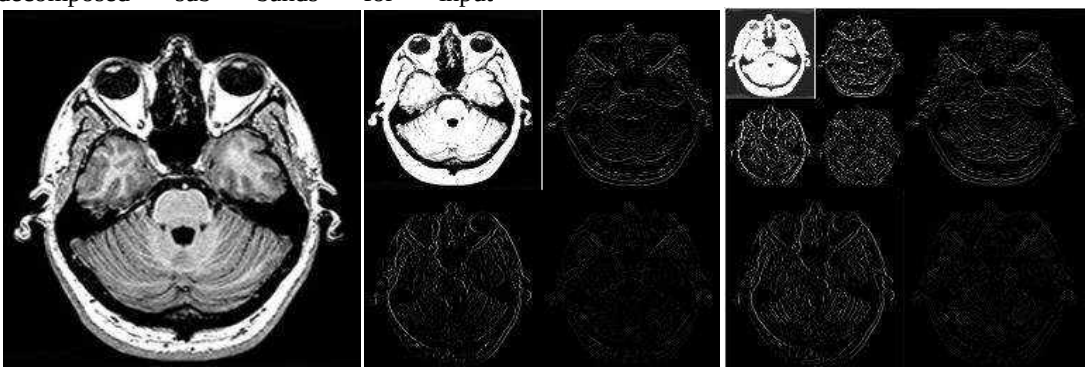
5.2 Adaptive Decision

The entropy of the images are determined and is defined as the measure of the information available in an image. Entropy of an image used in performance evaluation tests is calculated by using the formula used by the Galileo:

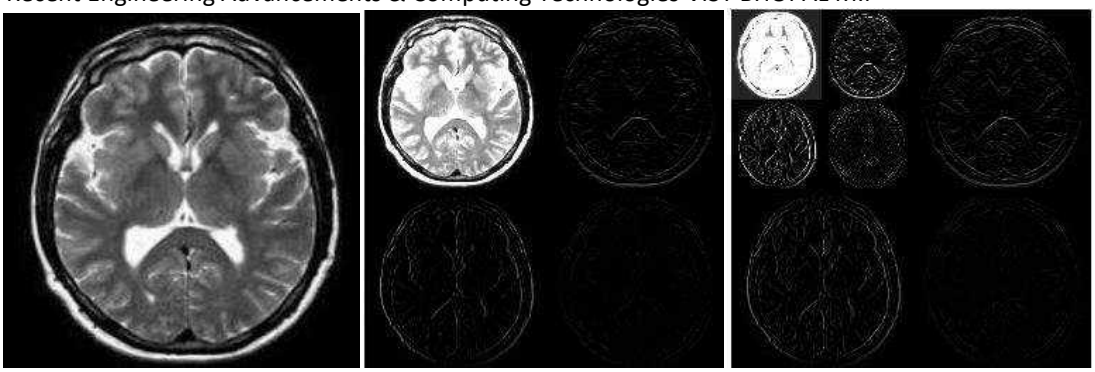
$$Entropy = \sum_i P_i \, Log_2 \, P_i \quad (2)$$

Where P_i is the probability or probability density function (PDF), that in a image the difference between 2 adjacent pixels are equal to The input medical image and enhanced image is fused using the three pixel level fusion rules Viz. Pixel level Maxima, Pixel Level Minima and Pixel Level Averaging or mean.

Proposed adaptive fusion method adopts the best pixel level fusion rules for enhancing the medical image quality based on entropy maximizations using the tri stage Entropy comparison It is observed that using the adaptive fusion rule selection the efficiency of the medical image enhancement is improved since now the fusion results are environment independent



a) Patient_2_CT_image b) first level decomposition c) second level decomposition



a) Patient_2_MRI_image b) first level decomposition c) second level decomposition
Figure 7.8 Results of Second level DWT Wavelet decomposition

6. RESULTS AND DISCUSSION

Histogram based method contrast limited adaptive histogram equalization CLAHE [5] improves the contrast also preserves the brightness and entropy because method maximizes entropy. This method not only gives flat histogram but also enhances image contrast. It is clear from the Figure 4 that enhanced Sonography image with CLAHE enhancement provides flat histogram distribution and describe the baby features more clearly.

Therefore using CLAHE enhancement is used to generate the multi-focused image set from single input image as shown in Figure 4 a) and b). it can also seen from Figure 5. The performances of the different fusion methods are compared based on the standard deviation (SD) and entropy as tool. Performance of various wavelet filters is also analyzed. The proposed approach is expected to performs better in both subjective and objective qualities due to better information contends

The fused results of various methods for Sonography image 1 is shown in the Figure 6. It can be observed that features in pixel level maxima fused image are more visible compared to others.

Conclusion

distinct medical source images are used for evaluating the performance as “Sonography Image 1, Patient image 1, Patient 2 CT image, Patient 2 MRI image, eyes Optical image 1, and X-Ray image. It can be observed that,

- The results based on the proposed adaptive wavelet fusion provide the better results than normal fusion methods. The results are compared with results of Peng et al. [9]. They have fused the images in multi-modality. It is found that our adaptive fusion method enhances the image quality in the absence of the multiple image samples.
- The performance of the different pixel based wavelet fusion methods are evaluated using entropy and standard deviations.
- It is observed from performance comparison that different pixel based fusion rules perform better for different images. For most of images Pixel level maxima gives the more entropy.

It is found that the proposed method provides the maximum Entropy performance. The method adopts right fusion rule thus entropy is significantly improved by the current enhancement method.

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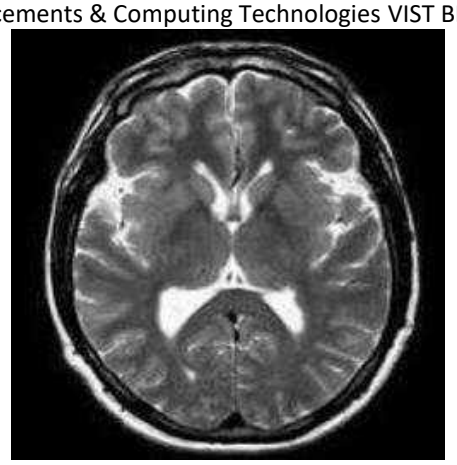
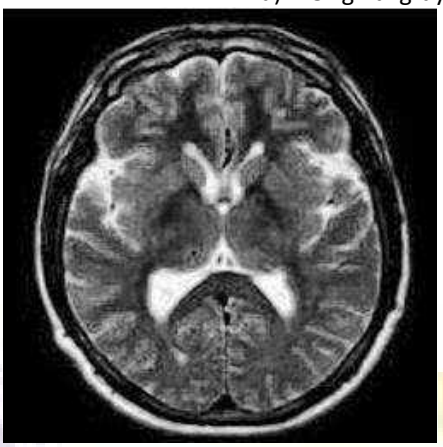
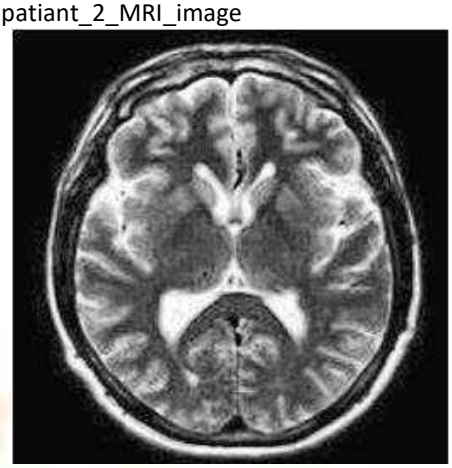
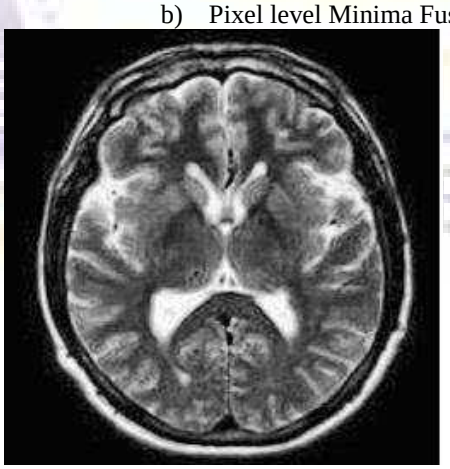


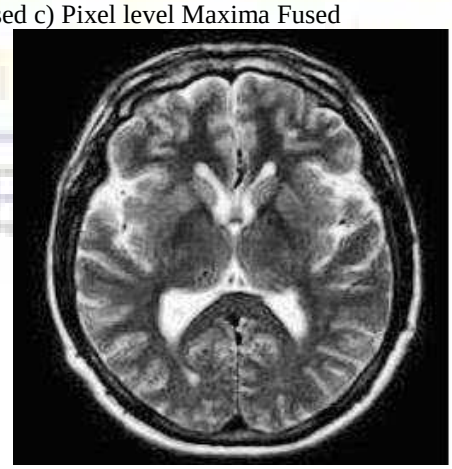
a) Original gray patiant_2_MRI_image





b) Pixel level Minima Fused c) Pixel level Maxima Fused





d) Pixel level Average Fused e) Adaptive Fused Averaging image

Figure 7.12 Adaptive pixel level fusion results for Patient 2 MRI image

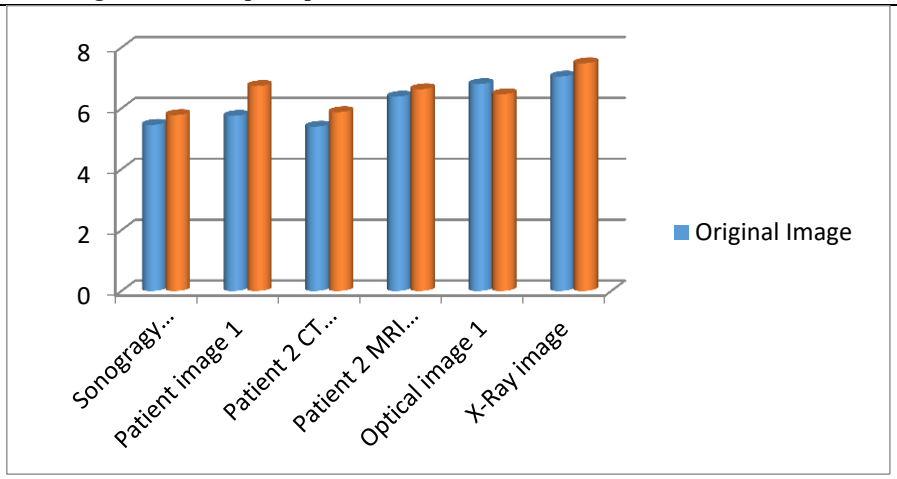


Figure 7.16 Entropy improvements Chart

Demonstration of Low Earth Gravity Dams Stability Analysis using MATLAB Tool

Anup Gorai[1] Rohit Kumar Gope[2] Pintu Kumar Das[3] Kumar Sanu[4]
[1] B.Tech Scholar, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[2] B.Tech Scholar, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[3] B.Tech Scholar, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[4] Assistant Professor, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[1]anupgorai8@gmail.com [2]kumarroshan8034@gmail.com [3]pintu.dhn17@gmail.com [4]sanu830@gmail.com

Abstract: The paper has demonstrated the application of the MATLAB tool in design and analysis steps for the stability analysis of the low earth gravity Dams. It is to make clear that paper just demonstrating the use of MATLAB tool rather emphasizing on efficient design. The Goal is just to take the random inputs to check the stability or instability of the dam. The three possible cases are considered for demonstration one is without water earth quack force acting down ward, Force acting upward, and the final case is analysis with water consideration. The matlab tool works efficiently and is good enough for the analysis. Careful parameter selection is required.

Keywords: Gravity Dam, Stability Analysis, Earth quack Force, Reservoirs, Water Analysis, share stress.

1. INTRODUCTION

The analysis of the Dam during designs is a critical issue. As concrete dam must be designed for the expected worst case of the earth quack and must not fail. Thus the goal of the paper is to demonstrate the use of MATLAB TOOL for the stability analysis of low Gravity Dams. The Figure 1 represent the basic structure of the Gravity Dams.

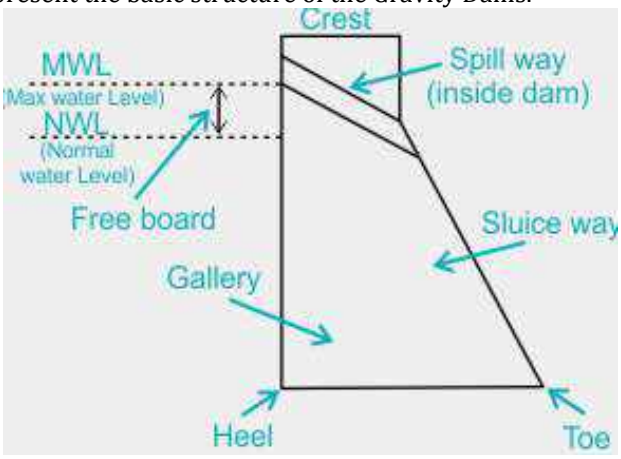


Figure the structure of gravity Dam

A gravity dam is a construction that is made to withstand loads from its own weight as well as from its resistance to overturning and sliding off its foundation. These dams were largely constructed recently, and the majority of them are unsupported concrete monoliths with sealed fissures.

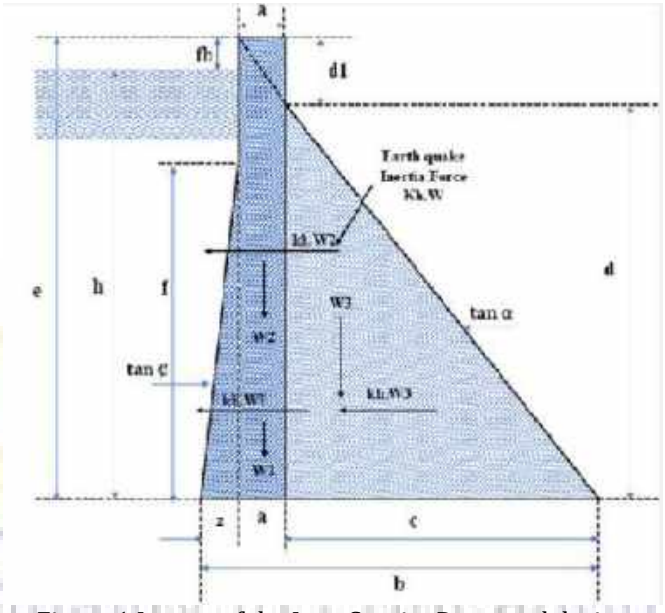


Figure 1 Layout of the Low Gravity Dams and design parameters.

The Figure 2 illustrated the basic design parameters to be considered for the Gravity Dam designs The weight of the dam is calculated using the defined heights parameters of the dam. The slope e is the ratio usually taken as 2/3 for the dam design. A gravity dam is a construction that has been built to withstand pressure through its own weight as well as durability against tipping upside down and sliding off its foundation. The vast majority of such dams, characterized by freestanding concrete monoliths with cemented fissures, were completed recently. Uses are given in Figure 3.

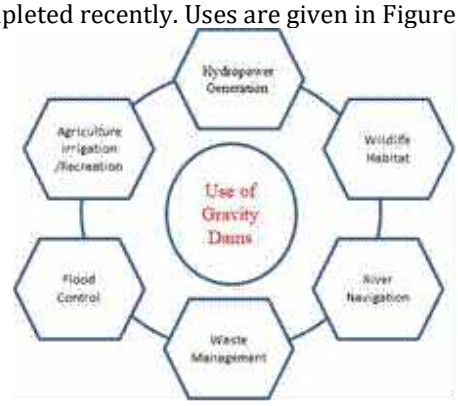


Figure 3 most common uses of the Gravity Dams

2. Literature Review

Tekie, P. B. and others [1] proposed to evaluate concrete gravity dams' performance in the face of seismic threats, this research proposes a methodology for calculating their fragilities. The late 1930s-designed Bluestone Dam on the New River in West Virginia serves as an example of the methodology. According to the seismic fragility assessment, if the dam were to experience an earthquake with a magnitude equal to or greater than the maximum credible earthquake (MCE) established by the U.S. Army Corps of Engineers, sliding at the dam-foundation interface is likely to occur. Jianyun Chen et al [2] used heterogeneity of hardfill mass density, Young's modulus, and tensile strength are all taken into account utilising the random finite element approach in this research using a 100 m high hardfill dam as an example. Discussions also cover the impact of the correlations between the tensile strength of hardfill and Young's modulus, the correlation between Young's modulus and mass density, the duration of the correlation, the dimension of the random field, and ground motions.

The research by Alban Kita et al. [3] includes numerical calculations using as a case study a sample concrete gravity dam situated in a strong seismic area of Italy. The adoption of a site-specific seismotectonic study and discussions of the variations from probabilistic code-based requirements follow. The impact of the vertical seismic component, which is frequently ignored in practical applications, is next investigated using streamlined studies.

M. A. Hariri-Ardebili et al. [4] updated 3D co-axial rotating smeared crack model with the capacity to update the variable shear transfer coefficient is employed in the current work. To evaluate the seismic cracking of three different types of concrete dams, namely gravity, buttress, and arch dams, the model is constructed in the finite element code.

K. Komal et al. [5] designed lower wardha dam, a concrete gravity dam located on the Wardha River at Varud (Baggaji) Dhanodi near Arvi in the Wardha District, is the subject of this paper's design and stability analysis. Throughout the challenging years, it has been noted that dam failures caused by a variety of factors are frequent. Therefore, it is crucial to analyses the dam in relation to all of its potential failure modes, forces acting on it, uncontrollable catastrophes like earthquakes, etc. For this, the preliminary information about the dam, including its dimensions, base and crest widths, etc., is needed for design.

Manoj Nallanathel and others [6] had main goal of project is to analyse the stability of a concrete gravity dam using both traditional and STAAD.pro methodologies. STAAD.pro is computer software that analyses a structure's stability and stress. Because the dam is such a large construction, evaluating it manually would take a very long time, so it is simple to assess the stability of the dam. STAAD.pro

The paper by Azevedo et al. [7] is based on a network of seepage channels and a unidirectional discretization. The suggested model is calibrated so that the same water pressure and discharges are produced with both models, and the hydro-mechanical model applied in the computational module Parmac3D-Fflow are checked and confirmed using straightforward examples.

Maria Luisa Farinha and others [8] modeled the water flow is assumed to only occur along the channels that are at the margins of the triangular interface elements that represent the discontinuities. Using two alternative techniques and a variety of constitutive models at the dam/foundation interface, the model is utilized to perform coupled hydro-mechanical study of a large arch-gravity dam and to evaluate safety against dam base sliding.

J. Wang et al. [9] proposed a CAV site-effect evaluation for the Taipei areas is presented in this work. More than 1200 strong-motion data from 47 significant earthquakes that occurred near Taiwan formed the basis of the study. The findings demonstrate that the site impacts are stronger in places adjacent to the basin margins, where seismic waves might be more easily reflected, refracted, and overlaid, Naproposes, et al [10] research describes a method for determining the seismic risk of existing concrete gravity dams (CGDs) while taking the ageing effect into account.

The analysis has made use of the fragility function and cumulative absolute velocity (CAV) in combination, depending on two failure situations. It depicts the conditional change in structural vulnerability in the event of seismic excitation as well as the time-varying degradation of the concrete structure. There are other dam designs propped in [11 to 15] which are based on seismic or stability analysis of dams.

3. Simulation and Analysis

Paper has preseted the testing and demonstration of the random gravity dam design. the aim is to address the challenges of analysis and the parameter selection and there impacts. Identifications

The parameters are randomly selected for the simulation and demonstration of the MATLAB tool the most important parameters are height of dam and the base width. The weight of concrete is essential and is standard to be 24 rather taken as 10. The coefficient of earth quack force has to be tuned with base width and slope to clear the stability criterion.

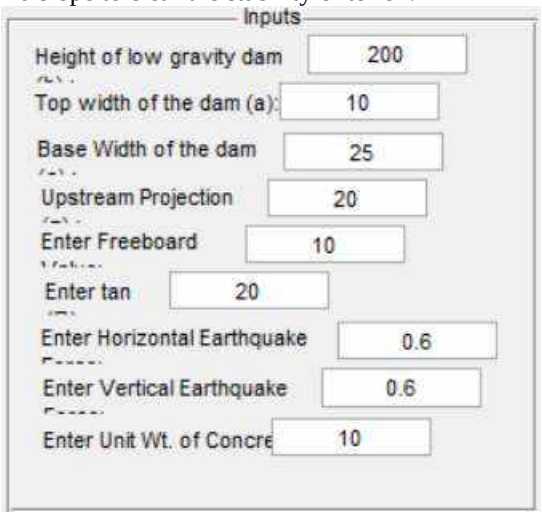


Figure 4 Input values to be assessed for the earth quacks

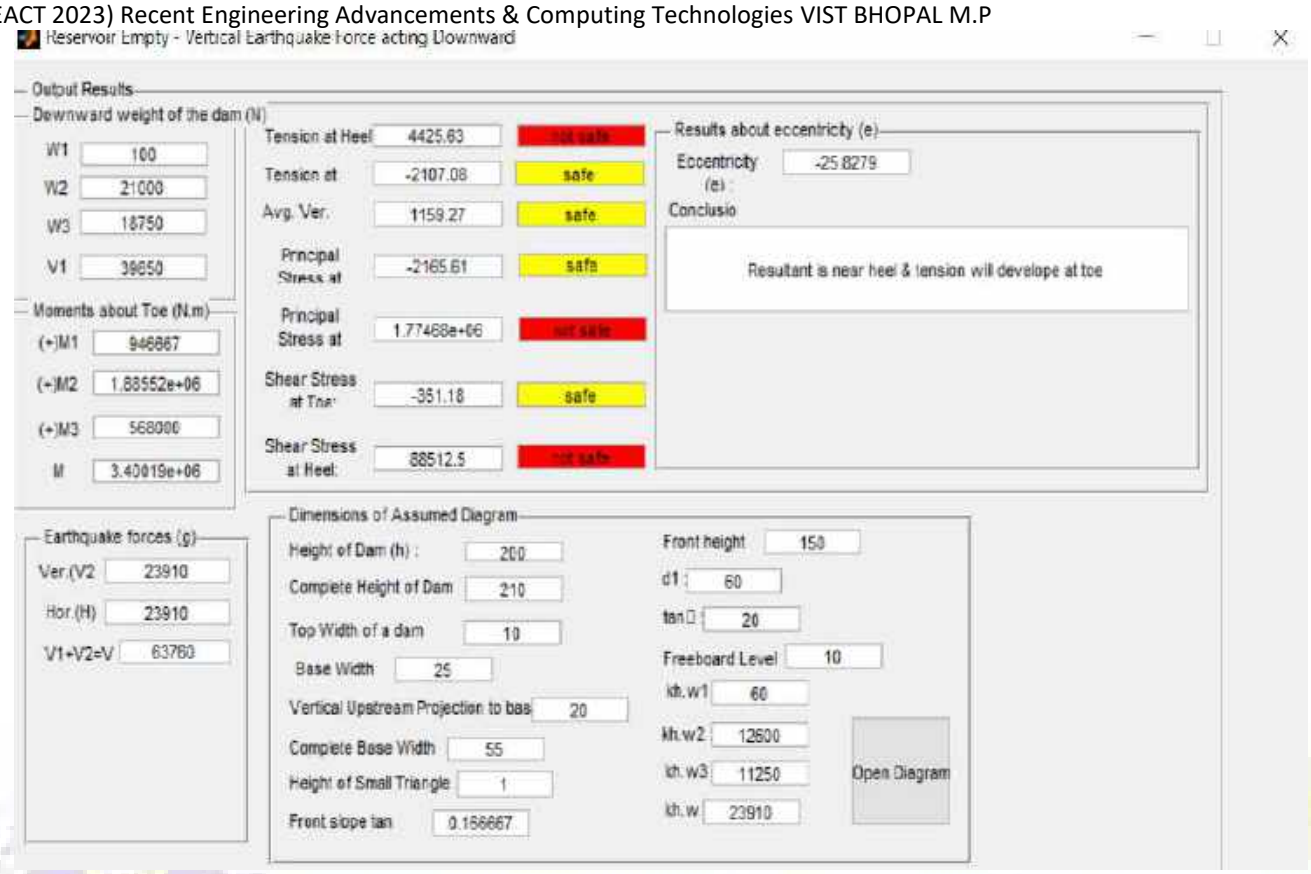


Figure 3 Results of the stability analysis of the Dam for the downward earthquake without Water case 1

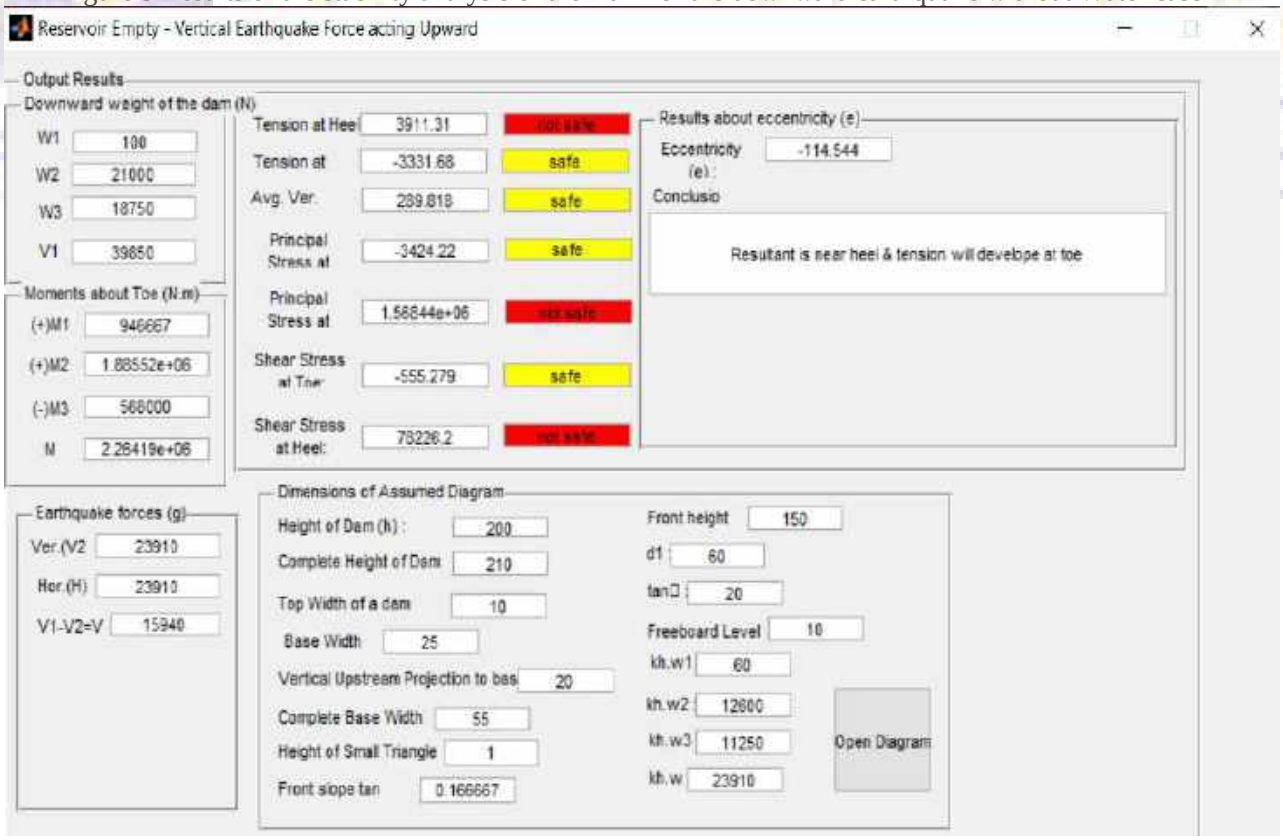


Figure 6 Results of the stability analysis of the Dam for the Up-ward earthquake without Water case 2

The MATLAB tool of Gravity dam stability analysis is tested for the random selected data parameters shown in Figure 4. The simulation is carried out using the Case 1 as earthquake acting downward. And case 2 as the earthquake acting upward. The

result of stability analysis is shown in the Figure 5 and the Figure 6 respectively for two cases. It can be concluded as the concrete weight strength is taken low and the base width is not appropriate so the dam design fails for this case. The conclusions is that the proposer selection of dam height and width ratio is necessary to provide the right slop of the dam and the force coefficients are required to be satisfied properly according o the units of forces. Thus still it is a challenging field of research but the Matlab tool is good enough to solve the critical problems.

4. Testing under Water case.

As a specific case 3 the Water force analysis the most critical part of design is taken consideration the coefficient are selected as shown in the Figure 7

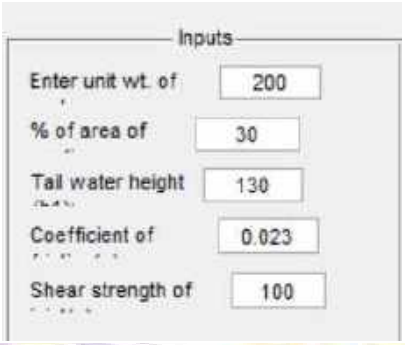


Figure 7 Random selected coefficients and inputs for the water analysis of Matlab tool for stability analysis.

The respective stability analysis results are shown in the Figure 9. The dam layout with water is shown in the Figure 8

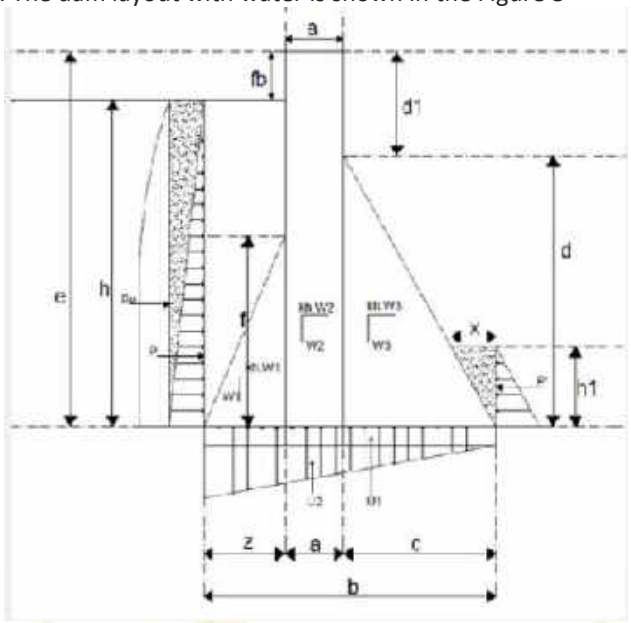


Figure 8 water level geometry of analysis with water heights

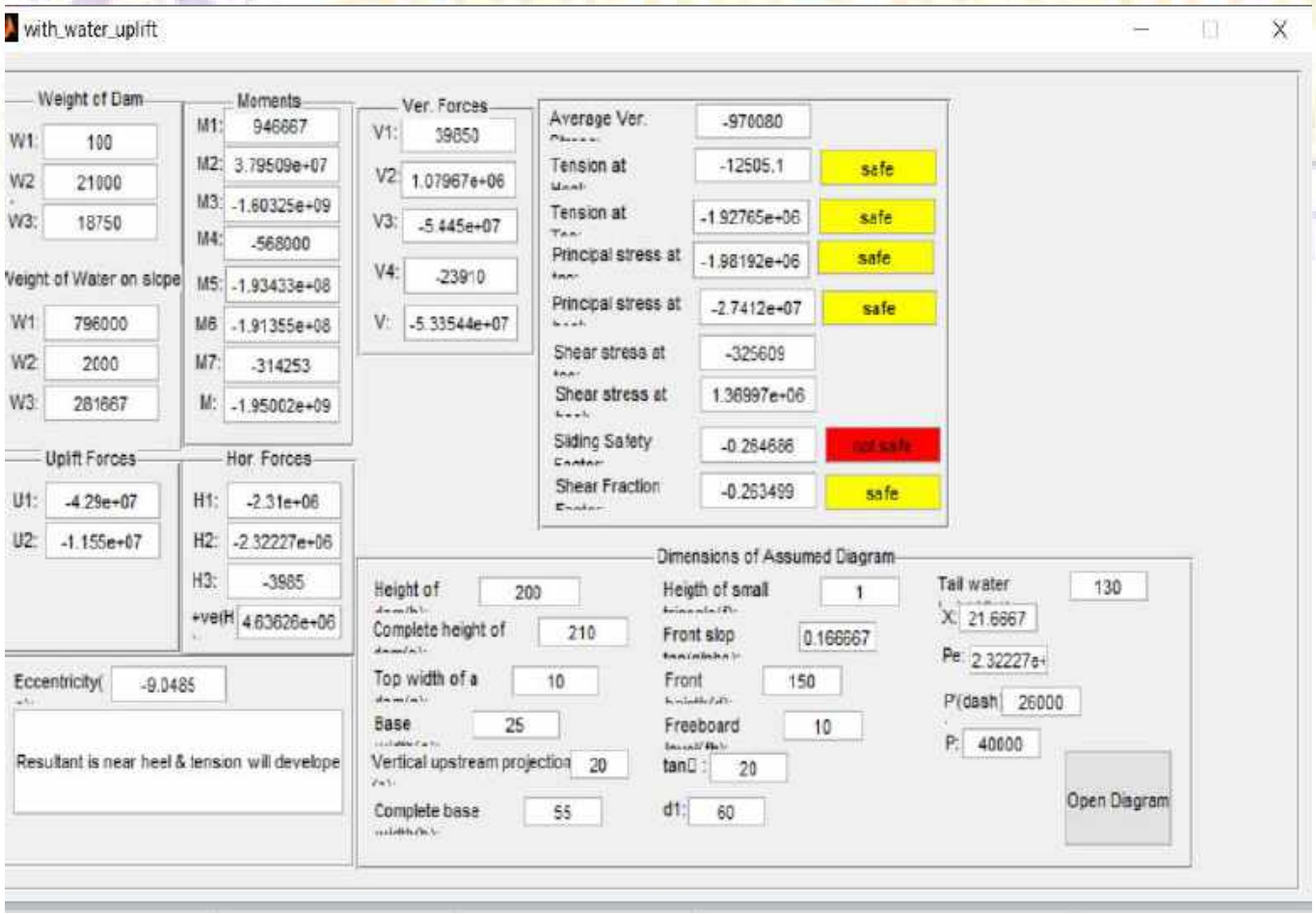


Figure 9 Results of the stability analysis of the Dam for the downward earthquake with Water level pressure case 3

It is again to e=mention that ultimately the design is failed due to wrong parameters. Thus, optimum parametric analysis is a critical design step. The aim of paper is to just distrait the validation of MATLAB tool.

6. CONCUSION

The study demonstrated the use of the MATLAB tool, as well as design and analysis stages, for the stability analysis of low earth gravity dams. It is important to note that the study is showcasing the usage of the MATLAB tool rather than emphasizing effective design. The goal is simply to use random inputs to determine the dam's stability or instability. For demonstration, three different instances are considered: one without water, one with earthquake force acting downward, one with force acting upward, and one with water consideration. The matlab tool works well and is adequate for the analysis. It is necessary to choose parameters with attention.

Although paper successfully validated and demonstrated the use of MATLAB Tool but still, random design is failure and the selection of the critical design parameters is essential for the future designs.

It is concluded that in future Tool can be used with optimal design to analyses the best possible dosing in short span of time.

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Study of Sensors Used in Structural Health Monitoring (SHM) Systems

Prem Prakash[1] Shubham Pandey[2] Prince Kumar[3] Kumar Sanu[4]
[1] B.Tech Scholar, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[2] B.Tech Scholar, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[3] B.Tech Scholar, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[4] Assistant Professor, Department of Civil Engineering,Vidhyapeeth Institute of Science & Technology, Bhopal(M.P), India
[1]6201096360prem@gmail.com [2]sp6843719@gmail.com [3]princek1621997@gmail.com [4]sanu830@gmail.com

Abstract: The article offers an overview of the contemporary digital techniques used for maintaining track of the structural life span of civil structures. The wide range of wireless sensors have been recently deployed with smart structures and are responsible for the structures health monitoring (SHM) throw-out its life span. During the past few years, studies into SHM have been conducted. Locate structural deterioration on a more extensive scale. This paper has classified various types of structures using sensor deployment then presented the study of the senior's uses to monitor these structures individually. The Dams, Bridges, and Tall Structures are mostly being using the sensors even the sensors networks. In the recent item lot of sensors uses are available on the construction site management. Paper has contribution to explore various sensing architecture and also preseted the future scope and challenges of SHM systems.

Keywords: Structure Health Monitoring, Sensor, FBG, Bridge Monitoring Dam Monitoring, GPS, GIS, Strain Gauge, Ultrasonic sensor , Crack Detection,

1. INTRODUCTION

Real and efficient approaches for keeping an eye on the structural health of ageing infrastructures are needed. Preventative care is required for guaranteeing a product's dependability, which motivates us to monitor the structural health of civil and commercial buildings in, real-time to enhance living circumstances and prevent financial losses. The SHM is the field of research to assure the routine maintenance of the structures [1]. Therefore in recent times smart structures are widely being used with inbuilt SHM systems. Various structures using the sensors for SHM are repressed in the Figure1. These structures consist of the Bridges, Tall Structures, Dams, Tunnels, smart homes and the Construction site of structures. Amongst these Dam sits and bridges have significant uses of the sensors [2]. Sensors of various types are installed on the structure itself for monitoring its health for the long life..

Prem Prakash : Student VIST Bhopal Dept.Civli Engg.
Email id 16201096360prem@gmail.com
Shubham Pandey: Student VIST Bhopal Dept.Civli Engg.
Email id sp6843719@gmail.com
Prince Kumar3: VIST Bhopal Dept.Civli Engg.
Email id 3princek1621997@gmail.com
Kumar Sanu4 VIST Bhopal Dept.Civli Engg.
4sanu830@gmail.com

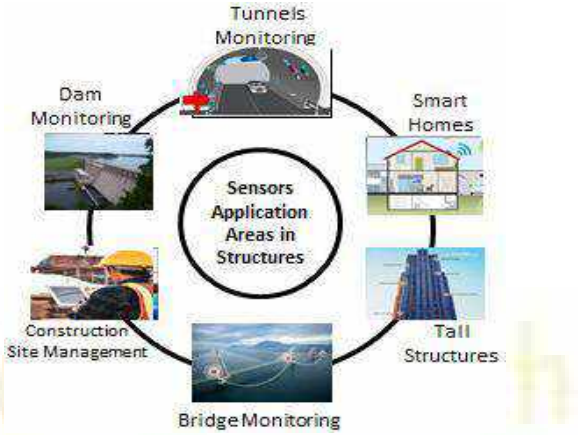

Figure 1 Various Structures using the Sensors

Conventional SHM relies neither on routine maintenance staff inspections, that are neither automated or nor devoid of human interaction Huge amount of and kind of sensors are deployed for the smart SHM systems in recent times. The most frequent sensors employed in monitoring structural health are illustrated in the Figure 2. These sensors include vibration sensor used in bridges and tall structures. Seismic sensors are used for earth quack detection and analysis. The GPS (Global position system) are the most frequent to be deployed on the Dam site localization and also in the bridges. In recent times GPS trackers are used for construction site workers load management. The wind speed and pressure are meteorologically measured using the anemometer.

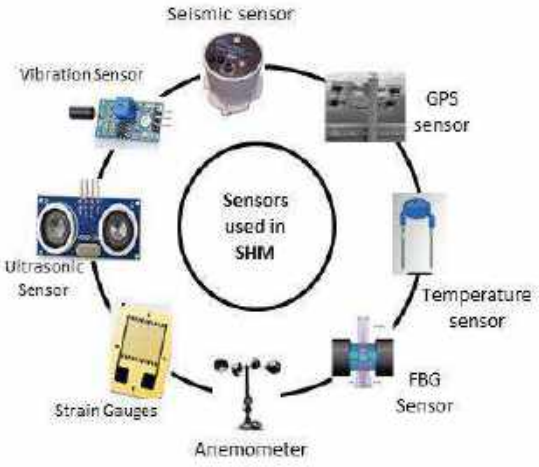

Figure 2 Most Frequent Sensors Used in the Structural

Health Monitoring

Z. H. Warsi [1] studied an overview of the contemporary electronic methods used to keep track of the structural life expectancy of mechanical and civil structures. Structure health monitoring refers to the techniques used to locate and assess anomalies that cause harm to a certain structure, typically one that is mechanical or civil in nature. The majority of SHM research undertaken in recent years has sought to more broadly define structural damage. Pedro et al. [2] create a path that enables a connected world through distributed measurement systems, this paper presents a critical review of the foundations and applications of sensing technologies for SHM systems using ESs. It focuses on their actual developments and innovation as well as analyses the challenges that these technologies present.

Kinet and others [3] addressed primary difficulties associated with the usage of FBGs in composite materials are discussed in this research. The issues of temperature, strain discrimination, amplitude spectrum demodulation during and after curing, and interaction between implanted optical fibers and the environment will be the main topics of discussion. It will be shown how much progress has been made in this subject over the past few years by summarizing and comparing the key tactics adopted in each of these three topics.

Edirisinghe etal [4] reviews 114 articles on the topic of the "digital skin" and presents a systematic and hierarchical classification of them. The hierarchical organization is built on applications that are pertinent to the construction industry, including augmented reality, building information model-based visualization, workforce tracking, supply chain tracking, safety management, mobile equipment tracking, timetable and progress monitoring. Three criteria—validation of technological viability, on-site application, and user acceptance testing—were used to evaluate the research articles

Rocha [5].review article focuses on the most promising class of commercially and lab-made sensors for the SHM of aerospace composites. Discussions include sensing concepts, characteristics, embedding techniques, interactions between sensor and host materials, and obtained sensor data and material behavior. In the context of liquid composite molding processes, the use of sensors for in-situ process monitoring is considered, in particular for curing and mound filling monitoring. There is also a brief mention of general factors for the development of SHM systems for the aircraft environment

Kemoto et al [6] used contactless loading sensor system that can measure the internal loading of an object structure via a variety of covering materials. Because the created system uses passive RFID for data exchange and a power source, it can be put into items without a battery. As a result of the power supply being typically very low with RFID, the system consumes less electricity. They have suggested a system architecture that is making use of two kind o the RFID tags.

Bremer and co. [7] study examines the resilience of functioning carbon structures (FCS) in an environment of very alkaline concrete. AB Noel [8] article provides a thorough review of SHM employing WSNs, highlighting the algorithms employed in damage detection and localization, explaining network design issues Edirisinghe and other [9] present smart safety vest prototype created to sense temperature and warn the wearer and nearby employees/management of thermal irregularities

Eastman and other [10] have proposed using building info management system (BIM) foe construction planning. The current study by A.Glii et al. aims to spread awareness about the advantages of using BIM in various areas of the building industry Samson Fosu Gyasi and others look into how locals in a few areas around the Bui Dam felt about the quality of their drinking water at Dam sites

The work by Wang T et al. With the suggested algorithm, a structure's precise global features can be determined using only the observed strain responses. To decouple and extract the strain modes one at a time, singular value decomposition, power spectrum augmentation, and least square fitting techniques are used.

Svendsen and other This research presents a data-based SHM technique for steel bridge damage identification. A thorough research of the most prevalent types of steel bridge damage described in the literature is used to introduce damage and collect data from a genuine bridge under various structural state conditions.

Over all it is concluded that the west rage of applications have been demonstrated for the use of sensors in the structures design and monitoring.. This paper has preseted some of the most frequent sensor deployment and uses in the most common civil structures. The uses of sensors for the reservoirs of the dam sits are also part of future discussion. It is expected to explore the various possibilities of seeing in smart structure designs

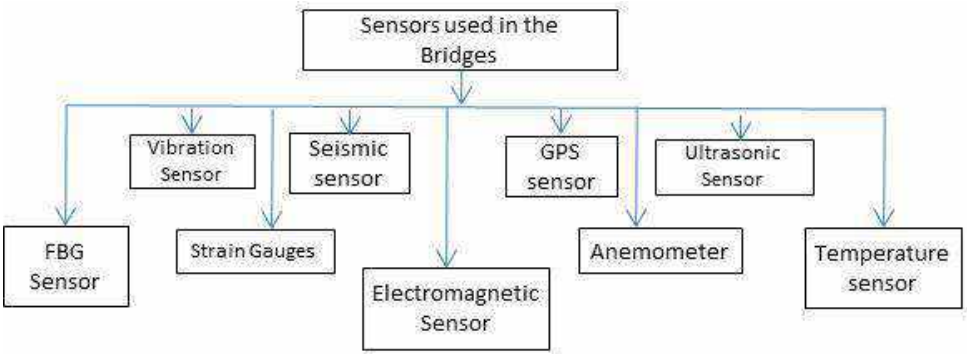

Figure 3 Classification of the Sensors used in the Bridge design and Monitoring

2 Sensors Used in Bridge Monitoring

Most frequent use of the SHM system is in the bridges. The classification of the sensors used in the Bridge design and monitoring is presented in the Figure 3. The sensors are broadly classified as the vibration sensor, Fiber brag gritting sensor, strain gauge, electromagnetic sensor, GPS sensor and anemometer. He most used sensors are fiber optics sensors (FOS) is discussed first.

Fiber Optic Sensors (FOS)

Optical Fiber Sensors Because of their non-conducting nature, lack of battery power requirements at the sensors node, as well as immunity to electromagnetic waves, FOS is becoming more and more popular among SHM engineers.

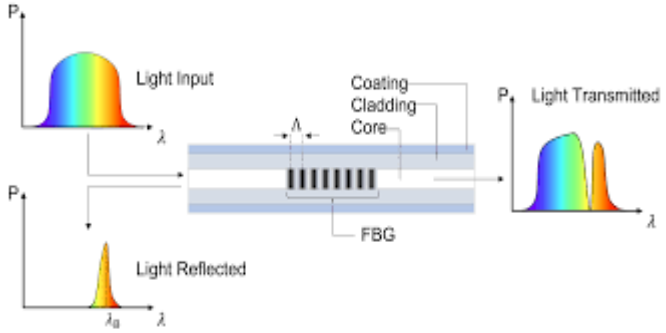

Figure 4 FBG sensors deployed to measures strain in Bridge structures

The optical fiber sensor most frequently used is the Fiber Bragg Gritting (FBG) sensor the FBG sensors are mounted in the beams, pillars and on the bridge surfaces. The may determine the load and pressure on the bridge. The light pulse width changes across the fiber output are measure of the physical quantities. Figure 4 depicts the basic process of FBG sensors.

Anemometer: They are mounted on the various bridges specially on cable straight bridges. And used for measuring the wind speed and pressure for the materialistic measures to ensure the long life of the cables.

Ultrasonic sensors: used for the easement of the crack and the depth and width analysis of the cracks on the structures surfaces Then letter data is used for the retrofitting and the sheerness of the cracks. These sensors are used for the determination of the rver flow level also for the lifetime. And used for the risk managmen.

Strain Gauges: The strain grudges are pressure and displacement sensors. Huge amount of gauge are installed on the structures itself for the long life measurements.

GPS for GNSS: the GPS sensors operated using the satellites navigation are used for the measuring the dynamic deflection in the bridges.

Electromagnetic sensors: are most widely used in the bottom of pillars and ridges surfaces and used for the energy harvesting applications.

Seismic sensors Seismic and Motion sensors keep track of the frequency and intensity of shaking over time. Also measures the earth quack intensities access the structures.

These are the few sensor uses. But in actual practice there is grate scope of sensors study in the civil engineering.

3. Sensors used in Dam Sites Monitoring

Dam monitoring is one of the most important engineering and monitoring challenges in contemporary society. Dams supply households, businesses, irrigation, as well as drinking water with energy. But as they get older, they often start to break and overflow, which can do a lot of harm. So, in order to foresee their overflows and ageing and to get early warnings about such conditions, we need a way to track and log them. After that, we can collect various analytical data about them. Some of the other senor uses on the Dam sits are as follows;

- Dam Water Quality Analysis: the reservoirs water quality and the water supply requires continuous testing of the water quality analysis on Dam sits.
- Dam Global Thermal Field: The thermal behaviors of dam walls are continually minters using the temperature sensors installed on the walls.
- GPS sensors are used to provide the navigation info of the Dam sites.
- Sensors are used to verify and substantiate the design's premise and presumption.
- To measure the river level on continues basis.
- Determining how reservoir application affects several variables, like stress, strain, pressure in the water, tendency, deflection, as well as water seepage

4. Sensors Used in Construction Sites

There are many applications where sensors are deployed on heavy construction sites. Few examples are as follows

- To maintain safety in the primary area and its surroundings during active construction.
- To monitor the constantly shifting parameters while building.
- To ensure the safety of nearby structures including the foundation while construction is taking place.
- Monitoring the SHM results to determine the structure's level of safety over its lifetime

The basic system block diagram for the seeing and testing units used on the SHM system is shown in the Figure 5. The sensors performance of the structures can be tested and easily used in the lab environment using the arduino boards.

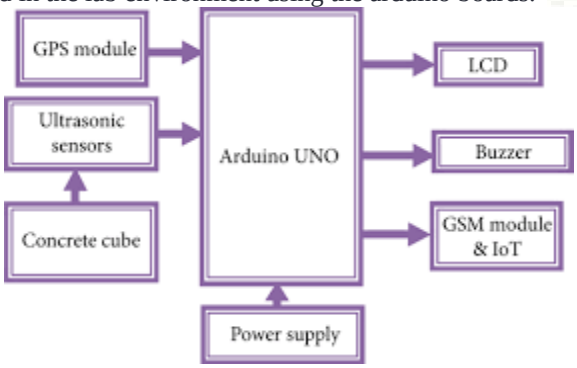

Figure 5 most simplest SHM system hardware diagram

Examples of the most common types of the seniors used in the SHM system design for the structural uses are shown in the Figure 6. An smart homes or structures consist of smoke sensor, fire detection and warning sensor, light sensors like LDR, IR sensors for object detection and counting, also sensor for energy harvesting.

Figure 6 most frequent sensors for smart structures

Safety is the major concern for peoples using the structures the most frequent safety sensors and applications are mention in the Figure 7

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Figure 7 safety measures to be taken on structure sites and projects.

SHM IoT architecture

IoT devices have a solid architecture that allows them to accomplish their goals. Additionally, the viability of IoT systems is determined by the level of quality of the built infrastructure. The frameworks and data flows used by various connected device types for diverse structure applications are comparable. The deployment of IoT-based SHM in different structures faces several challenges even though it has notable qualities and a wide range of applications. By way of example, sensors' battery life needs to be increased to guarantee that their durability. This issue can be resolved by employing techniques like increasing the microcontroller's sleep duration and transmitting data in short packets while the embedded system is operational.

6. CONCUSIONS

Article provides a summary of the modern computerized methods for tracking the structural lifespan of civil structures. A variety of wireless sensors have lately been installed in smart structures, and they are in charge of monitoring the health of the building during its lifespan (SHM). Studies on SHM have been carried out in the recent years. Find structural degeneration that is more pervasive. This study examined the methods used by seniors to monitor each of the many types of structures that were identified using sensor deployment. Most sensors, including sensor networks, are used in dams, bridges, and tall structures. In recent item lot of sensors uses are available on the construction site management. Let's give try on analyzing and building the smart structures for future adornments.

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Experimental Studies on Reduction of Water Absorption in Flyash Bricks

Yash Vinay Sahu[1], Aruna Rawat[2*]
[1, 2] Department of Civil Engineering, University Institute of Technology (UIT), RGPV, Bhopal, Madhya Pradesh, India.
*Corresponding author email: augupta2001@gmail.com

Abstract: The bricks are the most commonly used for constructing building walls. The dampness occurs in building walls due to bad design, faulty construction and use of poor quality of materials. This dampness not only affects the life of the building but also creates unhygienic conditions of the important items of work in the construction of a building. The treatment given to keep the walls, floors and basement dry is termed as damp proofing. In the present experimental study to reduce the water absorption content in flyash bricks the coating of bitumen and polymer on its surface is carried out. Further, its water absorption content with uncoated flyash brick is compared. Since there are many different causes of dampness, many of which cannot be fully resolved afterwards, this work aims to provide all required precautions and preventive measures in order to avoid it because prevention is always preferable to treatment. From the results it is concluded that using bricks coated with bitumen and polymer while constructing the building walls, can definitely reduce the dampness in it.

Keywords: *Dampness, water absorption, bitumen, polymer*.

1 Introduction

A brick is a block used to construct masonry structures such as walls, pavements, and other features. The bricks can be attached to one another by different types of mortars, adhesives, or by interlocking (IS 2212:1991). The bricks are made in large quantities and come in a wide range of classes, kinds, materials, and sizes that change depending on the location. Burnt clay bricks, sand lime bricks, hollow bricks, fire bricks, concrete bricks, flyash bricks, and engineering bricks are few of the varieties of bricks that are frequently used in masonry building. Flyash bricks are manufactured using flyash, an industrial waste from thermal power plants (Zhang, 2013). These bricks are lightweight, high fire insulation, high strength, uniform sizes for better joints and plaster, lower water penetration and durable. Nowadays, building dampness in brick masonry is very common. It may occur due to bad design, faulty construction and use of poor quality of materials. This dampness not only affects the life of the building but also creates unhygienic conditions of the important items of work in the construction of a building.

The treatment given to prevent leakage of water from roof is generally termed as water proofing whereas the treatment given to keep the walls, floors and basement dry is termed as damp proofing. Figure 1 shows the dampness in masonry.

Yash Vinay Sahu1 is an M Tech Research scholar UIT RGPV.
Fr Aruna Rawam: Prof. in UIT RGPV, she is PHd in Structure design from IIT delgi, and gold medelist in M Tech VJTI Mumbai. And having research intrest in
augupta2001@gmail.com

Figure 1 Dampness in masonry

One of the main sources of dampness is the absorption of moisture by the construction components. Due to the granular structure of the materials, moisture easily enters the spaces and, with the help of capillary action, is able to move in a variety of directions. The important sources of dampness are: Moisture rising through the foundation walling, moisture from wet ground may rise well above the ground level on account of capillary action, splashing rain water which rebounds after hitting the wall surface, penetration of rain water through unprotected tops of walls, parapet, compound walls, etc., rainwater may seep through a faulty roof covering on sloping roofs. Rainwater may enter the top supporting wall through a defective eaves course and eave or valley gutters, resulting in dampness. In the case of flat roofs, insufficient roof slopes, incorrect rainwater pipe connections, and faulty joints between the roof slab and parapet wall may prove to be the cause of moisture.

Kportufe (2015) provided up to date information about the various causes of dampness in buildings, the effect of dampness in buildings, method of preventing dampness in buildings or remedies of dampness and diagnosis of dampness. The causes of dampness in building are a great concern in the construction industry as it often leads to deterioration of structural component such as columns, walls, floors, roofs, and encourage rapid growth of molds and bacteria which causes related health problems.

Campian and Pop (2016) studied very sensitive problem caused due to dampness elimination in building walls. The various methods such as chemical method, electro osmotic method or physical method were discussed. Asamoah et al. (2017) studied rising damp in buildings and their effects and suggested remedial measures for controlling and treatment of rising damps. Hola (2018) tested the moisture content in masonry walls in the basements of monastery of the 14th century in the north of Poland, Europe. The non-destructive methods using the dielectric and microwave were carried out. The correlative dependence between the dimensionless indications of the apparatus was used in the tests and the mass

moisture content of the walls, which was determined using the gravimetric method.

Hoła (2020) carried out the experimental studies to determine the moisture content in brick walls of buildings. The tests were carried out non-destructive methods. The methodology was proposed for the various causes and negative effects of extreme moisture and salinity in brick walls. Knarud et al. (2021) investigated the interior insulated brick masonry wall segments undertaking wetting and drying. The segments were equipped with interior insulation and embedded wooden beam ends, and also with a smart vapor barrier. Gupta et al. (2021) studied the mixing process of lime stabilized fly ash bricks. The combined effect of two different mixing sequences at five different moisture contents on the properties of hydrated lime fly ash (HLF) bricks were examined.

Four major categories of materials are used to prevent and stop dampness in buildings are Flexible materials: - such as bituminous felts which may be Hessian based or fibre/glass fibre based, plastic sheeting, polythene sheet etc., Semi rigid materials: -such as mastic asphalt or combination of materials or layers, Rigid materials: - such as engineering bricks, stones, slates, cement concrete with additive and grout materials consists of cement sherry and acrylic based chemical or polymers. Thus, in the present experimental work an attempt is done to reduce the water absorption content in fly ash bricks by coating its surface with bitumen and polymer and compare its water absorption content with uncoated fly ash and traditional clay bricks.

2. Materials and Methodology

2.1 Flyash bricks

The manufacturing process of standard fly ash bricks involve various steps as follows

Mixing compositions: Generally fly ash, lime, cement, gypsum and sand or stone dust are manually feed into a pan mixer where water is added to the required proportion for homogeneous mixing. The proportion of raw material may vary depending upon quality of raw materials. After mixing, the mixture are allowed to belt conveyor through feed in to automatic brick making machine were the bricks are pressed automatically. Than the bricks are placed on wooden pallets or steel pallets kept as it is for two days thereafter transported to open area where they are water cured for 28 days. The bricks are sorted and tested before dispatch. Figure 2 shows the flowchart for manufacturing process of fly ash bricks.

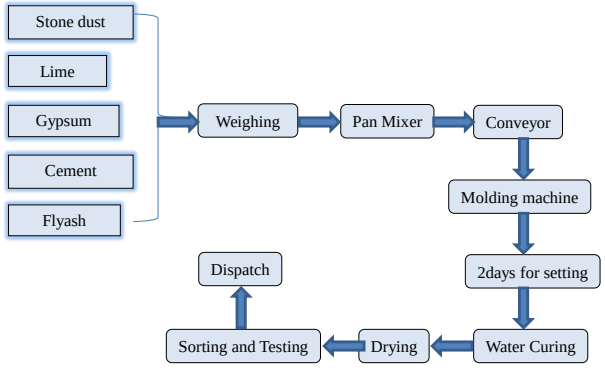


Figure 2 Flowchart for manufacturing process of flyash bricks

2.2 Water absorption

The water absorption test estimates the amount of moisture content in bricks. As per IS 12894: 2002 and IS 3495 (part 2): 1992 the limit for water absorption in high quality bricks is less than 20%. . The brick specimens are first dried at 105-115°C in an oven. After that the specimens are subsequently brought to normal room temperature, and weight is determined. The weight is recorded as W_1. The brick specimen is then completely immersed in clean water at a room temperature for 24 hours. The specimen is then removed, cleaned of water traces, and weighed accurately and recorded as W_2. The percentage water absorption of each brick specimen is given as

$$\%\ water\ absorption = \frac{(W_2 - W_1)}{W_1} \times 100 \quad (1)$$

The experimental study is carried out to reduce the water absorption content in fly ash bricks by coating its surface with bitumen and polymer and compare its water absorption content with uncoated fly ash bricks. The water absorption capacity ultimately relates the rate of dampness in masonry wall. Figure 3 shows the uncoated fly ash bricks. In order to reduce water absorption content in fly ash bricks bitumen and polymer coats are applied on the surface of the bricks as shown in Figures 4 and 5, respectively.

Figure 3 Uncoated flyash bricks.

Figure 4 Bitumen coated flyash bricks.

Figure 5 Polymer coated flyash bricks

3 Results and Discussions

3.1 Water absorption

The water absorption in flyash bricks uncoated and coated with bitumen and polymer is given in Table 1 and Figure 6. The average water absorption is 5.62 % which is within the limits of IS codal provision. bitumen. The average water absorption is observed to be 3.25 % when coated with bitumen. The water absorption is also within the IS codal provision and less than the uncoated bricks.

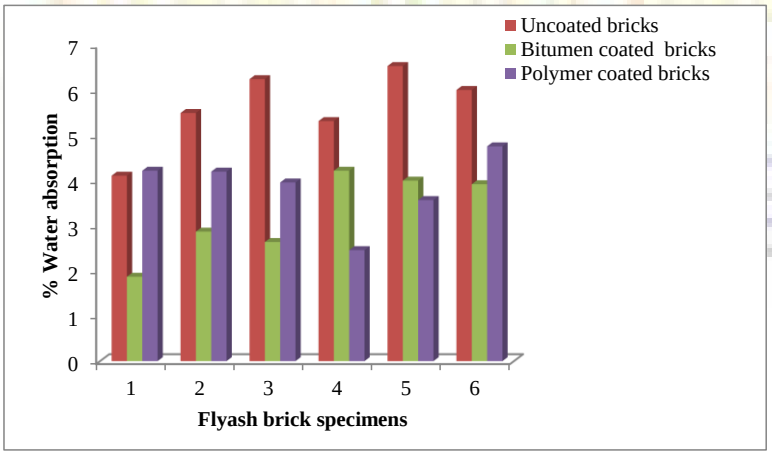
The average water absorption is observed to be 3.86 % when coated with bitumen. The water absorption is also within the IS coal provision and less than the uncoated bricks.

It can be observed that the water absorption of fly ash bricks is reduced in the bricks coated with bitumen and polymer coats. It is observed that using bitumen coat the water absorption is reduced by 42.17% and by polymer coat it is reduced by 31.32%.

Hence by using the bitumen and polymer coats in the masonry walls where there is dampness for example walls near bathrooms, WC, kitchen sink etc. The portion of wall masonry bricks can be coated with bitumen and polymer, can definitely reduce the dampness in building walls.

Table 1 Water absorption in uncoated and coated flyash bricks

Flyash brick specimens	Uncoated bricks	Bitumen coated bricks	Polymer coated bricks
1	4.11	1.87	4.22
2	5.50	2.87	4.20
3	6.25	2.64	3.96
4	5.32	4.22	2.46
5	6.54	4.00	3.57
6	6.01	3.92	4.76
Average water absorption (%)	5.62	3.25	3.86



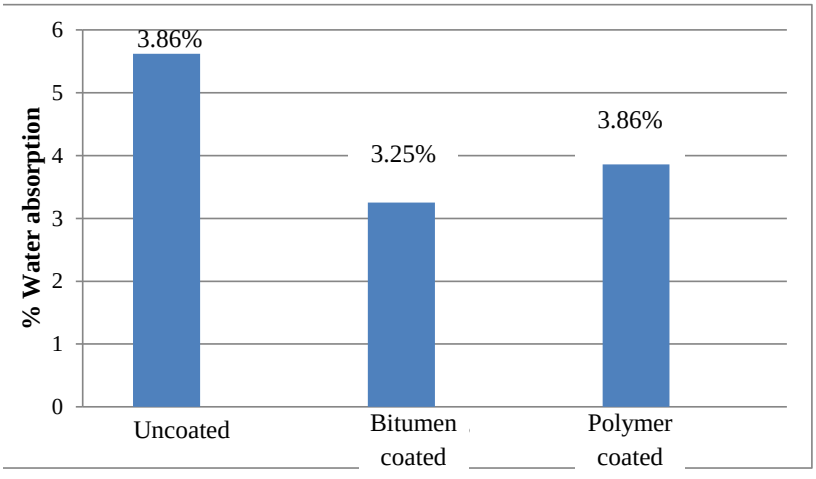


Figure 6 Water absorption in flyash bricks uncoated and coated with bitumen and polymer

4. Conclusions

The experimental study to reduce the water absorption content in fl ash bricks by coating its surface with bitumen and polymer and compare its water absorption content with uncoated flyash bricks. Since there are many different causes of dampness, many of which cannot be fully resolved afterwards, this work aims to provide all required precautions and preventive measures in order to avoid it because prevention is always preferable to treatment. The following conclusions are drawn:

1. The average water absorption of uncoated fly ash bricks is is 5.62 % which is within the limits of IS codal provision. In order to reduce water absorption content in fly ash bricks bitumen and polymer coats are applied on the surface of the bricks. The average water absorption is observed to be 3.25 % when coated with bitumen. The average water absorption is observed to be 3.86 % when coated with bitumen. The water absorption is also within the IS codal provision and less than the uncoated bricks.
2. It can be observed that the water absorption of fly ash bricks is reduced in the bricks coated with bitumen and polymer coats. It is observed that using bitumen coat the water absorption is reduced by 42.17% and by polymer coat it is reduced by 31.32%.
3. Hence by using the bitumen and polymer coats in the masonry walls where there is dampness for example walls near bathrooms, WC, kitchen sink etc. The portion of wall masonry bricks can be coated with bitumen and polymer, can definitely reduce the dampness in building walls.

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Analyses of Thermal and Flow Characteristics of Baffle Factor in Shell and Tube Heat Exchangers

[1]Vardan Singh, [2]Arun Kumar Patel, [3]Amit Vishwakarma
[1]Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[2] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[3] Assistant Professor, Vidhyapeeth institute of science and technology Bhopal, India
[1]nayak.vardansingh@gmail.com, [2]patel.arun2020@gmail.com, [3]amitvishwa4@gmail.com

Abstract— **The recent rise in oil prices and concerns about global warming have stoked a renewed interest in finding ways to reduce carbon emissions and maximize energy efficiency. There are a wide variety of industrial uses for heat exchangers. Reviews of the available literature show that Shell and Tube heat exchangers account for more than 60% of all industrial heat exchangers because they are cheap, simple, and straightforward to set up and maintain. In addition, it provides excellent dependability and productivity. The thermal efficiency of a Shell and Tub heat exchanger can be increased by careful regulation of key design parameters, which is why this area of study is currently receiving a great deal of attention. In this analysis, we recover the primary design parameters of the baffle plate and investigate the effect of scale on heat transfer velocity. The optimal value of the baffle plate has been determined using commercially available software. As the baffle plate height was varied from 50% to 78% and the number of baffles was varied, the performance was monitored (4, 6, 8, 10).**

***Index Terms*— carbon emissions, energy efficiency, thermal efficiency, Shell and Tub heat exchanger, baffles, CFD**

I. Introduction

Heat exchangers are devices that facilitate the exchange of heat between two fluids that are at different temperatures, through a surface. Heat exchangers can be used in various types of processes, from domestic heating and air conditioning systems to chemical processes and production of power in large power plants. (ÇENGEL & GHAJAR. 2012). Considering the various areas of application were developed of the various types of heat exchangers, such as: direct contact (when fluids mix), indirect contact (the exchange takes place by the contact area of the fluids with a surface), of double tube, serpentine, hull and tubes, and finally those of the type placa. The difference between each of them is how they exchange heat, and how they are constructed. Among the various types of heat exchangers, the hull and tube exchanger is considered to have the greatest versatility compared to other types, such as example the simplicity of its construction, the low cost, and still presents a good thermal yield (BICCA, 2006). This model of heat exchanger may consists of an external cylinder (hull) with several tubes inside, separated evenly and in rows, and to increase yield are used some deflectors (increased turbulence and fluid flow speed (FELIPPE, 2018).

[1]Vardan Singh, he is prof. in ME deptt. VIST Bhopal
[1]nayak.vardansingh@gmail.com,
[2]Arun Kumar Patel, he is prof. in ME deptt. VIST Bhopal2patel.arun2020@gmail.com
[3]Amit Vishwakarma
3amitvishwa4@gmail.com

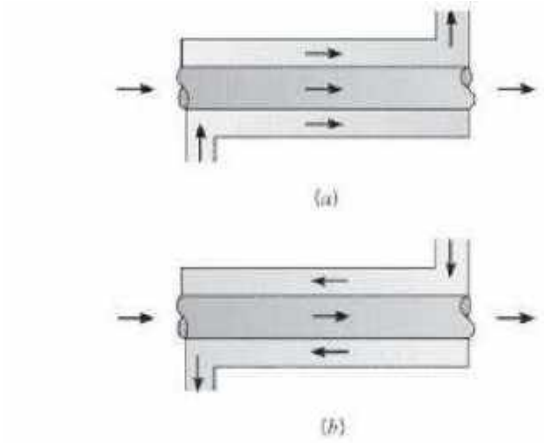

Figure 1.1: Heat exchangers of concentric tubes. (a) Parallel flow. (b) Counter current flow

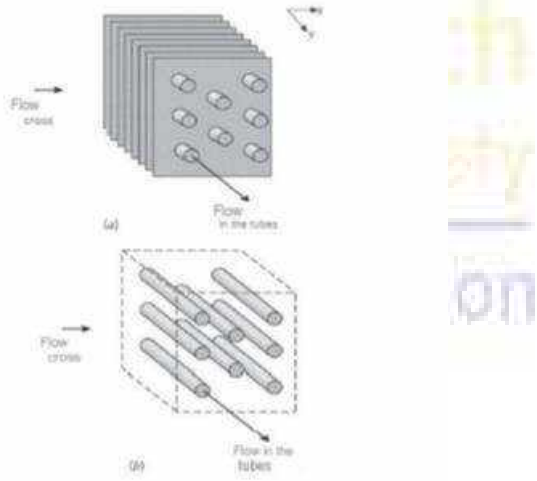

Figure.2: Heat exchangers with cross drains. (a) Flip-beded with both unmixed fluids. (b) Not summing with one mixed fluid and the other not mixed

Heat exchangers with cross drains. (a) Flip-beded (a) Parallel flow. (b) Counter current flow. with both unmixed fluids. (b) Not summing with one mixed fluid and the other not mixed.

The two configurations differentiate by the flow of fluid on the pipes in mixed and unmixed. Figure 2a states that the fluid is not mixed, because the fins prevent movement in the direction (y) that is transverse to the direction (x) of the main flow. The mixture, the movement of the fluid mixes in the transverse direction. (BERGMAN, et al. 2017). The most common configuration is the hull heat exchanger and pipes, Figure 3. Specific forms of this type of heat exchanger are characterized by the number of passes in the hull and tubes. The two most common forms are those that have a single pass on the pipes and the hull Heat exchanger hull and pipes.

With a pass on the hull and a pass in the tubes.
With one pass on the hull and two passes in the tubes.

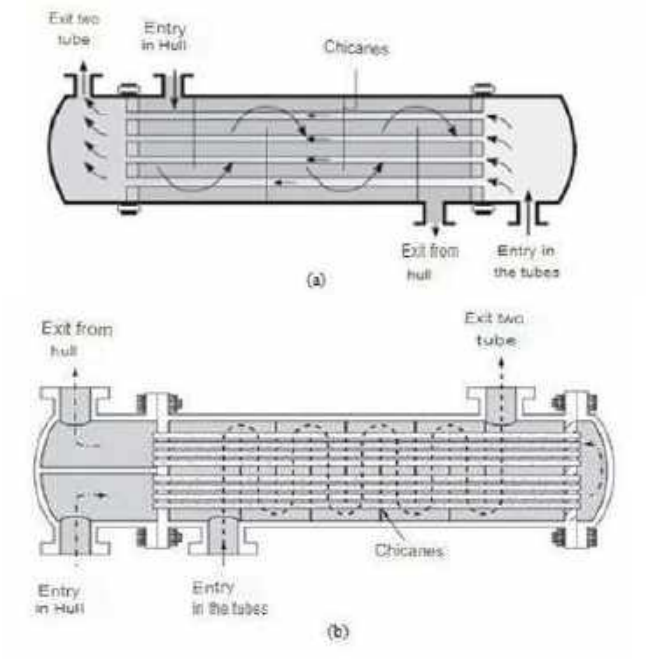

Figure 3: two passes in the tubes for a single hull

The development of this device consists briefly of two stages: the construction of the prototype and the detailed calculations of the mechanical design. In the construction of the equipment, it is necessary to size the entire structure. At this stage, parameters to be used, such as the type of material, diameter, thickness and length of the hull, quantity, diameter, thickness and compresses of the pipes and the spacing between the chicanes. After assembly, calculations will be performed to have knowledge of efficiency, the amount of heat exchanged, the heat lost, among other variables, and these will be confirmed by the functionality of the heat exchanger.

1.2 Research Background

Due to the recent rise in oil prices, there is a lot of concern about the use of paper efficiency, and due to global warming, there is a great deal of interest in how to get carbon dioxide. The carbon dioxide reduction method can be used as a method of recovering the generated carbon dioxide and the method of retrieving the generated carbon dioxide. However, in the case of self-extraction, the technology developed to ash is economically efficient in terms of carbon dioxide There are many restrictions on recovery treatment. Therefore, it can be said that the method of connecting carbon dioxide from the source to the source is actually a human solution.

Heat exchangers are used as key devices in almost every field of industry, transportation, and domestic use. Heat exchanger type shell-and heat exchangers and type heat exchangers are the most widely used heat exchangers in the industrial field, and since 2000, they have become many type heat exchangers. Compared to shell and tube heat exchangers, plate heat exchangers have high single-surface sugar heat ratio, high corrosion resistance, high wear resistance, small size, light weight, and excellent temperature resistance. However, liquids containing solid particles of 0.5mm or more, heat is more than 2500m2, 25kg/cm2 250°C or more, phase change and fluid velocity is less than 0.1m/s. Shell-and-tub heat exchangers are the most widely used heat exchangers, which can obtain a wide range of heat months, so the solvent is very wide, reliable and efficient. It can be manufactured in a variety of sizes, not only at high temperatures of more than 260°C. In addition, it has good pressure resistance for high pressure of more than 30 atmospheres, so its application field is air Conditioning equipment, chemical lantern foot equipment, etc. Industrial process heat exchanger furnaces are used. According to the literature, this heat exchanger accounts for more than 60% of the body industry process heat exchanger. However, the shape of the inlet outlet of the fluid, the shape of the head,

Due to the variety of design factors to consider, such as the shape spacing of the Baffle, and the complexity of the ten lunar phases in the shell, there is a limit to its characteristics. The design factor supports the vessel silver group and allows the flow of fluid in the cylinder to be orthogonal to the group and increases the flow rate to increase the turbulent strength and better mixing within the shell of the heat exchanger. It will increase the amount of ten months. However, increasing the amount of heat exchange is large Increasing the number of vessels will increase the limit of heat exchange performance and pressure drop. Female firms The power requirements and production costs are high, which reduces competitiveness. Therefore, it is necessary to go into more detail the characteristics of the main design factors to be considered in terms of improving thermal efficiency.

2. LITERATURE REVIEW

Shell- tube heat exchangers are widely researched as heat exchangers that are being used. A lot of research is being done. Shell- tube design factor distribution research is carried out at home and abroad according to the size, slope and number of ships, thermal moon performance and pressure drop downside. Looking at overseas research data, Tinker shows the flow field inside the heat exchanger shell containing double in one study on pressure drop and heat exchanger performance. III. However, at this time, computers were not developed, so they presented the ideal population, but they could not interpret the interaction between the niche flow and the lateral flow.

Stehilk et al. consider the effect of tilting the vessel as a method of reducing pressure loss in the heat exchanger while maintaining the heat effect, as a way to reduce pressure loss in the heat exchanger while maintaining the heat effect. III.
HuadongLi et al. studied the heat moon and pressure drop system according to the vessel interval in a shell-and-tube heat exchanger. Within a gently developed vessel compartment, the local heat moon coefficient of the surface of each tube was shown, and the pressure strength at the same reynolds number was studied by the scent given by the vessel interval through the average heat moon coefficient, and Shah (10) et al. studied the scent on ten moons according to the number of ships. Looking at domestic research data, Lee Sang-cheon et al. measured the thermal lunar overheating lunar coefficient when changing the flow conditions according to the number of times intervals and times of various values through experiments. A new equation is proposed by comparing the measurement results with the thermal lunar superheat moon coefficient calculated according to the Bell-Delaware method to consider the uneven interval correction coefficient. Park Myung (11, 12) etc. (tube) length

TEMA (Tubular Exchanger Manufacturers Association) E-type heat exchanger is studied through experiments. Kim Eun-pil uses numerical analysis to determine the belly cut (20-30%) and the belly inclination angle (0, 18, 25 Fig) and

study in detail the pear-tube-pear-cell, etc. Jinho et al. used porosity modeling of shell- tube heat exchangers to perform numerical analysis to determine the number of fold cuts (15, 21%) and pear number considering various shape factors, the best It also suggests a system direction.

3. OBJECTIVE

Following objective is find out from literature gaps as follows

1.Numerical analysis of baffle plates in shell and tube hear exchanger varying number of baffle plates and its heights ranging from 50% to 78% and (4, 6, 8, 10) respectively

2.Numerical Investigation of stream line effect of flow , velocity difference , heat transfer rate and pressure drop.

3.Finding optimized design for above heat exchanger problem

4 METHODOLOGIES

4.1 CAD Modeling

When it comes to numerical analysis, the first thing to do is to design a model. Experimental equipment the heat exchanger part is designed software CATIA (Computer Aided)

Three-dimensional Interactive Application) to model in three dimensions as shown in Figure 4 The shell surface assumes that there is no heat transfer, so the two of the shells are not taken into account. Since the change in flow caused by the fold is not considered, the thickness of the vessel is not taken into account by assuming that there is no movement of heat through the third-round modeling. In the original sphere, each model is required for the angular factor, so the shell and tube are fixed, as shown in Table 4.1, and the three-dimensional model ring is done by number of baffle and baffle height, respectively.

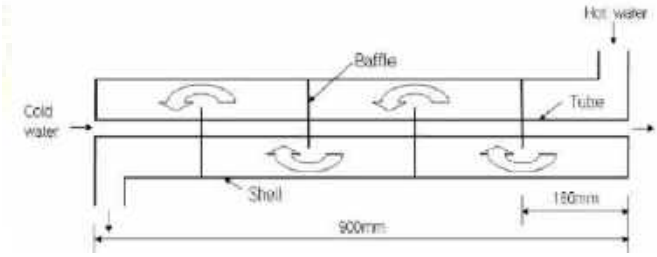

Figure 4: 2D geometry of analysis model

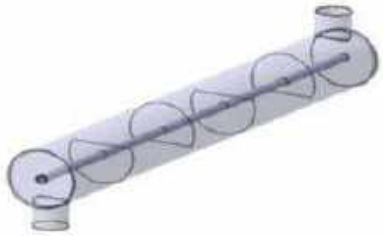

Figure 5 3D geometry of analysis model

Table.1 Shell and Tube configuration for analysis model

	contents	size(mm)
Tube	D_{at}	15.88
	t_t	0.9
	L_t	900
Shell	$D_{o,s}$	114.3
	t_s	2.8
	L_s	900
Baffle	Number of baffle	4, 6, 8, 10
	Height	54.35~83.7

4.2 Meshing

To perform numerical analysis, it is necessary to create a grid. This is because there are many errors in numerical results depending on the type of case. In this study, ICEMCFD, which is used for mesh, is used to organize hexamesh, which is an alignment grid, and the number of meshes is about 1 million. Figure 5 shows an in-mesh type image. Hexamesh takes longer to configure than Tetramesh, but in this study, multiple models need to be configured with the same mesh, so we use Hexamesh that allows you to configure the mesh as your own intention. III. There is one that can work as many mesh numbers.

Even if you increase the degree of numerical analysis, the tube part where the ten months occur It is necessary to organize the grid in minutes. Therefore, as shown in Figure 6 we create a grid with three parts of Shell, Tube, and Coldwater, and perform numerical analysis by combining each part. At this time, the mesh-nodes in each part do not work, resulting in errors in the analysis. In ANSYSCFDV.11, the commercial station used in this study, there is a feature called GGI that causes nodes to mismatch. can be compensated for.

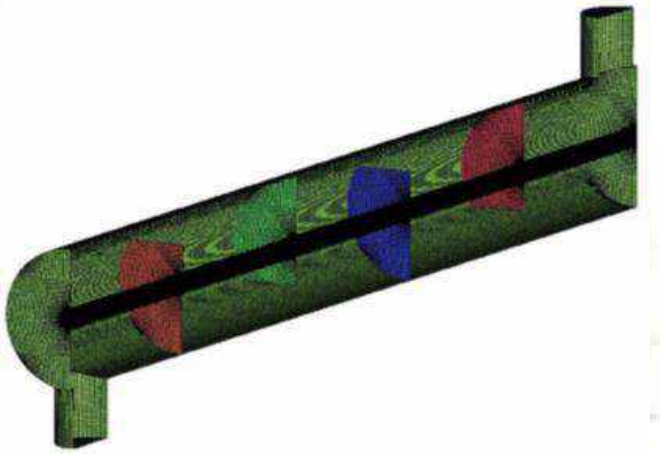

Figure 6: Comprehensive mesh for analysis model

4.3 Numerical Analysis Method

When performing numerical analysis of the heat exchanger, ten months of design is designed to improve performance,

In the past, numerous models have been manufactured and modified to improve performance, but this method costs a lot of money and time to build. Therefore, in recent years, research through CFD has been actively established. It is being lurked. In this study, numerical analysis was performed to determine the commercial stone software

ANSYS is used to simulate the flow thermal performance and pressure drop of hot water and cold water in a shell-and-tub heat exchanger by configuring HexaMesh, an alignment grid, using CFD. Before performing numerical analysis, some assumptions are required, and the assumptions used in this study are as follows:

(1) Perform the analysis in a steady state.

(2) The fluid has a three-dimensional incompressible turbulent flow.

(3) The turbulence model uses the SST turbulence model.

(4) The flow temperature entering the inlet is constant.

(5) Shell The outer surface is insulating.

(6) It is assumed that there are no ten months through Baffle.

4.4 Boundary Conditions Inflow Conditions

Three-dimensional numerical analysis requires boundary conditions, which are very necessary.

Table 3 is the result of an experiment with the inflow conditions. This results in the same model as the test unit with the size of the vessel (83.7mm) and the number of vessels (4), using the inflow conditions of Table 2. Numerical analysis is performed by comparing the results of the experiment with the results of the experiment to verify the validity of numerical analysis for the pear factor performed in this study. Looking at the boundary conditions during numerical analysis, the flow temperature of the water entering the Shell tube inlet was constant with the inlet conditions in Table.3. The exit condition uses 1 ATM as the table air pressure. One Shell surface and Baffle are hypothesized to have thermal months only through the tube (copper) between Hot water and Coldwater, assuming there is no movement of heat given the thermal insulation conditions.

Table 3 shows the inflow conditions used in this analysis, and Table shows the boundary conditions. Here, the boundary condition is the boundary condition when performing numerical analysis according to the control factor.

Table.2 Inlet conditions

No.	T_t(°C)	T_s(°C)	V_t(l/min)	V_s(l/min)
1	17.5	70	2.05	12
2	12.7	70.9	3.78	12
3	11	70.8	4.51	12
4	10.6	70.4	4.97	12
5	9.8	70.6	5.24	12
6	9.1	70.4	6.44	12
7	8.6	70.1	8.44	12

Table 3 Boundary conditions

Hot water	Inlet temperature	17.5(°C)
	Flowrate	6.12,18,24,36 (l/min)
	Outlet condition	1atm
Coldwater	Inlet temperature	70(°C)
	Flowrate	2.05(l/min)
	Outlet condition	1atm
Shell surface	Adiabatic	
Baffle		

4.5 Control Factors

In this study, based on information on the heat exchanger shape of the experimental device, the shell-tube Put the control factor baffle on the ten-month performance depending on the change in the size and number of vessels Let's look at how much it affects the pressure drop, and consider the following control factors to see the trend. III. The control factors and details are listed below, and the detailed schematics for these control factors are given.

4.5.1 Orientation Due to Changes In Baffle Height

Change in Baffle height Heating lunar performance Discover the scent of pressure drop change the Baffle height to 54.35, 59.35, 62.29, 64.35, 65.35, 66.35, 68.35, 70.35, 72.35, 73.35, 74.35, 83.7mm, reducing the thermal lunar pressure drop. In this case, the inflow condition is used No.1 in Table 3.

4.5.2 Changes in Number of Baffle

Change of Number of baffle Heating lunar performance Calculate the effect of pressure drop Adjust the spacing of the vessel to change the number of vessels to 4, 6, 8, and 10 At this time, the inflow condition is Table 3 to No.1 is used, and Baffle height uses 83.7mm, the same as the experimental unit.

4.5.3Fragrance due to changes in the flow rate of hot water

Each Baffle height, Number of baffle depends on the change in the hot water flow rate. To find out the effect of the thermal lunar performance pressure drop, we changed the flow rate of the hot water to 6 to 36 l/min. At this time, under the same conditions as Figure 7 and 8, the inflow condition No.1 was used to change the amount of oil in Hot water.

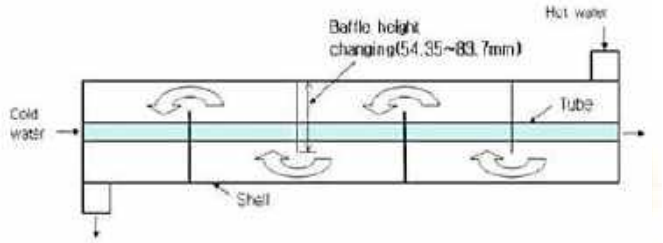

Figure :7 Schematics of changing Baffle height

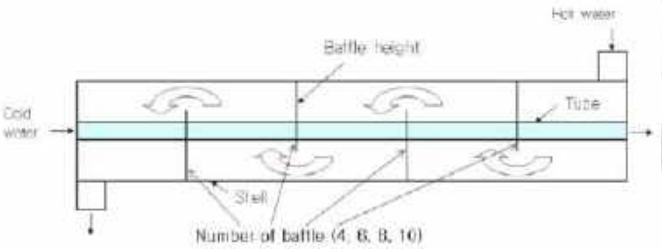

Figure 8 Schematics of changing number of baffle

5. RESULTS

Speed distribution with Baffle height changes

Figure 9, Figure 10, Figure 11, Figure 12, Figure 14, Figure 15 by learning how the ship has a scented effect on the size of the ship. Distribution. Here, the ship sizes are 54.35mm, 59.35mm, and 64.35mm, respectively, 69.35mm, 74.35mm, 83.7mm

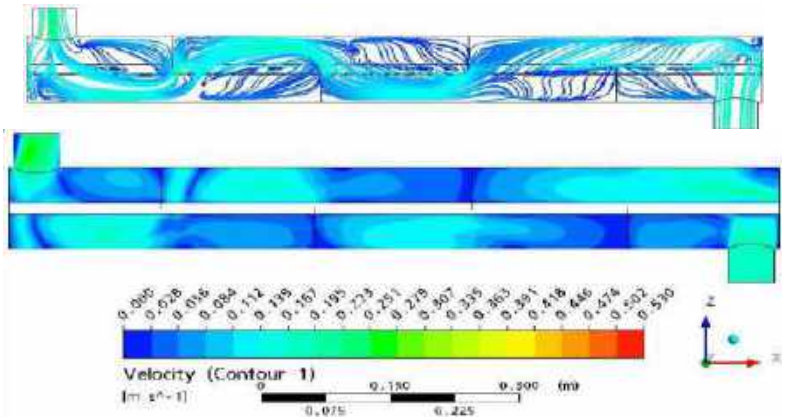

Figure 9: Streamline and velocity distribution with a Baffle height of 54.35mm

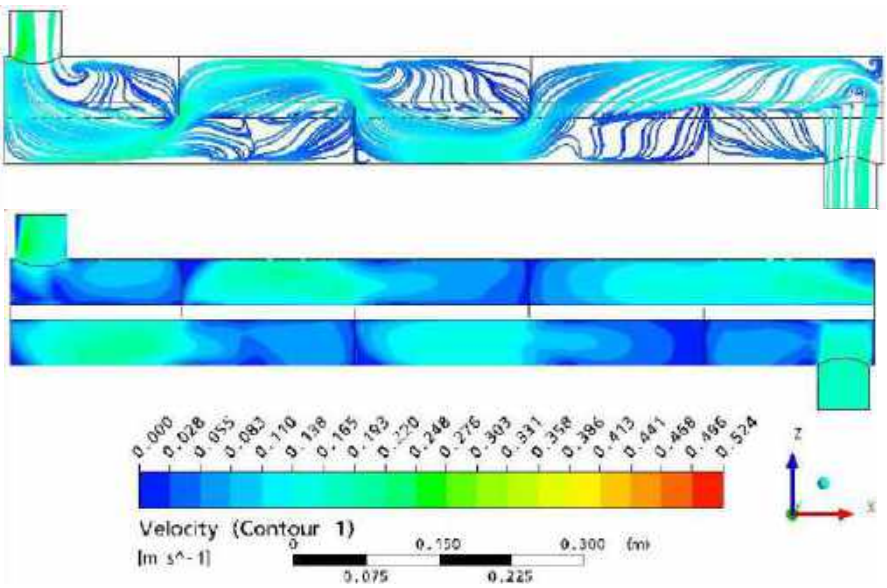

Figure 10: Streamline and velocity distribution with Baffle height of 59.35mm

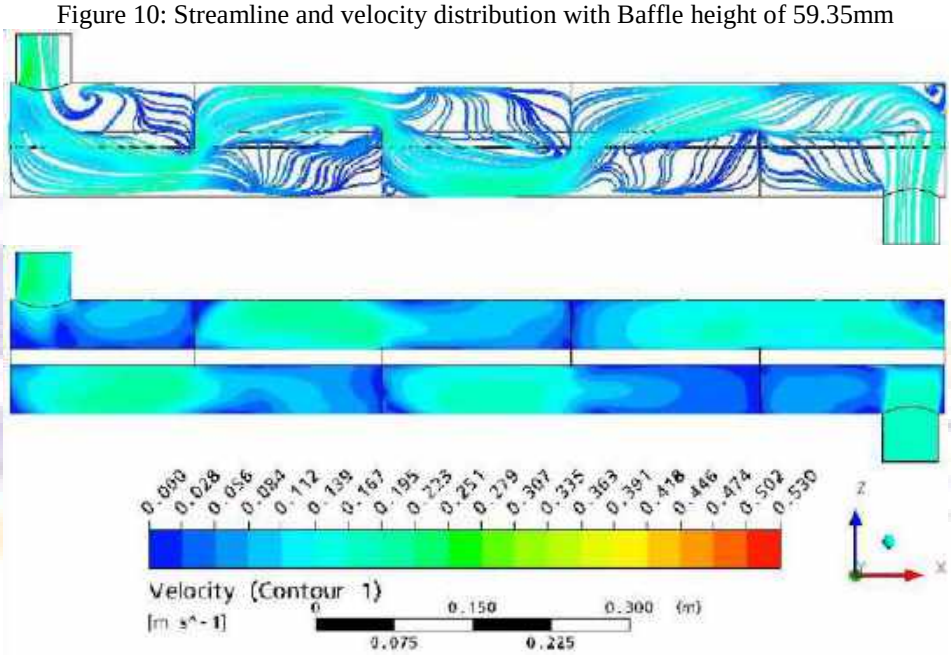

Figure 11: Streamline and velocity distribution with a Baffle height of 64.35mm

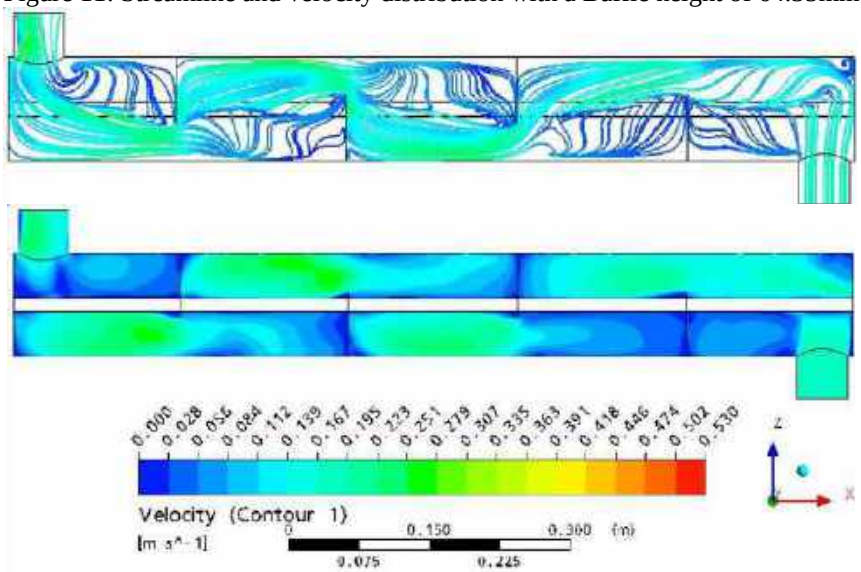

Figure 12: Streamline and velocity distribution with a Baffle height of 69.35mm

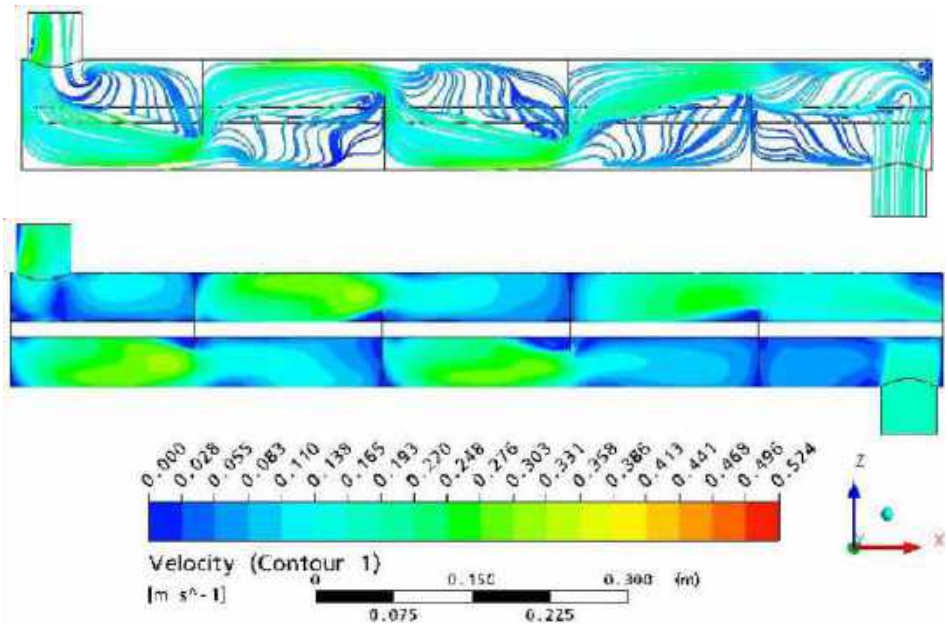

Figure 13: Streamline and velocity distribution with a Baffle height of 74.35mm

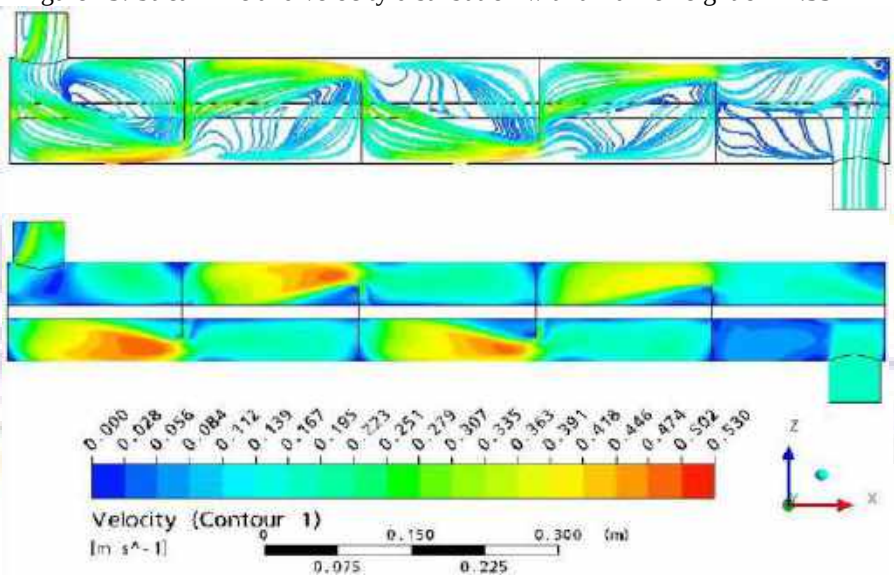

Figure 14: Streamline and velocity distribution with a Baffle height of 83.7mm

5.2 Number of baffle velocity distribution with change

Figure 16, Figure 17, Figure 18 show the Streamline velocity distribution by figuring out how the ten-moon incense is applied according to the change in the number of ships. The number of ships here is 4, 6, 8, and 10, respectively

.

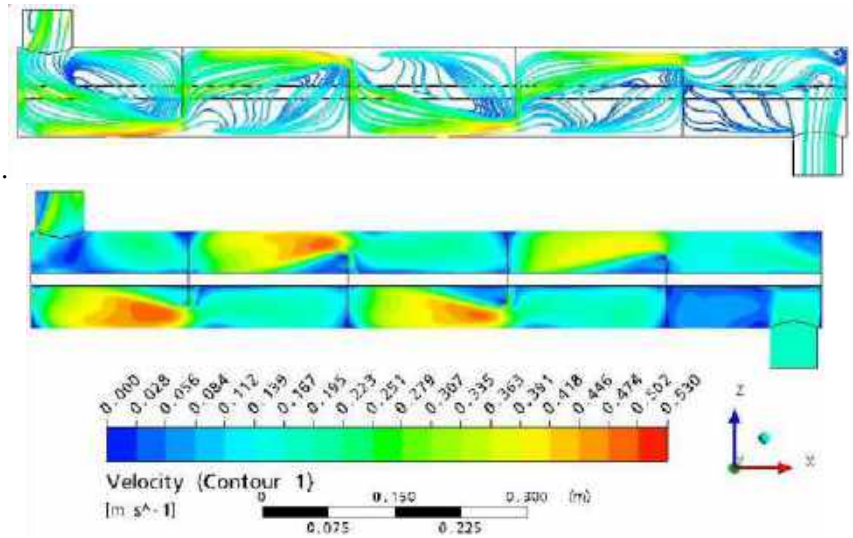

Figure 15: Streamline and velocity distribution with four baffles

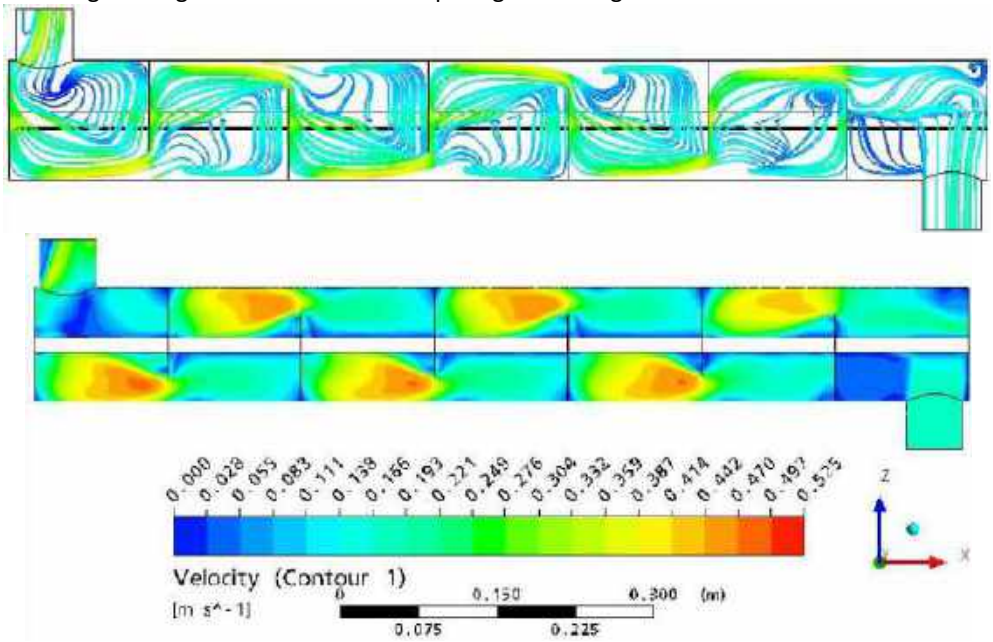

Figure 16: Streamline and velocity distribution with six baffles

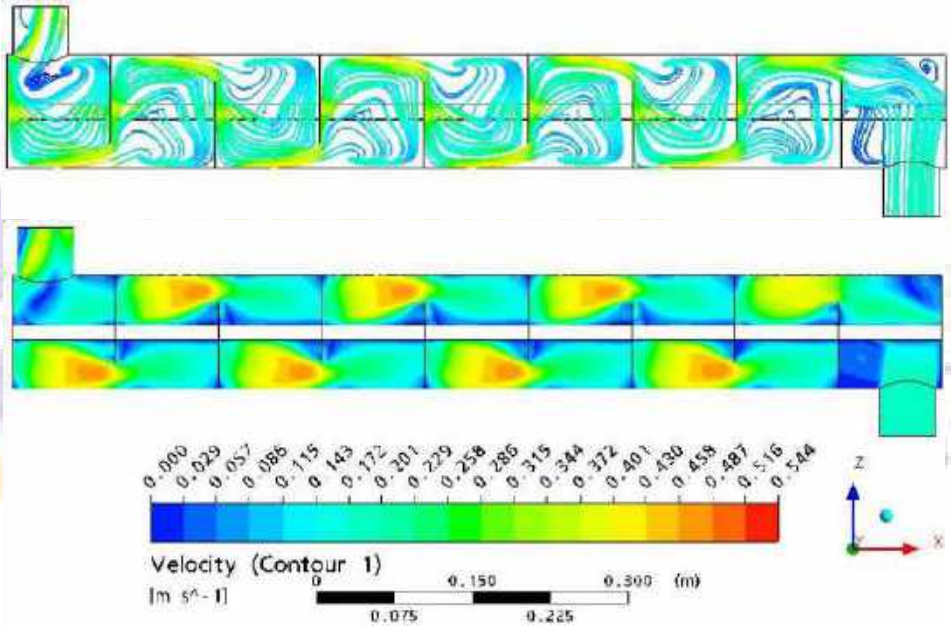

Figure 17: Streamline and velocity distribution with eight baffles

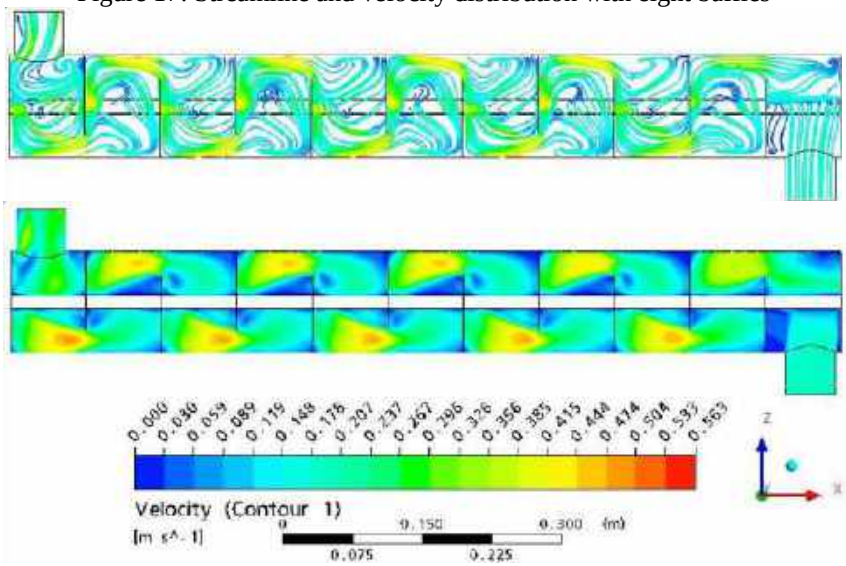

Figure 18: Streamline and velocity distribution with ten baffles

6, CONCLUSION

In this study, numerical analysis is done with the baffle height 54.35~83.7mm Number of baffle 4. The effect of 10 changes on the heat transfer performance and pressure drop of the work exchanger was analyzed, and the effect of changing the hot water flow rate of 6~36 l/min for each control factor was also analyzed. As a result, the following conclusions were obtained.

(1) The amount of heat transfer according to the size of the baffle increases constantly until the tube is completely covered, but decreases as the size of the baffle increases, due to the separation of the fluid, vortex, velocity, contact area with the tube, and residence time. showing an increase again.

(2) The heat transfer according to the increase in the number of baffles increases up to a certain number, but decreases when the number is exceeded. This is also determined to be caused by the contact area with the tube, speed, residence time, peeling and vortex.

Therefore, in order to maximize the recovery when manufacturing a cell-tube heat exchanger, deriving and manufacturing the optimal baffle size and number of baffles through numerical analysis is considered to be a very good method in terms of reducing trial and error as well as economically.

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Review and Applications of the SEIG in Electric Applications

Reeha chouhan[1], Dr. P.K. Sharma[2]
1. M. Tech. Scholar, Dept. of Electrical & Electronics Engg NRIT, Bhopal
2. Professor in Dept. of Mechanical Engg., NRIT, Bhopal
Mail id.: reehachouhan17@gmail.com[1]

Abstract: this paper is aimed to preset the review of the most frequent used self-excited induction generators (SEIG) and its applicationsto the high power generation especially having the focus on wind turbine based SEIG. Paper initially preseted the applications of the SEIG generators then operational principal is discussed considering wind turbine application. Finally the extended survey is preseted including the future scopes and findings are concluded.

Key words: SEIG, Wind Turbine, Power generation, Induction generations, Compensators, Genetic algorithm

1. Introduction

A high power renewable energy generation is the critical field of research in recent times. The solar PV and wind based energy systems are priority in today's reassert. The SEIG based generators are best suitable for such field of applications. When: Slip goes negative, which causes the rotor current as well as rotor EMF to reach negative values, a machine with induction will act as an induction generator. Prime mover torque turns into an electric torque opposite.

2. Application of SEIG in brake van system

There is wide range of the applications where the SEIG based generators ar employed now days. The most frequent applications are shown in the Figure 1. Provided that the conditions for self-excitation are satisfied the charged capacitors cause the terminal voltage to build up at the stator terminals of the induction generator.

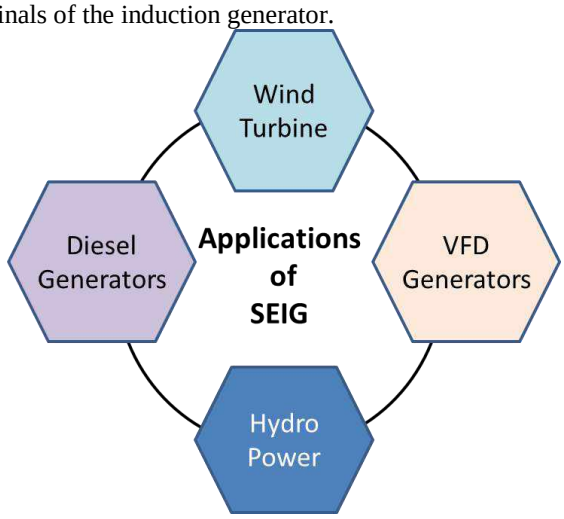

Figure 1 Applications of most frequent SEIG based power generations systems.

Whenever the charged capacitors are attached to the terminals, a transient excited current flows, resulting in a magnetic flux. The voltage generated by it magnetic flux shall be able to charge the capacitors. As the charge increases, more exciting current is injected into the induction generator. Because the magnetic flux is still increasing, the generated voltage is larger. Voltage is generated in this manner.

3. Wind Turbine

Wind turbines administrative frameworks continue to play critical roles in assuring turbine stability and safety, as well as increasing wind vitality catch. The most well-known administration frameworks in a common turbine body pitch administration are slow down administrations (uninvolved as well as dynamic), yaw management and others. Under wind speed conditions, a turbine's capacity yield may exceed its appraised worth. Control administration is projected for controlling the capacity yield among suitable American state actuations in order to keep a strategic distance for rotating motor mischief as well as settle the capacity yield. Within power administration, there are two primary management paths: pitch administration and sluggish control. The turbine controlling framework is used to manage capacity yield within acceptable deviations. The basic building blocks of the wind based power generation using the SEIG are shown in the Figure 2. The initial prime mover is the wind turbine and is followed by the SEIG generator connected through shaft.

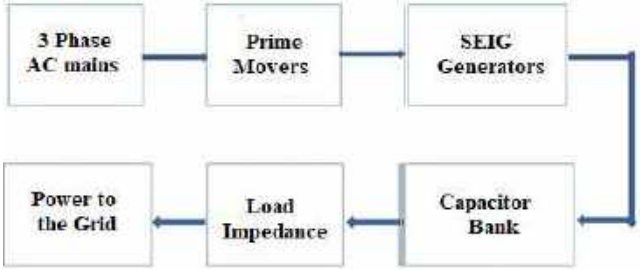

Figure 2 basic building blocks of the SEIG based Power generations

Working Principal

The respective working diagram schematic is shown in Figure 3.

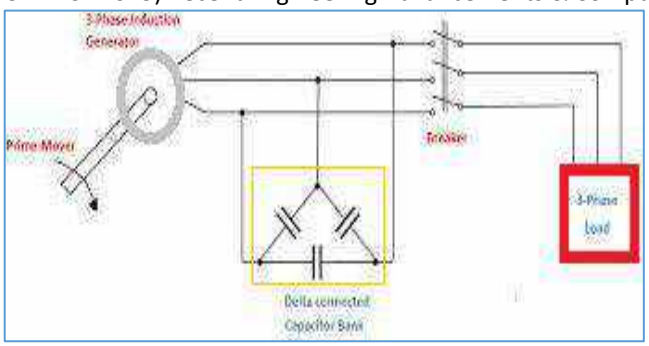

Figure 3 SEIG based generators operation

4. Literature review of SEIG

There are many recent researchers who have designed sophisticated new modified design of the SEIG based generators for power improvement.Hanafy and co. research has described the steady-state and dynamic behaviours of a suggested connection for the two-winding single-phase self-excited induction generator (TWSPSEIG) fitted with a stimulation capacitor and a compensating capacitor for operation at constant load voltage and frequency regardless of the no-load or various load conditions. By utilizing the loop impedance approach through the accurate equivalent circuit model of the TWSPSEIG based on the double rotating field theory, the performance equations at steady-state circumstances are obtained.

Dagang and other proposed a decentralized wind energy production system with a broad operating range of wind speed fluctuations, a new direct fuzzy control approach is presented in this study. To enhance system performance and more specifically the caliber energy injected into the electrical grid, the suggested strategy make usage of continuous fuzz torque and power control rules.On the generator side, the direct fuzzy torque control law is applied for generating the control signal of the converter in order to extract the maximum amount of power available at the turbine and to keep the machine's stater flux at a manageable level. On the grid side, the direct fuzzy power regulation law of the converter is used to achieve a power efficiency that is close to unity. Mousavi and co. numerous control strategies have been devised to cope with the simultaneous improvement of productivity and dependability of WECS as a result of extensive research on this subject in the literature. Due to its inbuilt resistance to parametric uncertainty and disturbances as well as its simplicity in design and execution, sliding mode control (SMC) has, however, shown to have the most reliable and best performance among most control strategies. In order to address various control design issues for WECS, this study provides a thorough overview of the literature that has already been published on the use of SMC and its recently developed modifications.

Seyoum and other In order to enhance the dynamics of cane bin rides and to aid in train braking, the sugar cane business uses brake vans that are connected to the ends of cane trains. Cane bins frequently lack both suspension and brakes, in contrast to other railway vehicles. At the moment, brake vans work by activating a brake caliper, which clamps a vented disc rotor on every of the four wheels sets, using compressed air provided by an onboard compressor.. Due to rotor and brake pad wear, this system needs maintenance. It is suggested to build an electrical braking system employing a self-excited induction generator. When an electrical brake is applied, energy is lost in adequately ventilated resistors. A brush-less design further reduces maintenance.

"Erhab et al. has designed a wind farms operate as a sink and produced reactive electricity as a result. To prevent low-voltage problems in the wind power system, reactive power management is necessary. Devices used in flexible AC transmission systems, such as static synchronous compensator (STATCOM), which may provide the reactive power needed for stabilization voltage, improve the performance of the electric power.

For the purpose of operating wind-driven Doubly-Fed Induction Generators (DFIGs) for independently power supplies, A. K. Tandon et al. developed a hybrid-excited system. In this instance, the generator is partially stimulated by constant capacitors at the stator terminals in addition to the rotor side excitation of the DFIG using an SPWM inverter powered by a set of batteries. For the suggested system, a steady-state corresponding circuit and its evaluation have been developed and presented. The choice of stator capacitors has been made very clear. Additionally, an effort is made to size various components, including batteries and inverters, for the specified machines rating and other circumstances of operation.

Self-Excited Induction Generators (SEIGs) by R.C. Bansal et al have been attempted twice using Genetic Algorithms (GA), in two nested loops. The outer loop is used to determine the stator winding's stator coil count and excitation capacitor value that would satisfy the generators stipulated performance requirements. For the first time, the inner loop utilized the GA tool to simply predict these performance quantities. Additional plans have also been incorporated, such as converting the stator connection from delta to star during periods of lesser wind speed and using a short shunt configuration that is appropriate for trailing power loads.

The research by Anurag et al. introduces a novel methodology to quantify the effects of 22 networks switching and/or reinforcement, ESS deployment, and the extent of renewable power integration in the 23 system. A changing and multi-objective stochastic mixed integer linear programming (S-MILP) 24 framework is created to conduct this analysis, which simultaneously considers the best placement of RES-based DGs and ESSs in cooperation with the strengthening and/or reconfiguring of distribution networks.

Self-excited induction generators (SEIGs) by Calgan et al. are among the finest solutions for providing electricity in rural regions due to their inexpensive cost, broad speed operating range, brushless construction, and low maintenance requirements. In spite of its benefits, it has weak voltage and frequency control that is influenced by the generator's speed, the load's impedance, the excitation capacitor, and the magnetizing reactance.

Hosseinzadeh and other In this paper, an induction generator dynamic model for MATLAB/Simulink is presented. This model enables simulation studies for the design of fuzzy logic controllers to control the generator's retarding torque output in an electrical brake application. In the literature, electrical breaking has been suggested as a mechanical braking system substitute with the benefit of requiring less maintenance. The kinetic energy of the vehicle is converted to electrical energy by an induction generator functioning as a brake. This electrical energy can then be utilized in a regenerative mode or dissipated in a resistor bank. The designed controllers for an efficient management of the torque that is generated of the

electrical braking system will be tested using the Simulink model that was built.

et al., El Akhrif Using a self-excited induction generator (SEIG) powered by a regulated DC motor with variable speed and load, a novel method for maintaining the RMS voltage output constant is proposed in this study. The methodology employed in this study is based on a traditional proportional-integral regulator that regulates an SPWM switching. To keep the AC voltage at the desired level, a MATLAB Simulink model of the system is created. The findings of simulation and experiment are then compared using the SPACE board.

VB Murali Krishna and others In this situation, the induction generator's self-excitation process is primarily influenced by the quantity of reactive power, followed by the rotor's speed and the system's load. The functioning of the self-exciting inductive generator is experimentally investigated in this work to determine the impact of these three factors. The goal of the study is to determine the ideal generator operating configuration for carrying out the highest loading capacity and most cost-effective operation. The suggested study was expanded to include an additional initial excitation method, which confirmed performance under the identical source and load conditions and yielded some important conclusions for using the generator to its fullest capacity. In this experimental work, a micro-hydro source powered turbine simulation was used as a source of input to the SEIG.

"Sedky et al. proposed a methodology for controlling the voltage and frequency (V-f) of a freestanding wind-driven self-excited reluctance generator (WDSERG) is presented in this study. The methodology is based on two alternative compensation configurations (short-shunt and long-shunt compensation) using two switching capacitors for (V-f) control. The two topologies' dynamic and a steady-state performances are discussed for various operating scenarios, including wind speeds, load currents, and power factors. To perform this analysis, a comprehensive dynamic model of the WDSERG, including the excitation capacitors and load, is created. As a result, full equivalent circuits are suggested. By modifying the operation cycle of H-bridge circuits with PI controllers, capacitor values can be regulated.

B Murali Krishna, V and others goal of the current study is to carefully examine the connection between emotional intelligence and commitment at a few Chennai-based home appliance companies. The study is of a descriptive kind. Using a straightforward random selection procedure, 200 employees were chosen as stakeholders, including staff members, supervisors, and casual workers from various departments. Structural Equation Model and the t test were utilized for analysis.

Rahim and co. In order to quantify the potential implications that inverter-interfaced PV dispersed generation may have on the quality of electric power; the results of a power quality (PQ) research conducted on a PV generator are summarized in this paper. Along with a comparison to the harmonic current restrictions set by BC Hydro, various interpretations of the IEEE 519-1992 standard's harmonic distortion limits are carried out. The results of a connection/disconnection test, a statistical analysis of all data taken using two PQ monitors, and harmonic simulation results are also included in this study.

Santolo Meo and others in their research paper designed a novel hybrid approach for the design optimization of direct-drive permanent-magnetic flux switch generator for low power wind applications is proposed. It combines multi-objective particle swarm optimization(PSO) and artificial neural networks (ANN). The suggested multi-objective optimizations aims to decrease the machine's expenses and weight while increasing the induced voltage's amplitude and decreasing its overall harmonic distortion. The search space for the optimization problem is defined by the permanent magnet width, stator and rotor tooth width, number of rotor teeth, and stator pole number of the device.

Bendjeddou and others presented a virtual flux orientated control (VFOC) based on nonlinear super-twisting sliding mode control (STSMC) is used in stand-alone wind energy systems (WES) to improve the robustness and dynamic performance of a self-excited induction generator (SEIG). The traditional proportional-integral-Fuzzy Logic Controller (PI-FLC) of the inner current control loops is replaced by STSMC. A PWM rectifier is used in conjunction with the suggested control method to achieve various benefits, including the reduction of harmonics and accurate and quick reference tracking. Simulated results are used to evaluate the performance of the suggested control method (STSMC-VFOC-SVM) to that of the established method (PI-FLC-VFOC-SVM). It demonstrates how the suggested approach enhances the system's dynamics with lower current harmonics..

Boubzizi and co. The Doubly-Fed Induction Generator (DFIG) is used in this study to propose an improved control technique for the Wind Energy Conversion System (WECS). To create the ideal aerodynamic torque and enhance the dynamic performance of the WECS, a strong Super-Twisting (STW) sliding mode control for variable speed wind turbines is created. To maximise power extraction, the electromagnetic torque of the DFIG is directly tracked using the suggested control. The performance and efficacy of the STW control method are contrasted with those of traditional proportional-integral (PI) and sliding mode (SM) controllers. In terms of chattering reduction, short convergence time, and resilience against parameter fluctuations and system disturbances, the suggested STW algorithm demonstrates remarkable features..Lokesh Varney and others The self-excited induction generator (SEIG) dependability estimation based on performance analysis is presented in this study utilising the Monte-Carlo simulation (MCS) method and data from a self-excited induction motor functioning as a generator. The capacity of an SEIG to enhance the system's inadequate voltage regulation (VR) and frequency regulation (FR) determines whether or not it will be widely accepted. The performance characteristics of SEIG are constrained during system disruptions since SEIG is also able to handle the dynamic loadings. When an induction generator is grid-connected, the grid becomes weak because the magnetizing current is extracted from it. The SEIG's independent operation, in contrast. In order to get the minimal capacitor value necessary for SEIG excitation in isolated mode applications, such as stand-alone wind power generation, this study.

5. Conclusions and Future Scope

With a focus on wind turbine-based SEIG, this study seeks to provide an overview of the most frequently used (SEIG) as well as their applications to high power generation. Before

examining operating theories with reference to wind turbine applications, the paper first described the uses of SEIG generators. The enlarged survey is finally prepared, along with potential stipulations, and the results are given.

It is concluded that in recent times performance of the SEIG is elevated using the optimization methods like GA and is required to be evaluated in the near future. The combination of the PSO and ANN based approaches may also offers the edge over others.

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A Review On Heat Integration using Heat Exchanger Network

Arvind Gwatiya , Dr Nitin Dubey
Madhyanchal University Bhopal

Abstract: - Heat Integration using Heat Exchanger Network (HEN) is a popular technique for energy conservation and efficiency enhancement. The cost of the investment and the design of the HEN retrofit would be impacted by the different types of heat exchangers and materials. In order to introduce a framework for HEN retrofit that takes heat exchanger and material selection into account, this paper critically examines the characteristics of various types of heat exchangers, their working environments and investment costs, as well as the state-of-the-art of the current methods for HEN synthesis and retrofit. The necessity for more research in this area is also covered.

Keywords: - Heat integration, Heat exchanger, Heat exchanger network, thermal response, double-tube counter

1. INTRODUCTION

Heat exchanger is a device or equipment, which is use to transfer heat between two fluid which may be in direct contact or indirect contact. There are lots of applications of heat exchangers in our day to day life. For example condensers and evaporators are used in boilers, condensers, air coolers and chilling towers etc. Likewise, heat exchangers are used in automobiles sectors are in the form of radiators and oil coolers inside engines.

Heat exchangers are also used widely in chemical sectors and process sectors for transmitting the heat between two fluids which are at a single or two states.Heat exchangers are widely used in industrial Sector. The most common industries where heat exchangers are used are power generation plants, nuclear plants, process plants, refrigeration, heat recovery systems, food processing industries etc.

Triple-tube heat exchangers are introduced to solve the disadvantages of double-tube heat exchangers by passage of the extra flow and increase of heat transfer area per unit length. The three fluids namely hot, cold, and normal fluid pumped from three different tanks to the heat exchanger as shown in Figure 1.

The cold water flows though the inner most pipe, hot water flows though the middle tube and the normal water flows though the outer annulus. This arrangement of flow of different fluids is called C–H–N configuration of the heat exchanger. In actual experiment, the direction of flow of hot water was changed to get the counter current parallel flow arrangement of the heat exchanger, keeping the flow directions of the other two fluids.

The water starts flowing from the tank through the pump, passes through the Rotameter measuring the volume flow rate, and enters the heat exchanger inlet.

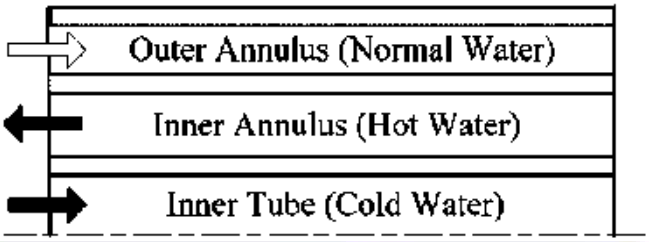
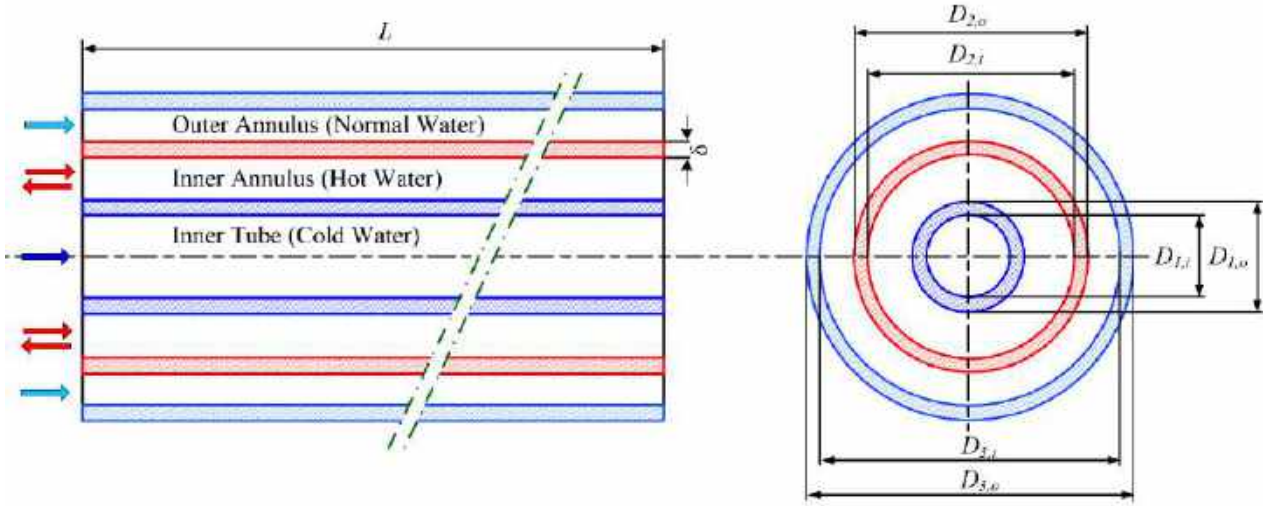


Figure 1: Flow directions of three fluids of the triple concentric pipe heat exchanger

Working principle of triple concentric tube heat exchanger:

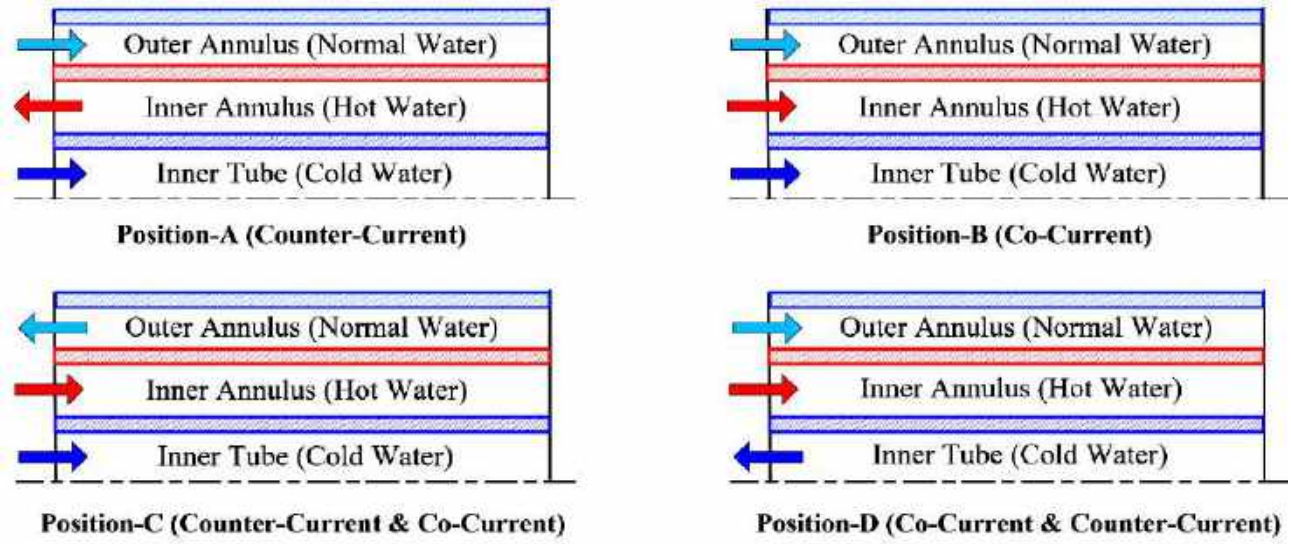
A schematic diagram of the triple concentric-tube heat exchanger configuration is shown in figure 2. Three fluids being considered which are chilled water in the inner tube, hot water in the inner annulus, and normal tap water in the outer annulus of the heat exchanger.



Source: Abdalla Gomaa at el. 2016

Figure 2: Schematic diagram of the triple concentric-tube heat exchanger

Possible flow patterns on triple concentric tube heat exchanger:



Source: Abdalla Gomaa at el. 2016

Figure 3: Possible flow patterns on the triple tube heat exchanger

Possible four flow arrangements as shown in figure 3 where Position A to D of the three fluids inside the triple tube heat exchanger including the counter-current, co-current, counter-current with co-current and co-current with counter-current flow.

2.LITERATURE REVIEW

Chen, (2022) investigated the Effects of non-uniform fin arrangement and size on the thermal response of a vertical latent heat triple-tube heat exchanger. *Mehdi,* (2022) employed a novel crimped-spiral rib inside a triple-tube heat exchanger working with a nanofluid for solar thermal applications: Irreversibility characteristics. *Seyed,* (2021) worked on Energy and exergy analysis of ferrofluid flow in a triple tube heat exchanger. *M Malavasi* (2021) studied the Thermal characterisation of triple tube heat exchangers by parameter estimation approach. *Mehdi,* (2021) combined neural network combined with nature-inspired algorithms to estimate overall heat transfer coefficient. *Mehdi,* (2021) predicted heat transfer rate of a ribbed triple-tube heat exchanger working with nanofluid using neural network. *Deepak,* (2021) investigated on triple concentric tube heat exchanger. *Iman,* (2021) investigated on Effects of water-aluminum oxide nanofluid on double pipe heat exchanger.

Mehdi, (2021) proposed a two-phase of a triple-tube heat exchanger through heat transfer intensification using novel crimped-spiral ribs and nanofluid. *Arun,* (2021) analyzed the thermal characterisation on the thermal performance of triple tube heat exchanger equipped with different inserts with WO3/water nanofluid. *Ashraf,* (2021) performed exergy analysis of different perforated rib designs of triple tubes heat exchanger employing hybrid nanofluids. *Seyed,* (2021) performed assessment on individual and integrated topological parameters influencing the melting behavior of a triple concentric tube heat exchanger.

P Tanish, (2021) studied of Heat Transfer in Concentric Triple Pipe Heat Exchanger. *Ahmed,* (2020) studied the PCM latent heat thermal energy storage system utilizing a modified webbed tube heat exchanger. *Mahmoud,* (2020) studied a triple spirally coiled tube heat exchanger thermofluid characteristics. *Mahmoud,* (2020) investigated of the triple conically tube thermal performance characteristics. *Sumit,* (2020) worked on Improving hydrothermal performance of hybrid nanofluid in double tube heat exchanger. *Tuyen,* (2020) studied the Thermal-hydraulic characteristics and optimization of a liquid-to-suction triple-tube heat exchanger. *Amin,* (2019) worked on charging/discharging mechanism of wavy channels triple-tube LHS unit.

3 Heat transfer enhancement:-

As the demand of saving energy is increasing due to lack of resources available to us, a huge amount of research is going on for the better utilization of the available energy resources. This encourages designing various techniques for the enhancement of heat transfer rate between the working fluids, in order to make the heat exchangers more compact and economic. Heat transfer enhancement techniques are generally categorised in two types.

4. Heat Transfer Enhancement Method:-

For the enhancement of heat transfer rate, Geometry heat transfer coefficient (overall heat transfer coefficient) of the system must be made as large as possible. The overall heat transfer coefficient depends on different parameters like orientation of heat exchanger, geometry of heat exchanger, properties of fluid flow, type of fluid flow such as laminar and turbulent**,** material of tube etc.

The heat transfer in case of turbulent flow is always greater than the transfer of heat in laminar flow. Heat transfer rate can be increased by producing turbulence effect in fluid flow. Turbulence can be created by two ways.

Active Methods:-

These techniques are more complex in use and also complex from design point of view, as these methods require some external power input to cause the desired flow amendment for increasing rate of heat transfer. It has limited application because of the requirement of external power in many practical applications. In comparison with passive techniques, this technique has not shown much potential as it is difficult to give external power input in lots of cases. In these cases,

external power is use to assist the desired flow amendment and the associated improvement in the rate of heat transfer.

For example:

i. Mechanical aids
ii. Surface vibrations
iii. Water vibration
iv. Electrostatic fields (DC or AC)
v. Jet impingement
vi. Suction.
vii. Jet impingement.

(i) Mechanical Aids
(ii) Surface vibration
(iii) Fluid vibration
(iv)Electrostatic fields
(v) Injection
(vi) Suction
(vii) Jet impingement:

Passive Methods: -

These techniques commonly use surface or geometrical changes to the flow channel by incorporating inserts or additional devices. They endorse higher heat transfer coefficients by disturbing or changing the existing flow nature (except for extended surfaces), which also tends to increase in the pressure drop. These techniques do not require any direct input of external power; rather they use it from the system itself which ultimately tends to increase in water pressure drop. They normally use surface or geometrical modifications to the flow channel by incorporating inserts or additional devices. They endorse higher heat transfer coefficients by disturbing or change the existing flow nature except for extended surface.

For example: -

i. Treated surfaces
ii. Rough surfaces
iii. Extended surfaces
iv. Displaced enhancement devices.
v. Swirl flow devices
vi. Coiled tubes
vii. Additives for gases
viii. Additives for liquids.

(i) Treated Surfaces
(ii) Rough Surfaces
(iii)Extended Surfaces
(iv) Displaced Enhancement
(v) Swirl Flow
(vi) Coiled Tubes
(vii) Additives Liquids
(viii) Additives for gases.

4, CONCLUSIONS

This paper's review focused on excitation mechanisms and their prediction. This is typically sufficient in the circumstances of fluid elastic stability and acoustic resonance because these excitation mechanisms must be avoided. Avoiding resonance may result in extreme conservatism in liquid flows where vortex shedding resonance occurs, yet it is difficult to avoid turbulence.

Accurate vibration amplitude prediction and identification of acceptable amplitude limits are required for these latter scenarios.

Even if a comprehensive discussion of them is outside the purview of this essay, a few quick observations regarding recent research might be helpful.

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Impact Of Aggregate Quality On Recycled Concrete Strength

line 1: 1st Mumtaz Begam
line 2: *Department of Civil Engineering (Structure Engineering),*
line 3: *Madhyanchal Professional University,*
line 4: *Bhopal, (M.P.), India*

line 1: 2nd Dr. Rakesh Pate
line 2: *Department of Civil Engineering (Structure Engineering)*
line 3: *Madhyanchal Professional University*
line 4: *Bhopal, (M.P.), India*

***Abstract*— The construction industry, driven by rapid economic growth and urbanization, generates a substantial amount of construction and demolition waste in Vietnam. Mismanagement of this waste poses environmental challenges, and with limited landfill space, alternative solutions are imperative. Simultaneously, the excessive use of natural aggregates in concrete construction depletes valuable resources and harms the environment. This study explores the potential of utilizing steel slag (SS) as an aggregate replacement, a by-product of steel production. SS is composed mainly of CaO, Fe2O3, and SiO2 and holds promise as a sustainable alternative. With the concrete industry accounting for a significant portion of global material usage, investigating alternatives like SS aggregates becomes crucial for sustainable development.**

Keywords— ***Construction waste, steel slag, sustainable development, concrete, aggregate replacement..***

I INTRODUCTION

Concrete is one of the most common materials used in the construction industry. Due to the rapid development of the economy as well as urbanization, the construction of new structures and the demolition of old structures have increased significantly. In Vietnam, the annual amount of waste from construction and demolition increased from. If this waste material can be not treated properly, a huge amount of solid waste materials will cause many environmental problems. Additionally, Vietnam has a limited number of landfills due to the country's population expansion, thus finding a new way to use this garbage is vital. The building of new projects employing natural coarse and fine aggregates results in the depletion of resources concurrently. Natural aggregate use and exploitation have a detrimental effect on the ecosystem. Thus, it is very crucial for the concrete industry to explore a new approach to use this waste material as an aggregate for sustainable development [1].

The concrete industry has a significant role in sustainable development by using industrial leftovers as raw materials for building, resulting in substantial environmental benefits. Typically, 60% to 85% of the volume of concrete is made up of aggregates (both coarse and fine). Creating and handling construction and industrial waste is one of the most enduring obstacles. Engineers from all over the world are compelled to create an alternative construction material due to the excessive usage of natural aggregate in constructions. During the steel-making process, a variety of products are created, including steel. Furnace slag. This slag is made in two distinct types of furnaces: Basic Oxygen Furnaces (BOF) and Electric Arc Furnaces (EAF). The main chemical components of SS are CaO, Fe2O3, and SiO2. Steel Slag is well-known to be a significant waste by-product of the steel manufacturing process. For 1-ton of steel reproduction, the steel slag waste is around 130–20. There is a great deal of interest in using waste materials as aggregate replacements, and extensive research is being done on using different materials, such as coal ash, blast furnace slag, and steel slag aggregate, as aggregate replacements. This method of recycling waste materials could reduce the lack of aggregate on various construction sites and ease environmental concerns related to the mining of aggregate and trash disposal [2].

Concrete is utilized twice as much globally as steel, wood, plastics, and aluminum combined. An estimated 11 billion metric tons of concrete are utilized annually. Concrete is made of coarse aggregates and mortar, which is made of fine particles (like sand grains) and cement. coarse aggregates play an important role in construction with a volume proportion of 40% to 50%. Zhou and collaborators conducted cube compression tests in concrete with six different types of coarse aggregates, and they found that the compressive strength of the cubic concrete samples can be either higher or lower than that of mortar and that when the aggregates are weak, concrete strength is drastically reduced [3].

The impact of aggregate quality on recycled concrete strength is a critical factor in sustainable construction practices. Recycled concrete, often derived from demolished structures, relies heavily on the quality of the aggregates used in its production. Aggregates, which constitute a significant portion of concrete, play a pivotal role in determining the overall strength and durability of recycled concrete. High-quality aggregates, free from contaminants and with proper grading, can significantly enhance the strength of recycled concrete. They provide a stable matrix for the cementitious binder to adhere to, resulting in improved compressive and flexural strength properties. Conversely, poor-quality aggregates can introduce weaknesses into the concrete mix, leading to reduced strength and durability. Therefore, careful selection and quality control of aggregates are essential in maximizing the structural performance and sustainability of recycled concrete, promoting its viability as an eco-friendly construction material.

Recycled aggregate is prepared with waste concrete by crushing, screening, and removing impurities. Using waste concrete to produce recycled aggregate concrete can reduce the consumption of natural aggregate and promote the effective consumption of construction waste. However, because old mortars are attached to recycled aggregate, the

mechanical properties and durability of recycled aggregate concrete are poor. Compressive strength is not only the basic indicator of mechanical properties of concrete, but also one of the key parameters. Under the complex environmental condition, the strength will vary. Concrete has a variety of deterioration forms in different environments. Although the failure characteristics and erosive medium are different, the mechanism is closely related to the impermeability of concrete. Especially in the deicing salt environment of coastal areas and cold regions, the resistance to chloride ion penetration is the key to the durability of concrete facilities. Accordingly, it is of great significance to study the compressive strength and chloride penetration resistance of recycled aggregate concrete [4].

A. Significance of the Study

With the progress of globalization in the economy and in society, it is essential for Chinese students to acquire communication skills in English, which has become a common international language, in order for living in the 21st century. This has become an extremely important issue both in terms of the future of Chinese children and the further development of China as a nation. But over the last two decades, the summary of English education in China most often repeated by students and teachers and parents is that "Although we study English for all of ten years we still cannot speak it." People became frustrated about not being able to speak as much and fast as they wished. They decided to blame the traditional Grammar Translation method [5].The review's goals are to evaluate material performance, identify best practices, and take environmental effects into account while synthesizing current information on clay soil augmentation using nylon fiber, jute, fly ash, and waste materials.

TABLE II. TABLE 1 FINDINGS ON CONCRETE AND AGGREGATE CHARACTERISTICS

Authors	Main Findings
De Brito, aT. aL.	Aggregate geological nature and quality significantly influence concrete compressive strength. Neglecting aggregate properties results in inadequate predictions of concrete strength. Even with natural aggregates, there is a significant scatter between calculated and experimental compressive strength values. Aggregate choice (geological type and quality) notably impacts concrete performance, with basalt-rich mixes showing the highest calculated strength. Concrete strength tends to be overestimated as aggregate quality decreases, with a more pronounced effect observed with recycled aggregates due to their heterogeneous nature.
Naderpour, H., et. al.	Construction waste materials can be recycled and reused as recycled aggregate concrete (RAC) for various construction purposes. Artificial Neural Network (ANN) model predicts RAC compressive strength using input features like water-cement ratio, water absorption, aggregate types, and ratios. ANN efficiently predicts RAC compressive strength, making it a valuable tool for RAC applications.
Naderi, S., et. al.	Developed a meso-scale modeling framework to investigate concrete fracture under uniaxial and biaxial compression, considering mesostructural characteristics. 3D mesostructure of concrete with realistic aggregates was generated using Voronoi tessellation and splining method. Aggregate shape has a negligible effect on compressive strength, but irregularity influences crack initiation and growth in concrete.

II INFLUENCE OF AGGREGATE QUALIT

The influence of aggregate quality on concrete cannot be overstated. As the foundational component of concrete mixtures, aggregates play a pivotal role in determining the strength, durability, and overall performance of concrete structures. This influence becomes even more pronounced when considering the wide variety of aggregates available, each with its unique geological nature and quality characteristics. The research delves into the complexities of how different aggregates, whether natural or recycled, impact concrete properties. It reveals that even subtle variations in factors such as density, water absorption, and abrasion resistance can lead to significant differences in concrete strength and behavior. This understanding holds immense practical value, guiding engineers and builders in selecting the most suitable aggregates for specific applications. It also underscores the importance of stringent quality control measures during aggregate procurement and concrete production to ensure consistent and reliable concrete performance. Ultimately, this research highlights the critical interplay between aggregate quality and the integrity of concrete structures, making it an essential area of study in the field of construction materials.

Fig. 1 Definition Types Coarse Aggregate

Coarse aggregates, particles larger than 4.75 millimeters in diameter, are vital components of concrete. They can be natural, like crushed stone or gravel, or recycled from old

concrete. These aggregates impact concrete properties significantly, affecting its strength, workability, and durability. Understanding their types and characteristics is essential for creating robust and reliable concrete mixtures in construction.

VII. CONCLUSION

The research highlights the pressing need for sustainable practices in the construction industry, given the increasing construction and demolition waste generation in Vietnam. Steel slag, a by-product rich in minerals, emerges as a promising alternative to natural aggregates, offering a sustainable solution to resource depletion and waste management. As the global demand for concrete continues to rise, the adoption of alternative materials like steel slag aggregates can significantly reduce the environmental impact of the construction sector. However, further studies are required to optimize the use of steel slag aggregates and address challenges related to concrete strength and durability. This research underscores the importance of responsible material choices in the pursuit of sustainable construction practices.

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Strength Enhancement of Clay Soil Using Nylon Fiber, Jute, Fly Ash, and Waste Materials: A Comprehensive Review

line 1: 1st Mumtaz Begam
line 2: *Department of Civil Engineering (Structure Engineering),*
line 3: *Madhyanchal Professional University,*
line 4: *Bhopal, (M.P.), India*

line 1: 2nd Dr. Rakesh Pate
line 2: *Department of Civil Engineering (Structure Engineering)*
line 3: *Madhyanchal Professional University*
line 4: *Bhopal, (M.P.), India*

***Abstract*— Concrete, a ubiquitous material in civil engineering, relies on a complex interplay of constituents for its properties, particularly compressive strength. While water-to-cement ratio remains a critical factor, the influence of various additives and constituents has drawn the attention of researchers. Soft computing, an emerging collection of methodologies, offers robust, cost-effective tools for analyzing nonlinear relationships in concrete composition. Artificial Neural Networks (ANNs), a subset of soft computing tools, have gained prominence in modeling concrete strength. Moreover, the pursuit of high-strength concrete has led to innovations in construction practices. Circular economy principles advocate for waste reduction and resource recovery, especially in the construction sector, where substantial solid waste arises from demolition activities. Carbonation processes in cement-based materials have implications for durability. Recycled aggregates (RAs) have emerged as sustainable alternatives, impacting recycled aggregate concrete (RAC) performance. This review explores these multifaceted aspects, highlighting the role of aggregate characteristics, the potential of waste alternate materials (WAMs), and the integration of soft computing techniques in predicting concrete strength.**

Keywords— ***Concrete, compressive strength, soft computing, artificial neural networks, high-strength concrete, circular economy, carbonation, recycled aggregates, waste alternate materials, sustainability.***

I INTRODUCTION

Concrete is an essential material in civil engineering, which is widely used all over the world. It is a composite material comprising of key constituents, namely, cement, sand (as fine aggregate), fly ash, coarse aggregate, admixture and water. The properties of concrete, including its compressive strength are a highly nonlinear function of its constituents. Various studies have shown that concrete's strength not only depend on water-to-cement ratio, but is also related to the other additive constituents. The lack of standard empirical relationships to judge the compressive strength of concrete based on its constituents has created the interest of the researchers towards soft computing tools has defined Soft Computing is a emerging collection of methodologies that seek to achieve resilience, tractability, and overall cheap cost by taking use of tolerance for imperfection, ambiguity, and partial truth. Tools from statistics, probability, and optimization are used in soft computing. for learning, predicting and classifying new patterns based on the past data. Artificial Neural Networks (ANNs) touted as the next generation of computing forms a sub-set of Soft Computing Tools [1]. The term high strength concrete is used for concrete with a compressive strength in excess of 41 MPa, as defined by the ACI Committee 363. Others define high strength concrete as having a uniaxial compressive strength greater than what is typically obtained in a location, as the maximum strength of concrete currently being manufactured differs significantly from region to region. Smaller cross-sections result from the use of high strength concrete, which lowers a structure's dead load. This facilitates the construction of longer-span bridges and taller skyscrapers by engineers. [2].

Over the last decade the concept and development model of Circular Economy has been gaining a growing attention. It aims to provide an alternative to the traditional and dominant model featured at consuming resources and then disposing it. Circular Economy emerges through three main actions, namely reduction, reuse, and recycle. waste management, as a recovery of resources and environmental impact prevention, has become an important sub-sector of Circular Economy. Around 30% to 40% of the urban solid wastes come from construction and demolition (C&D) activities. The overwhelming amount of C&D wastes generated in the forms of concrete, bricks, and tiles are causing pressures on the limited urban landfill space. On the other hand, due to the scarcity of natural resources, such as virgin aggregates, recycled alternatives must be used to meet industry demand [3]. Carbonation of cement-based materials refers to the process where CO2 diffuses into the material through the pores and subsequently reacts with hydration products and unhydrated cement clinker minerals. Calcium hydroxide (CH) is continuously used up during the carbonation process of hardened cement-based materials. Additionally, other hydration products including calcium silicate hydrate (CSH) also participate in the carbonation process, causing cement-based materials to shrink and break [4]. the aggregate produced by washing, grading, and crushing leftover concrete. Recycled coarse aggregate (RCA) is what is used when the nominal particle size of RA is more than 5 mm. Natural aggregate (NA) makes up the majority of RA, with mortar remaining on the surface. The surface is rather rough, with several edges and corners, as a result of the manufacturing process. RA has a high water absorption rate, high porosity, low crushing index, and low apparent density. As a result the relative performance of RA is lower than that of NA, which affects the performance of RAC [5].

A. Aggregate Characteristics

Explore the key characteristics of aggregates that influence concrete properties, including density, water absorption, Los Angeles abrasion resistance, and shape.

Aggregate characteristics are pivotal factors in determining the strength, durability, and overall performance of concrete. These characteristics encompass a range of

properties that influence how aggregates interact within the concrete matrix. One fundamental attribute is density, which relates to the mass of aggregates per unit volume. The density of aggregates impacts the density of the concrete mixture, subsequently affecting its strength and workability. Another critical aspect is water absorption, which quantifies the amount of water absorbed by aggregates. Aggregates with high water absorption can lead to undesirable effects such as increased water demand and reduced workability.

Los Angeles abrasion resistance is a measure of an aggregate's ability to withstand wear and degradation during handling and mixing. Aggregates with higher resistance tend to produce more durable concrete. Additionally, the shape of aggregates plays a significant role in concrete performance. Well-graded aggregates with a mix of particle sizes can enhance packing and reduce voids in the concrete mix, improving overall strength.

II LITERATURE REVIEW

Sabnis, G. M., & Mirza, S. M. The paper reviews current research on the effect of specimen size on compressive, indirect tensile and flexural tensile strengths, the stress-strain characteristics, and related quantities. In all tests, it was found that decreasing specimen size caused the measured compressive and tensile strengths to rise. It was observed that the nondimensional stress-strain curves in compression testing were similar for prototype and model concretes. Smaller specimens exhibit a higher tensile-compressive strength ratio. Reports are made regarding the impact of curing conditions, specimen shape, and other variables. Techniques for choosing the cylinder size to assess the compressive strength of concrete in a model specimen are offered. To assist with the determination of size effects and standardization, the ACI Committee 444 on Models of Concrete Structures has recommended that model investigations should include compression tests on 2-in.×4-in. (50-mm × 100-mm) cylinders along with any other cylinder sizes used.

Pan, X., et. al. Cracking is one of the main problems in concrete structures and is affected by various parameters. The time and cost involved in the sequential laboratory procedure, which calls for casting samples, curing for a predetermined amount of time, and testing, are still concerns. To solve the issues mentioned above, such as the excessive waste of time and resources, novel machine learning techniques are being proposed for predicting the behavior of raw materials on the final output of concrete. This work estimates the splitting-tensile strength of concrete containing recycled coarse aggregate (RCA) using artificial intelligence methods considering nine input parameters and 154 mixes. The model's performance was assessed using the coefficient of determination (R2), root mean square error (RMSE), and mean absolute error (MAE). Then, the model's performance was validated using k-fold cross-validation. The random forest model, with an R2 of 0.96, outperformed the AdaBoost models. The random forest models with greater R2 and lower error (RMSE = 0.49) had superior performance. The SHAP research showed that the cement content had the largest positive impact on the splitting-tensile strength of the recycled aggregate concrete and that cement's main contact is with water. The splitting-tensile strength of recycled aggregate concrete (RAC) isplitting-tensile strength by high water content, according to the feature interaction plot, but it is positively impacted by increased cement content.

Neves, R., et. al. One of the main dangers to the service life of reinforced concrete structures is steel corrosion, which is facilitated by chloride penetration. Due to sustainability and environmental issues, Concrete production has been using recycled aggregate more and more. The purpose of this work is to create analytical models that anticipate how concrete containing recycled aggregates would react to chloride penetration. On a dataset obtained from the literature, multiple linear regression analysis was used. There were 942 case studies in the collection, which came from 33 publications. By using the analysis, two mathematical models were created and explanatory factors were found. One of these models is intended to predict the chloride diffusion coefficient from accelerated non-steady state migration tests, while the other predicts the charge transfer in rapid chloride permeability tests. The obtained correlation coefficients and analysis of variance (ANOVA) test results evidence the adequacy of both models. Thus, it is possible to estimate the resistance to chloride penetrat.

Siddique, R., et. al. The paper presents a comparative performance of the models developed to predict 28 days compressive strengths using neural network techniques for data taken from literature (ANN-I) and data developed experimentally for SCC containing bottom ash as partial replacement of fine aggregates (ANN-II). The information used in the models is organized into six and eight input parameters, covering the amount of cement, sand, coarse aggregate, fly ash as a partial replacement for cement, bottom ash as a partial replacement for sand, water and water/powder ratio, superplasticizer dosage, and an output parameter for 28-day compressive strength and compressive strengths at 7 days, 28 days, 90 days, and 365 days, respectively for ANN-I and ANN-II. For utilizing a neural network to forecast strengths at various ages, the significance of various input parameters is also discussed. The model created using data from the literature could be simply modified to account for experimental results, with bottom ash serving as a substitute for sand in some areas.

Sivananda Reddy, et. al., among others. Due to the impact of conventional concrete on global warming, the use of foam concrete (FC) was expanded from being utilized as a filler material to an alternative concrete. Due to its low density (400–1800 kg/m3) and superior thermal conductivity, FC has a wider range of applications than ordinary concrete and can reduce production, labor, and transportation costs.. In most cases, FC is made by mixing pre-made foam with cement and aggregate slurry. In this case, the investigation involved modifying the FC's strength properties by adding a coarse aggregate and a foaming agent at various percentages. The physical and mechanical characteristics of FC were examined. In order to forecast the strength of FC, an Artificial Neural Network (ANN) was created using the trial results. The Polynomial Regression Analysis (PRA) model's training and testing results have demonstrated that they have a lot of potential for forecasting FC's compression, split tensile, and flexural strengths. It was discovered that a decrease in foam volume and an increase in coarse aggregate volume increased the strength of FC. 1% foam and 50% coarse aggregate, in the other hand, result in a strength of 25.6 N/mm2.

III. WAMS (WASTE ALTERNATE MATERIALS)

The linear economy is a wasteful system in which many valuable materials are "lost" to landfills and the manufactured goods are often underutilized. This is particularly prevalent in cities, where several studies have demonstrated systemic problems with waste generation and management in key sectors like transportation, agriculture, and the built environment (e.g., [3,4]). Due to the increased expenses of waste management (WM) and collection caused by the garbage produced by these ineffective processes, municipal budgets are put under more stress, and there may also be potential environmental and societal risks. Contrary to a linear economy, which strives to separate expansion from the consumption of finite resources, a circular economy is restorative and regenerative by nature. WAMS, short for Waste Alternate Materials, refers to materials that are used as alternatives to traditional construction materials, reducing the reliance on virgin resources and promoting sustainable construction practices.

- Marble Powder as WAMs: Concretized technological advancements can reduce reliance on renewable energy sources and other natural resources, as well as the amount of pollutants that are released into the atmosphere. In natural stone manufacturing facilities nowadays, enormous amounts of marble dust are produced, having a negative impact on both the environment and people. Marble has long been a popular material in the construction industry for a variety of uses, including flooring and wall cladding.
- Steel Slag: In the process of separating molten steel from impurities in steel production furnaces, steel slag, a byproduct of the steel-making process, is created. These are suitable for use as aggregate in concrete. Because magnesium oxides and free lime are present in steel slag aggregate, which can hydrate and swell in damp environments despite not having yet interacted with the silicate structure, the material typically exhibits a tendency to swell.
- Recycled Aggregates: WAMS often include recycled aggregates, such as crushed concrete, brick, or glass, which can replace natural aggregates in concrete production, reducing the environmental impact of construction.
- Fly Ash: Another common WAMS is fly ash, a byproduct of coal combustion. When mixed with cement, it enhances the properties of concrete, improves workability, and reduces greenhouse gas emissions.
- Sustainability: The incorporation of WAMS aligns with sustainability goals by conserving natural resources, diverting waste from landfills, and reducing the carbon footprint of construction projects.
- Regulations: The use of WAMS may be subject to specific regulations and standards to ensure their safety and suitability for construction applications.
- Quality Control: Quality control measures are essential when utilizing WAMS to maintain the desired structural and performance characteristics of construction materials.
- Research and Development: Ongoing research and development efforts focus on finding new WAMS and improving their properties for various construction applications.

VII. CONCLUSION

The multifaceted nature of concrete's mechanical properties and the role of aggregate characteristics, soft computing methodologies like Artificial Neural Networks (ANNs), high-strength concrete for innovative construction, circular economy principles for waste reduction, carbonation processes affecting durability, and the use of recycled aggregates (RAs) and waste alternate materials (WAMs) in sustainable construction practices are highlighted in this review. It underscores the need for research in enhancing WAMs for diverse construction applications and the importance of adhering to regulations and quality control measures. In summary, this review emphasizes the complex interactions within concrete and the potential of WAMs and soft computing to enhance sustainability in modern construction.

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Comprehensive Review Of Strength Enhancement of Clay Soils Using Nylon Fiber,Fly Ash, Jute and Waste Materials:

Zen Pravin Raut 1, 2 Dr Manendra Pratap Verma,
1 Research Scholar, 2 Professor, Department of Civil Engineering,
Madyanchal Professional University,Bhopal (M.P.)
dr.mpverma@mpu.ac.in , : zen.raut55562@gmail.com

***Abstract*— Clay soil provides substantial problems with geotechnical engineering because of its strong flexibility and susceptibility to volume fluctuations. This review paper examines the problems with clay soil and provides methods for managing and stabilizing it effectively, with an emphasis on environmentally friendly and sustainable practices. For improving the performance and strength of clay soil, the integration of elements such as nylon fiber, jute, fly ash, and waste products is investigated. Because it increases the capacity of the soil to support more weight, fortifies the soil, lessens settling problems, and is in line with environmental sustainability, soil stabilization is essential for assuring the longevity, safety, and cost-effectiveness of infrastructure projects. This review provides insightful information on improving clay soil by synthesizing existing knowledge, evaluating material performance, identifying best practices, and taking environmental effects into account.**

Keywords— ***Clay Soil, Soil Stabilization, Nylon Fiber, Jute Fiber, Fly Ash, Waste Materials, Geotechnical Engineering, Sustainability, Environmental Impact.***

I INTRODUCTION

Clay soil presents a variety of difficulties in geotechnical engineering and construction due to its small particles and strong plasticity. Due to its tendency to significantly change in volume in response to changing moisture levels, poor drainage properties, low natural bearing capacity, susceptibility to shear failure, and seasonal variability, it is not the best material to use as a foundation material for large structures. Construction activities are made more difficult by compaction issues, and volume variations may be made worse by the presence of expanding clay minerals [1]. Additionally, the investigation of eco-friendly and sustainable alternatives is necessary due to the environmental impact of current stabilization techniques. In particular, when taking into account incorporating of raw materials like nylon fiber, jute, fly ash, and waste materials for improving the soil's durability and effectiveness, which is addressed in this review paper, comprehending these challenges is crucial for developing efficient techniques for clay soil management and stabilization.

Because soil stabilization is crucial to guaranteeing the durability, safety, and economic viability of numerous infrastructure projects, it plays a crucial role in civil engineering, geotechnical engineering, and construction. First off, it greatly increases the soil's capacity for carrying loads, enabling it to effectively support the weight of buildings, roads, bridges, and other essential elements of the built environment. As stabilization protects the structural integrity of projects, this is especially important in areas with weak or subpar natural soil conditions [2]. Furthermore, soil stabilization techniques significantly increase the strength and stability of the soil, whether they involve mechanical compaction, chemical additions, or the introduction of reinforcing components like fibers or waste products. This successfully reduces problems with soil deformation, settling, and failure, protecting the long-term functionality of built assets. Beyond structural factors, economic savings are another benefit of soil stabilization. It decreases both initial building costs and continuing maintenance costs by removing the need for substantial excavation and the replacement of subpar soil [3]. Finally, there is a rising focus on sustainable stabilization methods that are also environmentally beneficial. These techniques, which incorporate the utilization of waste products or bio-based additives, not only enhance soil functionality but also adhere to ecological principles by minimizing the negative effects of construction activities on the environment. In conclusion, soil stabilization is essential to the accomplishment, durability, and environmental friendliness of infrastructure projects, making it a pillar of contemporary engineering techniques [4]. The review's goals are to evaluate material performance, identify best practices, and take environmental effects into account while synthesizing current information on clay soil augmentation using nylon fiber, jute, fly ash, and waste materials.

II ROLE OF NYLON FIBER, JUTE, FLY ASH, AND WASTE MATERIALS

In soil stabilization and building techniques, the use of nylon fiber, jute, fly ash, and waste materials is essential. Jute and nylon fiber are used as reinforcement materials to increase the tensile strength and stiffness of clay soil, lowering the likelihood of structural failure and cracking. [5] Fly ash is a valuable addition to geotechnical projects because of its potent pozzolanic qualities, which are used to increase soil stability and strength. Additionally, several waste products [6] are reused to improve soil qualities, adding to sustainability and cost-effectiveness [8], such as rice husk ash, sugarcane bagasse ash, plastic waste, coir pith, and others [7]. Together, these resources address the issues raised by clayey soils, providing practical answers for soil enhancement and environmentally friendly building techniques [9].

A. Properties and Characteristics

Pozzolanic Properties of Fly Ash

Flyash is a pozzolanic substance that, when combined with calcium hydroxide and water, yields cementitious compounds.

Flyash is a filler used in hot mix asphalt applications, and because of its spherical shape and particle size dispersion, it enhances the fluidity of permissible fill and grout. The investigation conducted by Senol et al. [11] to stabilize four different types of soft subgrades from separate road sites in Wisconsin, USA, used various types of self-cementing fly ashes (without any other activators). By combining fly ash in various concentrations with changing amounts of water, stabilized soil samples were created. In order to stabilize the expanding soil, Kumar and Harika [12] employed waste materials like fly ash as an additive to blend with the soil. The experimental findings show a decrease in the Atterberg limits, Plasticity Index, and Free Swell Index with the addition of fly ash to the Black Cotton Soil at a rate of 0% to 20%. Untreated soil has a CBR value of 2.189%, whereas treated soil with fly ash has a maximum CBR value of 2.33% (10% fly ash), which is an increase of 6.0% from the value that was originally measured. Unconfined compressive strength (UCC) of soil without treatment is 0.1688 N/mm2, and when treated with fly ash, it increases to a value of 0.333 N/mm2 (10% fly ash), which is a 49.30% increase from the initial value. Additional down drift is seen in both CBR and UCC values. According to Tastan et al. [13], the CaO concentration and CaO/SiO2 ratio [or CaO/(SiO2+Al2O3) ratio] of fly ash are important properties that influence the increase in unconfined compressive strength and resilient modulus. Organic content in the soil is harmful for stability. The strength of the soil-fly ash mixture weakens rapidly as soil organic content rises..

TABLE 1 PHYSICAL AND CHEMICAL PROPERTIES OF FLYASH

Property	Description
Physical Properties	
Color	Typically gray or tan, but can vary depending on the source of the fly ash.
Particle Size	Fine, powdery consistency, with particles ranging from micrometers to sub-millimeters in size.
Density	Typically ranges from 1.9 to 2.4 g/cm³, depending on the type and source of fly ash.
Specific Gravity	Generally ranges between 2.0 and 2.8.
Fineness	Most fly ashes are finer than Portland cement and contribute to improved workability in concrete mixes.
Chemical Properties	
Silica Content (SiO_2)	Predominantly composed of amorphous silica, typically ranging from 40% to 90% or more.
Alumina Content (Al_2O_3)	Contains aluminum oxide, usually in the range of 10% to 35%, depending on the type of fly ash.
Calcium Oxide (CaO)	Typically contains varying amounts of calcium oxide, which contributes to pozzolanic reactivity.
Iron Oxide (Fe_2O_3)	Contains iron oxide, usually ranging from 5% to 20%, affecting the color and reactivity of the fly ash.
Loss on Ignition (LOI)	Measures the unburned carbon content; lower LOI indicates higher combustion efficiency.
Chemical Composition Variability	Fly ash properties can vary widely depending on its source, combustion conditions, and type (Class C or F).

Unconfined compressive strength and resilient modulus rose as fly ash content was raised for the majority of the soil-fly ash combinations evaluated. Fly ash, a crucial component in construction and geotechnical engineering, has a wide range of physical and chemical characteristics that are detailed in Table 1

An extensive variety of particle sizes are often present in fly ash, which has a fine, powdery consistency. Fly ash's physical characteristics, such as color, density, specific gravity, and fineness, differ depending on the material's origin and nature. Fly ash is mostly made up of silica (SiO2), with different amounts of alumina (Al2O3), calcium oxide (CaO), and iron oxide (Fe2O3), according to its chemical composition. The unburned carbon content and combustion efficiency are measured using the loss on ignition (LOI) method. It's necessary to take into account the unique qualities of the fly ash source when incorporating it into construction materials and projects because the chemical composition of fly ash can vary greatly.

B. Enhancing Tensile Strength Using Nylon Fiber

The process of fixing soil makes use of nylon fibers' extraordinary qualities. These synthetic fibers have remarkable tensile durability and strength. These nylon strands are painstakingly integrated into the soil during construction when used as soil reinforcement. This calls for evenly mixing the fibers with the soil surrounding them to obtain a consistent dispersion. The nylon fibers that are incorporated into the soil mixture form a structural network in the soil matrix. By acting as a reinforcing system, this structure raises the soil's natural resistance to tensile stress as well as its capacity to withstand it. Numerous variables, including changes in the moisture content or the usage of loads, which are frequently observed in construction and construction-related tasks, could be contributing factors of these forces. This reinforcement considerably improves the material's tension strength, reducing the likelihood of erosion and fracture formation, particularly in locations with severe weather patterns or high traffic. The use of nylon fibers aids in ensuring the long-term stability and integrity of the construction project in addition to fortifying the soil. A reduction in fracture occurrence, which ensures that structural integrity of elements like pavements, is one of the many advantages of this technique. The enhanced tensile strength of the soil results in improved durability, which also lengthens the usable life of built-up infrastructure. Additionally, the soil reinforced with nylon fibers is more resistant to erosion, which makes it beneficial in locations with frequent heavy rains or water exposure. Furthermore, employing nylon fibers throughout soil stabilization can be more cost-effective than using other methods, making it a viable option for a range of civil construction and architectural purposes.

Demsie et al.'s [14] investigation into subgrade soil stabilization and nylon synthetic fiber (NSF) compromises. Fibers with a longer fiber length and a lower fiber content have been used in some investigations in the past, but the contrary has also been true in other studies. However, this study's design was special in that it took into account the right fiber length (10 mm and 20 mm) and content (0.5%, 1%, 1.5%, and 2.5%) to stabilize poor subgrade soil. Natural soil had wet

CBR and CBR swell values of 1.80% and 8.95%, respectively. In comparison to natural soil, the percentage increase in the soaking CBR value due to reinforcement is 265.3, 310.0, 282.8, and 342.2 for aspect ratios of 33.33, 66.67, 25, and 50, accordingly. Additionally, there has been a 34.7, 52.75, 43.55, and 36.9 percent reduction in swelling, respectively.

The findings of an experiment into how fiber affected both the consolidation and shear strength characteristics of a clay soil reinforced adding nylon fibers are presented by Estabragh et al. in [15]. Samples of unreinforced and reinforced clay with various amounts of randomly scattered nylon fibers underwent a series of one dimension rather consolidation and triaxial tests. By mixing recycled polyethylene terephthalate (PET) fibers with fly ash in the subgrade soil, Mishra and Gupta [16] investigated the impact of soil engineering features. PET fibers make up the proportions ranging from 0% to 1.6% by weight of the soil with an increase of 0.4%, whereas Fly Ash makes up the proportions ranging from 0% to 20% by weight of the soil with an increase of 5%. The optimal amount was determined to be 1.2% recycled PET fiber and 15% fly ash by weight of soil, which increased the subgrade soil's strength metrics.

Glass fibers are being used as discrete random reinforcement in expansive subgrade soil by Rabab'ah et al. [17] to increase the strength of the soil for use in pavement construction. By weight of dry soil, the fiber content ranged between 0.25 and 1 percent. According to the test results, adding glass fibers to subgrade soil dramatically raises the UCS, ITS, and CBR values while lowering the free swell values. Glass fibers may be an appropriate reinforcement for the subgrade layer in the construction of pavement, according to MEPDG analysis. The addition of glass fibers to subgrade stabilization can significantly reduce pavement thickness.

According to Pallavi and Poorey [18], an effort has been made to use waste from factories as stabilizing agents, including fly ash and nylon fibers. It has been investigated how fly ash and nylon fibers affect clayey soil's liquid limit, plastic limit, plasticity index, dry density, and CBR (Soaked). Study the cumulative impact of different percentages of the appropriate quantity of fly ash and the optimal quantity of Nylon fiber at a variety of aspect ratios on the properties of black cotton soil. First, investigation that combined impacts of ranging percentage of fly ash (10%, 20%, 30%, 40%) and that differ percentage of Nylon Fibre (0.25, 0.50, 0.75, 1, 1.25, 1.50) at varying aspect ratios (20, 40, 60, 80).

The exploratory findings from testing on organic soil reinforced with nylon fibers that were scattered at random and stabilized with RHA are represented by Brahmachary et al. [19]. Standard proctor compaction, unconfined compressive strength (UCS), unsoaked and soaked CBR tests were first performed on soil samples that had been partially substituted by RHA with doses of 0%, 5%, 10%, 15%, and 20%, and then on soil plus the ideal percent of RHA and various contents of nylon fiber (0.3%, 0.5%, 0.7%, 1%, and 1.2%). The results of the investigation show that adding various doses of RHA and nylon fiber to organic soil raises its ideal moisture content while lowering its maximum dry density.

C. Sustainable Reinforcement with Jute

Jute fibers have the ability to improve soil characteristics in geotechnical and building applications, and sustainable reinforcing using jute is a method that promotes environmental friendliness. Being a natural and biodegradable fabric made from plants, jute offers a number of attractive benefits. Jute fibers interlace inside the soil matrix when added into soil, enhancing its cohesion and general stability. This reinforcement increases the soil's resistance to structural failures, lowers the likelihood of landslides, and helps avoid soil erosion. In addition, jute's moisture-retentive properties are especially useful in areas with arid or semi-arid climates, where they aid in maintaining ideal soil moisture levels for plant growth and guard against soil drying out and cracking. When working with expansive soils susceptible to volume fluctuations due to differences in moisture content, jute fibers can help lower the plasticity of highly plastic clay soils, making them more appropriate for construction. Jute fibers biodegrade spontaneously over time, leaving behind soil with improved characteristics without introducing long-lasting foreign materials into the environment, which makes this process particularly sustainable. Additionally, jute reinforcement is frequently inexpensive, which makes it a desirable option for soil stability and is in line with green building techniques. In conclusion, jute is a useful material for sustainable reinforcement in geotechnical engineering, helping to improve soil quality and protect the environment.

The goal of Gupta et al. [20] is to create a fly ash-based treatment method that is affordable, environmentally safe, and greatly enhances jute's engineering and strength capabilities as a geotextile. Alkali-activated binders (AAB) are becoming more and more used in engineering applications. It is created through the reaction of an alkali activator solution and an aluminosilicate precursor (most commonly Class F fly ash and/or slag). Jute geotextile that has undergone AAB treatment demonstrates an increase in load-bearing capability of about 27%.

According to Lal et al. [21], adding a Jute fiber strip to soil can improve its properties. On unreinforced jute fiber soil and normal soil, a series of triaxial and CBR experiments were conducted. The progression of subgrade strength of roads reinforced with alkali activated binder (AAB) treated jute geotextile is understood by Komaravolu, V.P. (2021). Testing for CBR, bearing capacity, on unreinforced soils, untreated jute reinforced soils, and treated jute reinforced soils revealed a significant increase in CBR, bearing values in treated jute geotextiles.

TABLE III. TABLE 2 COMPARATIVE SUMMARY OF SOIL STABILIZATION AND REINFORCEMENT MATERIALS

	Fly Ash	**Nylon Fiber**	**Jute Fiber**
Pozzolanic Properties	- Acts as a pozzolanic material.	- Synthetic nylon fibers with high tensile strength.	- Natural and biodegradable jute fibers.
Use in Soil Stabilization	- Stabilizes subgrades and soft soils.	- Enhances soil tensile strength.	- Reinforces soil and prevents erosion.
Influence on Soil Properties	- Reduces Atterberg limits, Plasticity Index, Free Swell Index.	- Increases soil tensile strength and resistance to tensile forces.	- Enhances cohesion, prevents erosion, and reduces plasticity.
Impact on CBR (California Bearing Ratio)	- Increases CBR values, improving load-bearing capacity.	- Significantly improves CBR values.	- Increases CBR values, enhancing soil strength.

Unconfined Compressive Strength (UCS)	- Increases UCS, enhancing overall soil strength.	- Enhances UCS, reducing cracks and erosion susceptibilit	- Contributes to improved soil cohesion and stability.
Key Factors Affecting Effectiveness	- CaO content and CaO/SiO2 ratio.	- Fiber length and content.	- Natural fiber interlacing and moisture retention.
Environmental Considerations	- Utilizes waste fly ash material.	- Synthetic material, but enhances soil durability and longevity.	- Natural and biodegradable fibers, eco-friendly solution.
Cost-Effectiveness	- Can be cost-effective compared to other soil improvement methods.	- Offers cost-effective soil reinforcement.	- Often cost-effective while promoting sustainability.

The unique qualities and effects of fly ash, nylon fiber, and jute fiber as soil reinforcing and stability materials are highlighted in Table 2. Fly ash is a good choice for subgrade stabilization since it has improved soil strength and load-bearing capacity thanks to its pozzolanic qualities. Jute fiber provides sustainable reinforcement, fostering eco-friendliness and cost effectiveness, while nylon fiber greatly increases tensile strength while lowering the susceptibility to fractures and erosion. The choice of material relies on the particular project requirements and environmental factors, as each material has distinct advantages and can meet a variety of geotechnical engineering objectives

III. CONCLUSION

This review study emphasizes the need for efficient stabilization techniques while highlighting the numerous difficulties that clay soil presents in geotechnical engineering and construction. In order to increase soil strength, decrease settling issues, and promote sustainability in construction projects, soil stabilization is crucial. Promising answers to these problems can be found in the use of materials including nylon fiber, jute, fly ash, and waste products. Fly ash, which has pozzolanic characteristics, increases soil strength, and jute and nylon fiber reinforcement reduce the likelihood of erosion and fissures. These materials have distinctive qualities that make them appropriate for use in a variety of geotechnical engineering applications. Environmental factors and project-specific requirements influence the material selection. Overall, this research offers important insights into improving clay soil and offers a thorough understanding of environmentally acceptable and sustainable soil stabilization techniques.

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Case Study of Internal Combustion Engine Design and Simulation for Future High Speed LMV

Tarun Kumar Yadav[1], Gaurav Khare[2], Hemant Jain[3], Dr. Veeresh Fuskele[4]
[1,2,3]Assistant Professor, Babulal Tarabai Institute of Research and Technology, Sagar
[4]Professor, Babulal Tarabai Institute of Research and Technology, Sagar
tarunyadav07@gmail.com, 05gauravkhare@gmail.com, hemant23_jain@rediffmail.com, vfuskele@yahoo.com

Abstract: The article aims to evaluate the performance of the Internal Combustion (IC) Engine under the consideration of RPM variation for light motor vehicles (LMV). This paper presents various applications and the overview of the types of strokes in the IC engines. Then finally the impact of the RPM variation on the velocity, displacement of the piston and the PV curve of the IC engine operation for the single cylinder operation is considered in this paper. The evaluation is carried out corresponding to the different Crancks angles. This paper has preseted simulation case study using the MATLAB based code. The constant gamma and variable gamma constant considered for the simulation of the pressure and volume analysis. The variation of the Gamma is evaluated for the combustion, compression and the expansion cycle and the variation in temperature is monitored. Over all paper preseted the concluding impact of RPM variant on IC engine design.

Keywords: Internal Combustion Engine, LMV, Stroke, RPM, Gamma, Applications PV curve, Piston Velocity, Piston Displacement,, Fuel Efficiency

1. INTRODUCTION

All across the world, internal combustion (IC) engines is frequently employed in a variety of applications. Small utility leisure, agricultural, construction, light-duty cars, heavy-duty vehicles, maritime, and electric energy production are all applications for IC engines. As an illustration, it is projected that by 2035, there will be more than 2 billion automobiles and the engines that power them worldwide. These are extraordinary numbers for a device of this complexity. Application areas of the IC engines are vast but frequent ones are shown in Figure 1.

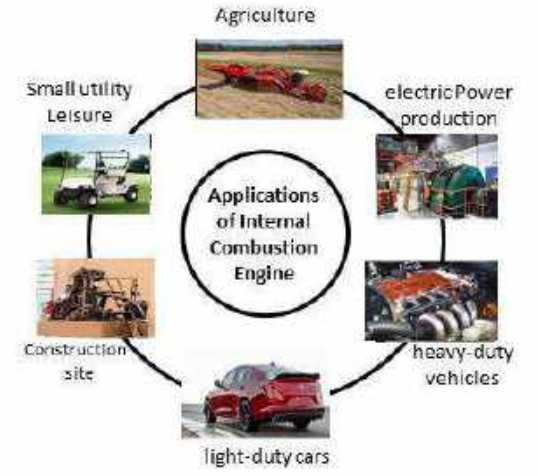

Figure 1 Applications of IC engines

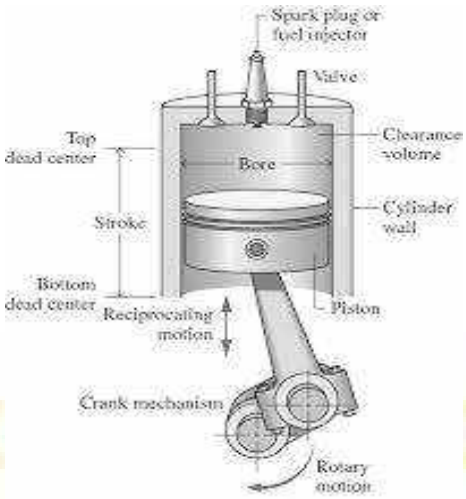

Figure 2 various parts of the Internal Combustion Engine

The various basic elements of the IC engine design are shown in the Figure 2. The 4-stroke engine is a relatively efficient engine. It can convert up to 35% of the energy in the fuel into power. However, it is also a relatively complex engine. It has more moving parts than a 2-stroke engine, which makes it more expensive to manufacture and maintain. The 4-stroke engine is also a cleaner engine than a 2-stroke engine. It produces fewer emissions, which is why it is more commonly used in cars and trucks.

2. Types of Engine Strokes

A 4- A gasoline or diesel engine known as a stroke engine generates power by going through four strokes, or cycles. There are four strokes:

Intake stroke: As the engine's piston descends in the cylinder, in order a void is created, drawing air and fuel into the engine:

Compression stroke: The combination of air and fuel is compressed as the piston rises in the combustion chamber.

Power stroke: The air and fuel combination is ignited by the spark from the plug, which causes it to erupt and push the combustion chamber downward.

Exhaust stroke: The gases that leave the engine are forced out of the cylinder when the piston's pressure rises. Engines with four strokes come in a variety of designs. Whichever is the application, a 4-stroke engine's architecture can change. A mower's cylinder will be built differently than a car engine, for instance.

The kind of fuel an engine utilises also has an impact on how it is built. A diesel engine won't be built similarly to a petrol engine. A well-established technology is the 4-stroke engine. It has been in use for more than a century and continues to be the most popular type of engine with internal combustion. The 4-stroke engine's architecture can still be improved in a variety of ways, though.

Here are some suggestions for enhancing the 4-stroke engine's style:

Minimise friction: The 4-stroke engine's biggest cause of inefficiency is friction. Here are several strategies for lowering friction, including the use of coverings and low-friction components.

Increase combust productivity: By utilising more cutting-edge technology, such as the use of direct injection and adjustable valve timing, the process of combustion in the engine with four strokes can be improved.

Reduce emissions: By employing less polluting fuels and more effective burning technology, pollution from 4-stroke engines can be decreased.

Although the four-stroke engine is an established technology, here are still lots of opportunities to enhance its design. The 4-stroke motor will get even more effective and greener as these enhancements are implemented.

2.1 Intake Stroke Significance

In the case of a four-stroke engine, the stroke that starts the engine is the primary stroke. When the piston descends in the cylinder, a vacuum is created and an amalgam of air and gasoline is drawn into the engine. The next steps involve compressing, lighting, and exhausting the air-fuel combination during the compression stage, power, and exhaust strokes. Although it is the initial stage of burning, the induction stroke is important. What will ultimately be burned and used for powering the engine is the combination of fuel and air that is pulled into the combustion chamber. The engine will run more efficiently depending on the intake pulse.

The effectiveness of the stroke used for intake can be impacted by a few different factors. The entrance manifold's design is the first. The component of the engine's combustion chamber that sends the combination of air and fuel to the cylinders is the intake funnel. The distribution of the air-fuel combination inside the combustion chamber will be improved with a designed effectively entrance tract.

The overall shape of the gates is an additional factor that may have an impact on the effectiveness of the intake stroke. The components of the motor that regulate the passage of both fuel and air from the inside to the outside of the cylinder are called valves. The combination of air and fuel will be pulled into the combustion chamber quietly and efficiently if the openings are attractive. The state of the engine can also have an impact on how effectively the intake stroke works. The ability of the engine to pull in the mixture of air and fuel will be reduced if it is unclean or worn. In order to keep the engine in good shape and maximise the effectiveness of the induction stroke, it is crucial to frequently repair the motor.

2.2 Compression Stroke Significance

The subsequent stroke in an engine with four cylinders is the one for compression. The combination of air and fuel that was pulled in throughout the intake process is compressed at this point by the piston rising in the cylinder. The air-fuel mixture now has a higher pressure and humidity, which improves the likelihood that it, will ignite whenever the ignition source fires. The stroke that causes compression is important since it helps the engine run more efficiently. The pressurised air-fuel combination grows increasingly combustible.

This can increase fuel efficiency because less fuel is required to provide the same quantity of power. The total volume of the chamber while the crankshaft is at the bottom pf the stroke's length divided by the amount of space of the chamber while the mercury is at the very top of the stroke is known as the percentage of compression. The amount of compression of the air-fuel combination increases with the proportion of compression. Higher compression ratios might, however, also increase the engine's susceptibility to knocking, an unregulated explosion that can harm the engine's components.

A few factors can have an impact on the length of the stroke of compression. One piston's construction is the first. To lessen the chance of the air-fuel combination adhering to the piston, it should be smooth. A strong seal around the piston is also necessary to keep air from seeping past it. The overall shape of the cylinder is another element that may have an impact on the length of the stroke of compression. The cylinder ought to be flawless and devoid of any flaws that could lead to a combination of air and fuel leaking past the stroke of the piston.

To guarantee that the combination of air and fuel has been compressed to the right level, the cylinder must be of the proper size. The state of the engine might also have an impact on the length of the compression stroke. The combination of air and fuel will not be compressed as effectively if the combustion system is filthy or worn. To keep the engine is good shape and maximise the effectiveness of the stroke that produces compression, it is crucial to frequently repair its condition.

3. Improvements

Here are some suggestions for enhancing the performance of the four strokes:

Use a good air filter because a dirty one can hinder airflow entering the engine's combustion chamber, which can harm the effectiveness of the entrance stroke. Use high-performance entrance manifolds to enhance air flow into the engine's combustion chamber, which will also increase the effectiveness of the entrance cycle.

To verify that the gates are open and shut correctly, they must be modified to the required height. This will facilitate the effective and smooth entry of the mixture of air and fuel into the cylinder's combustion chamber. In order to increase the effectiveness of the stroke used for intake, the engine should be cleaned because a dirty engine might hinder the flow of fuel and air. To get rid of any possible dirt or debris, the engine needs to be cleaned frequently. You may increase the 4 stroke's effectiveness and make your engine run with greater ease and effectiveness by using these recommendations.

3. Related Works

There have been lot of research carried out for IC engine design in past. This section review some of relevant works referred in the paper. According to Alsuwian et al. [1], process plant technology may be employed to reduce severe production losses caused by irregular unplanned equipment tripping. In their study, they suggested a sort of IC engine hybrid fault-tolerant control system that combines an active fault-tolerant management system and an inactive fault-tolerant control framework. The active component was created using the fault identification and separation unit based on genetic algorithms. If any sensor fails, this genetic algorithm transmits anticipated values to the engine control system. S. Studener et al. [2] created a conceptual air intake model for a four-stroke IC engine based on the fundamentals of mass conservation and energy conservation. The whole valve activation is taken into account: The opening angles of the intake and exhaust valves, as well as the adjustable valve lift, are considered plant inputs that can be changed to boost air intake rate and, thus, engine production. The model must be validated for a formal relationship to be made between the angle of the crank resolved physical model and modern facilities mean value theories.

S. Studener et al. [2] developed a conceptual air intake model for a four-stroke IC engine based on mass and energy conservation principles. The entire valve activation is considered: The intake and exhaust valve opening angles, as well as the adjustable valve lift, are considered plant inputs that can be modified to increase air intake rate and, hence, engine production. For a formal relationship to be established between the angle of the crank resolved physical model and modern facilities mean value theories, the model must be validated. The emphasis of Charles Fayette Taylor et al [4] was on fuel efficiency. All of the statutory constraints on air pollution have resulted in advancements and modifications in engine construction and management, which have been incorporated into this revised edition of Taylor's classic treatise on internal combustion engines. The emphasis on complete tests of air ability, wear and tear, heat transfer, including the effects of cylinder size, as opposed to just descriptive examinations of real combustion cycles, has all been preserved.

Huang et al [5] uses an immediate motion similarity approach to develop a general formula for the non-constant drag of engines flywheel assembly. They established equations for dynamics of a multi-cylinder flywheel component considering nonlinear elements such as the torsional resonance of shaft sections with reciprocating components' non-constant inertia. They adopted eigenvector approach to study inherent resonance and mode configurations of a crank assembly. The integral approach is used to study the compelled vibration behavior of an engine’s shaft assembly while handling non-constant inertia.

Chinujinim G Thomas et al [6] preseted the fuel based performance assessment of IC engines, including spark and ignition with compression motors. There studies looked at the efficiency of spark and compression-ignition and kind of fuel utilized in engine. Additionally, they found that engines with spark ignition are more affordable, quieter, and create more speed. Yet, the study advised using petrol with the injector to increase its speed and that they should be properly installed on the bench to prevent vibration and noise. Duque Amaya et al [8] created a mathematical model of the emissions from the Twingo D7F engine. Under pollutant emission conditions, the effects of adjustments in fuel/air equivalency ratio, compression ratio, combustion duration and spark advance, were evaluated.

Mahdisoozani et al [7] study engine vibrates throughout this energy conversion process due to a number of factors, which severely reduces the engine's efficiency and lifespan. The goal of the current study is to compile all recent efforts made to isolate and lessen engine vibration before it spreads to other car components like the drive shaft and chassis. The ICEs' history and the characteristics related to their vibration will be discussed in order to serve this objective. The paper's main body is broken into three sections: The vibration-based theory in ICE defect detection is first briefly summarized. The use of various techniques and engine upgrades to reduce vibration is then discussed.

Ge, Y.; Chen et al [8] work analyses the design of FTT optimization for ICE cycles from the four perspectives listed below: studies on the best operating characteristics of air standard irreversible (with only heat resistance being irreversible) and reversible the Immigration and Customs cycles, such as Otto, Diesel, who Atkinson's Brayton, Dual, Miller, It Medium, and omnipresent cycles with unchanged specific heats, parameter specific heats, and parameter specific ratios of the traditional and period working fluids (WFs); examines on the effectiveness limits of ICE cycles with inconsistent WF with a Newtonian and other thermal transfer laws; studies on the achievement simulation of ICE cycles; and investigations on the optimum piston motion (OPM) paths of ICE cycles, such as Otto and Diesel, also known as cycles with the Newtonian and other warmth transfer laws.

Abdullah Jamil et al Various engine layouts and combinations have been created in recent years in an effort to increase the thermal and fuel efficiency of internal combustion engines. The geometrical characteristics of combustion chambers and engine topologies and their impact on in-cylinder air/fuel combining turbulent conditions, and combustibility of fuel have grown more and more important due to the field's continual advancement. As a result, a critical evaluation of the present in-cylinder flow analysis methodologies, their use with various engine types and the study's findings is urgently required.

Pisnoy et al have proposed to design ignition and gas-exchange operations in the Wankel engine were simulated numerically using three-dimensional fluid mechanics and chemistry. This technique was created and approved. The placement of an additional plug in the operational room, in place of the two currently mounted plugs on the front face of the base engine, and the creation of a slot on the back side of the rotational recess were also investigated as methods of improving performance.

Balaji Mohan et al [13] used machine learning-based optimization framework for gasoline-powered applications is presented in this paper. A Super Learner method, a group of multiple base learners augmented by optimizations techniques, and a method of active learning are all included in this system. By employing an elitist-based evolutionary algorithm to optimize the hyper-parameters, the efficiency of the Super Learner model was increased. In this study, a smaller dataset

pertaining to a heavy-duty petrol compression ignition engine of size 64 that was randomly selected from the existing dataset will be used to show the framework.

4. Proposed Simulation Methodology

In this paper the simulation of the IC engine is carried out in MATLAB and to evaluate the impact of higher RPM requirement of design. It is required to calculate the piston velocity, and displacement. The variable RPM is considered for imapcat analysis in the work. The mass fraction of the consumed fuel as an estimate of crank angle is required, or the instance of the cycle simulation employed here. This is provided for this task by a Wiebe function.

$$xb=1-\exp(-aym+1) \quad (1)$$

When xb represents the mass percentage of fuel consumed, an as well as m are constants in nature, where the burn curve is chosen to be acceptable. According to Heywood, a = 5.0 and m = 2.0 for this job. Y stands for the non-dimensional advance variable in this equation.

$$y=(\theta-\theta o) / \theta b \quad (2)$$

where θ is the immediate crank angle, θo is the ignition, and θb is the length of the combustion

$$\text{Mean Speed of Piston (fpm)}=(\text{Stroke} * 2 * \text{RPM}) / 12 \quad (3)$$

It can be observed from the Figure 2 that during one crankshaft revolution, a piston's velocity fluctuates constantly as it travels from top dead centre (TDC) to bottom dead centre (BDC) and back to TD**C**.

It is observed that the velocity peak is increased with the increase initial RPM value. The RPM is varied to 1000, 1200 and 1500 range for the performance evaluation and simulation as shown in the Table 1.–

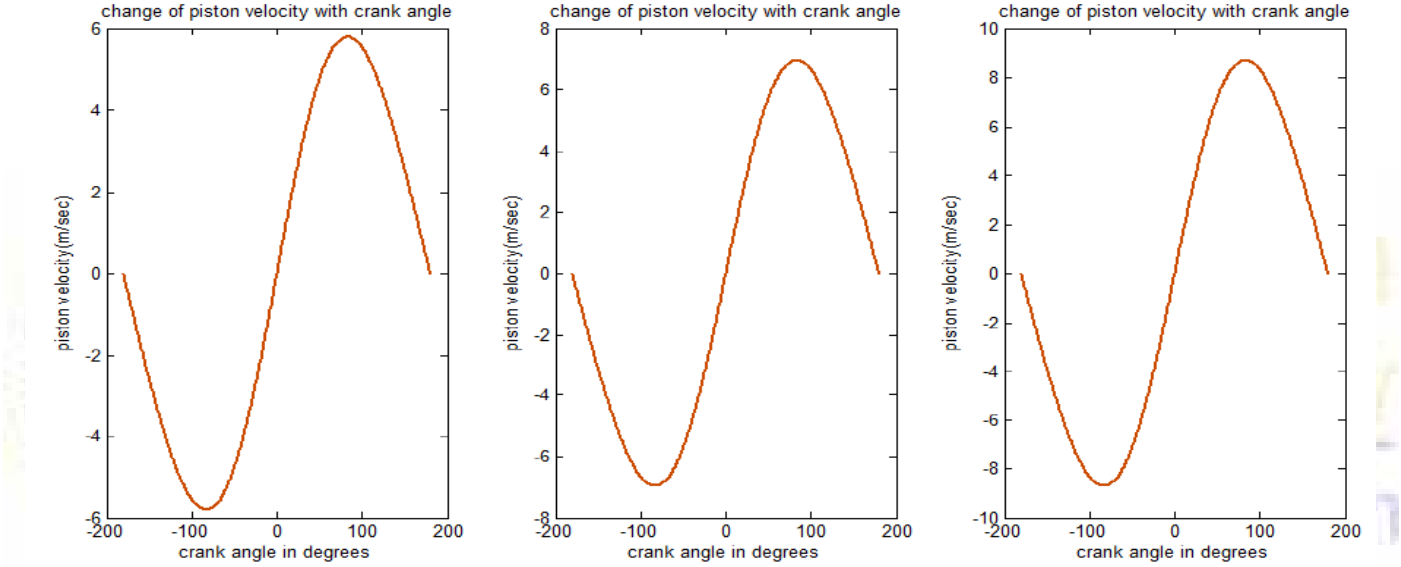

Figure 2 impacts of the rpm variation on piston velocity a) for n=1000, b) for n=1200, c) for n=1500

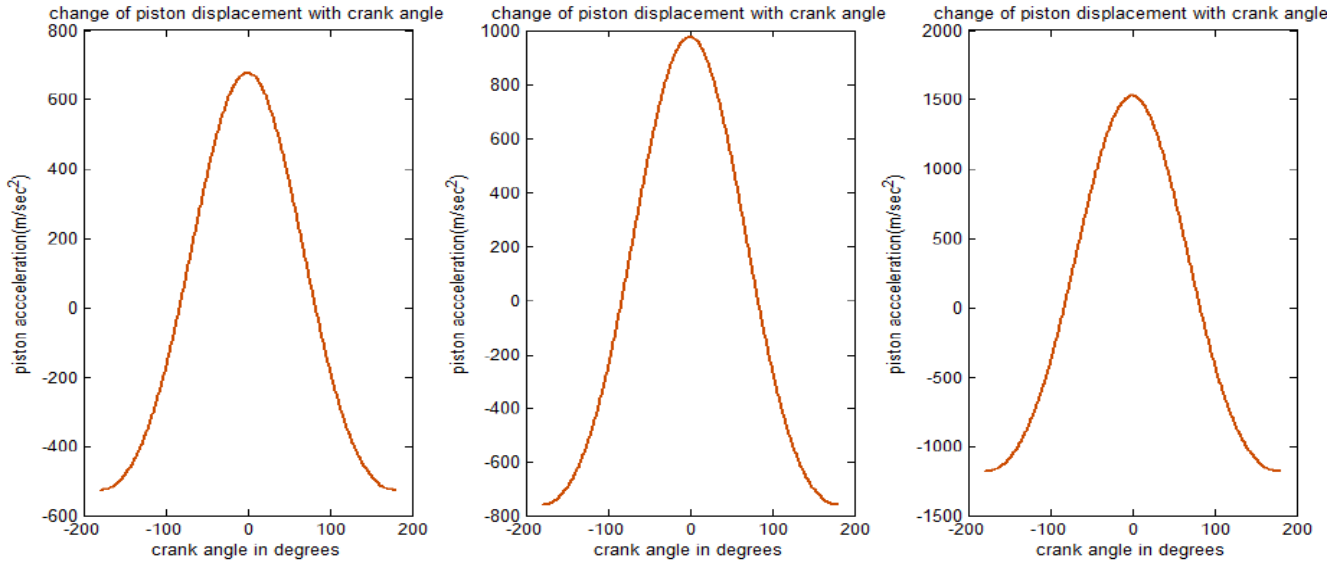

Figure 3 impacts of the rpm variation on piston displacement for three cases as a) for n=1000, b) for n=1200, c) for n=1500

Table 1 Simulation parameters

Variable	Description
S=0.11	Length of stroke in meters
rd=S/2	Cylinder tedious
Lc=4*S	Rod connecting length
Tmax=3000	Maximum temperature in ^{o}K
D	Diameter = stroke
Gama=γ=1.4	Initial constant rage of γ
RPM= [1000 to1500]	Speed range
theta_deg=-180:1:180	Cranck angle range

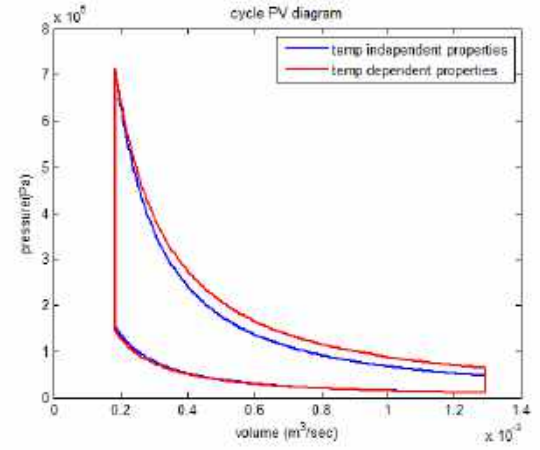

Figure 4 The cycle PV diagram corresponding to Higher RPM

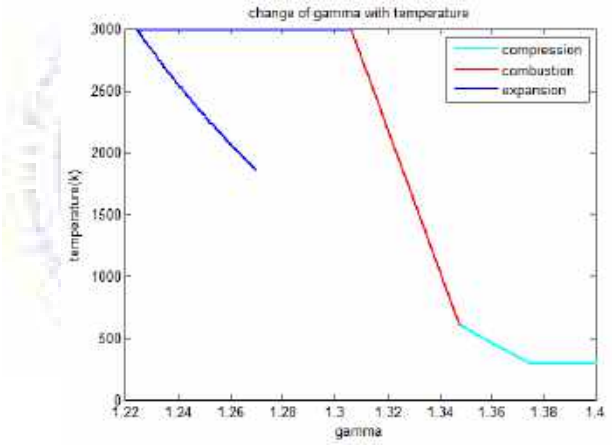

Figure 5 gamma variations with temperature at higher RPM 1500

Similarly it can be concluded from the Figure 3 that displacement must be higher for the achieving the higher RPM or Speed of the vehicles. Piston Displacement=π (Radius x 2) x stroke x N cylinder It is concluded from the Figure 4 showing the PV plot for the IC engine for the higher RPM. It can be concluded that the pressure increases with RPM requirement. This might reduce the fuel efficiency of the system.

6. CONCUSION

The article's main goal is to assess the internal combustion engine's (IC) performance while taking RPM variation into account. The paper provides an overview of the several types of strokes used in IC engines as well as diverse applications. Finally, this article considers the effects of RPM variation on the velocity, piston displacement, and PV curve of the IC engine operation for the single cylinder operation. According to the several Crancks angles, the evaluation is completed.

Using MATLAB-based code, this paper has a pre-set simulation case study. For the simulation of the pressure and volume analysis, the constant and variable gamma constants were taken into consideration. For the cycles of combustion, compression, and expansion, the variation of the Gamma

It has been noted that as beginning RPM increases, the velocity peak increases as well. We can infer that the pressure rises as the RPM requirement increases. The system's fuel efficiency may suffer as a result.

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CHALLENGES OF VOCATIONAL AND TECHNICAL EDUCATION IN PRESENT TIME

Mrs. Saroj Mahale
Asst.Prof. Vidhyapeeth Institue of Education, Bhopal

ABSTRACT- In the present research article, the challenges faced by technical and vocational education has been studied. From the very beginning special emphasis has been laid on general education in our country after some time technical and vocational education were also included in the curriculum. Due to opening of colleges students obtain of bachelor degree therefore there is continuous rise of engineers , but only few of them are of high capability ,so even after getting technical and vocational education unemployment is still present in our country even if they get employed there intitled to work in low wadges. In the National Education Policy (2020) prominently highlights the need for Vocational Education and provide for a detailed roadmap to promote Vocational Education in the country. It aims to make Vocational Education more accessible, more contemporary, more relevant, more inclusive and more creative.

1. INTRODUCATION-

Education is a boon for human beings .Its leads to the development of human being in all sphere of life it enable a person to live the life in a way that is helpful to society and the growth and development of a nation depends upon the quality of education which is being provided to the people. The most important objective of modern education is considered to develop increase productivity individual. Education should enable a person to get his bread and to earn his living in a society. Indian society is changing very rapidly due to stupendous advancement of science and technology our social progress, activities, daily living life styles all amenities depend on modern scientific and technological development. It is the era in which we can not think any aspect of our life without science and technology. The world of today is getting closer day by day due to the advancement of computer and Internet system.

The building of modern nations depend upon the development of people through proper education .Our education has been so academic and theoretical and so divorced from practical work that the educated classes have generally failed to make enormous contribution to the development of the country's natural resources and to add to natural wealth .It is the technical and vocational education which is prerequisite for sustaining the complex structure of modern civilization and economic and social development.

Vocational education is an alternative arrangement to meet up the crisis of unemployment in India. The goal of vocational education is to fulfil the man power requirement for national development and the social requirement for unemployment.

2 **WHAT Is VOCATIONAL EDUCATION** -The term of vocational education came into prominence near the beginning of the 19th century . Vocational education is a bridge between the general education and the demand of industries .The Indian education system acknowledges the role of education at all levels and specifically vocational education. From the Wardha scheme of Basic education 1937 to Kothari commission 1964-66 to UNESCO 2013 to NPE 1968,1986and 2020) all have laid specific emphasis on vocational education. According to the repot to the Indian Education commission and Kothari Commission 1964-66 ,it sets a number of goals to be followed one of the important out of them was to vocationalize secondary education.

Vocational education is an inclusive term and viewed broadly , make our all those experiences whereby an individual learns to carry on successfully an occupation. These experiences may be organised and institutionalised or unorganised and more or less haphazard. In a narrower sense vocational education may be defined as a series of controlled and organised experiences arrange to prepare a person socially useful employment.

All types of education are connected with vocations. Technical and vocational education is more directly related with occupation because specialised efficiency for specialised type of job is the essence of vocational education. Vocational education may indirectly contribute to national wealth and material progress. Vocational education of the right type should be able to redress the problem of occupational maladjustment. A vocational education will make the educative effort purposeful. It will be use of each individual capacity for securing efficiency. It may contribute to national guidance hence assumed great importance together with his demand for vocational education in America, Europe and other countries.

Vocational and skill based education is becoming more important today because employers these day expect the new employees joining all the practical skills, like the agriculture sector need to be supplemented with skilled workers in many related areas such as horticulture, fertilizers and pesticides, food processing , fisheries and livestock management. Many of these sectors are vital to India's wellbeing and overall development, so the humongous target of vocational education must be addressed it multiple ways.

What is Technical Education-Technical education play a vital role in human resource development of the country by creating skilled manpower, enhancing industrial productivity and improving the quality of life of its people. Technical Education covers programmes in engineering , technology , management , architecture, hotel management and catering technology. Similarly technical and management field require technical education which degree and diploma program in engineering, information technology, architecture, town planning management, business administration and management, hotel management, catering and food technology while health care education include whole host of allied health staff such as radiologist, pharmacist, lab technicians, physiologist, home care giver for elderly and many others.

The first engineering college was stabilised in Uttar Pradesh in 1847 for the training of civil engineers in Roorkee which made use of large workshops and public buildings there that were erected for the Upper Ganges Canal . The Roorkee college (or to give it's official name The Thomason

Engineering College) was never affiliated to any university but gave diplomas considered equivalent to degrees.

Technical education focus on providing industrial training and imparting knowledge for specific purpose that help to build or improve once career . In order to become a technically skilled worker one would need to learn subject such as mathematics, physics, chemistry , electronics engineering and other applied science. Technical education has a wide area of fields to choose4 from based on once interest due to it's highly specialised nature of training, technical education focus on providing a more hand on approach them on general education.

The technical education help to reduce unemployment through skill man power and hence helps in economic development of nation. The progress and economic development of any country is dependent upto industrialisation .The technical education produce a person which has necessary skill to run and stablish the industries .

3 OBJECTIVES -

1-To study the relationship between Vocational education and Technical education

2-To study the challenges facing vocational education and Technical Education

Relation between Vocational and Technical education -Vocational and Technical programs are shorter more focus training and educational programs that prepare their student for immediate employment. Both types of school are considered trade or careers schools they do very a bit in their focus. According to the U.S. department of Education technical school teach the theory and science behind the occupation while vocational school tags a more hands on approach to teaching the skill needed to do the job successfully.

Vocational and Technical Education play a wide role in human resource development of the country by creating skilled manpower, enhancing industrial productivity and improving the quality of life. The term technical education and vocational education use synonymously. It is essential to life long learning and plays a crucial role in providing opportunities for people from all background including those who have marginalized in the labor market.

4. Major Challenges in Technical And Vocational Education

LACK OF VET -In India there is a shortage of technical and vocational education . According to the country's population there is a shortage of technical institutions ,but due to the opening of many private institution in big cities for a decades efforts are being made to fulfill these short comings, but still the country there are many areas where the lack of technical institution should be filled.

INSUFFICENT QUALITY EDUCATION-

In our country , number of technical colleges is increasing but the technical education is decreasing , when we have adopted education as a business there are only a few colleges where good technical education is given.

THE INDIFFERENT ATTITUDE OF THE PEOPLE-In today's scenario, youth gives more importance to mental work instead of physical labour, person considers it more appropriate to work while sitting in the office and other considers this work respectable ,unlike those who do work related to handcraft or labour.

UPDATION OF SYLLABUS- There is a limited curriculum or technical subject in technical and vocational education. Due to lack of general education subjects students does not learn the rules of society and how to maintain human relationship.

SHORTAGE OF GOOD TEACHER- There is a shortage of good teachers and good academic records in technical and vocational education . students which get a good education like to work in a good company with a good package . In educational institution there is a need for such talented people who can work for some less salary and provide good education to the coming generation.

COMPLETE LACK OF CONTINUING EDUCATION- The youth who get technical and vocational education are unavailable to update themselves on time. So they are forgotten many things . With present time ,there are many changes in technology that's why it is necessary for the youth to update themselves.

INADEQUITE PRACTICAL EXPERIENCE- It Is not enough to give knowledge of theory in technical and vocational education. In order to get proper knowledge in this education ,it is necessary for the students to have knowledge of theory as well as practical also.

CHOICE OF LANGUAGE – Mostly the medium of technical and vocational education is English. Students who study from hindi medium or other regional languages it is difficult for them to get these kind education . These student face difficulty to gain technical knowledge due to which there is a feeling of inferiority in the children.

4. SUGGESTIONS

1. In our country institute of technical and vocational education should be increased, technical institutes should be opened in some small cities and town so that students who live near them can get technical education.
2. Even after lots of technical institution there is need to make up for the lack of high quality education . Educational institution should understand the importance of education and expend the development of education in there institution on the same basis.
3. Efforts should be made to change the attitude of people towards technical and vocational education . Handcrafts and labour work should be given equal importance as office work, for this proper education should be given to the student to change there attitude towards work . The dignity of labour work should be taught , the importance of manual labour and skill development .
4. The the syllabus of vocational and Technical Education should be redesigned in such a way that the child should be provided with more practical knowledge to live in the society and become a social person.
5. In order to meet shortage of good teachers in technical and vocational institution good salary and all facility should be arranged in the institute which is available in a company so that that teachers work in institution for a long time and can prepare good students.
6. Students who have completed degree and are not doing job, they should also keep themselves update by searching internet or good books related to their course , so he does not forget any content.
7. These institutes should have proper laboratory and attention should be given to provide practical knowledge to each

students, so that the student can acquire theory as well as practical knowledge

8-In technical and vocational courses, the curriculum should be design in such a way that Hindi and other regional languages are also included in them, so that the child does not face any kind of difficulties in getting education because of the language.

5. CONCLUSIONS

It has been found in the present research that there is a deep relationship between technical and vocational education technical education is a form of vocational education through which one can earn his livelihood by developing skill and getting employment similarly there are many challenges before technical and vocational education by improving those challenges we can provide high quality education. The education by which all round development of the child can be achieved and the labor force can be developed in the country.

Without vocational education and practical knowledge no one can enter into the struggle of life it is necessary for a man to do some work for his livelihood with proper training and practice one can a acquire a variety of excuse and move ahead in life through this skills.

The building of any nation depends on the development of the people through proper education that's social and economic development of the society also depends on the system of manpower vocational education is an alternative system to solve the problem of unemployment in India the main power system of this country will be efficient in one way the the productive capacity of that country increases and the economy also reach the top.

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Role of Student Care on Quality Education of Institute

Dr. Rishu Agarwal, Vidhyapeeth Institute of Science and Technology, Bhopal

Abstract: At present quality education is need of society as well as educational institutes. Access to quality education enables student to develop and flourish. Educated children have more confidence in themselves and their abilities. They acquire the keys to solve everyday problems and to prepare their future. Quality committed institutes focus on quality in their working, valuate results then review and follow up since it is a continuous process. Whatever progress our society has made over the centuries is because of quality education. Education is the foundation stone of society; it brings reforms, helps in progress and paves the way for innovation. Because of quality education humans have been able to explore the vastness of the universe and the mystery of its existence in atoms.

Student care is important for nurturing of qualities among students. They may learn more and more in healthy and caring environment on the other hand may become violent and deviated in careless environment. Values of students are future of any society and nation. Avoidance of students deviate them from studies, personal development, career concerned thinking and other activities which is required for their multidimensional development. Objective of life period of college studies is to inculcate career which is possible due to caring by teachers. Carelessness of students is indication of their involvement in antisocial and political activities which is a hurdle for career. Present study is focused on finding of impact of student care on quality education of institute.

1. Introduction:

Quality is a perceptual, conditional, and somewhat subjective attribute and may be understood differently by different people. Students may focus on the specification quality of institute or how it compares to competitors in the market place. Society might measure the conformance quality, or degree to which the service was produced correctly. Quality in this sense is about being measured against criteria. It is not an end in itself, but a means by which the end product is judged as being up to standard. Quality, in this relative or ascribed definition, need not be expensive or exclusive. They do not have to be luxurious or special. They can be ordinary, any product or service can aspire to the label quality. They do not have to be exclusive. While the absolute notion is elitist, the relative notion is potentially egalitarian. Quality is achieved by services meeting a predefined specification in a consistent fashion. Quality is demonstrated by a producer having a system, known as a quality assurance system that supports service to a particular standard or specification.

Quality is achieved by putting systems and procedures into operation and ensuring that those systems are efficiently and effectively operated. Today much quality work is concerned with finding appropriate evidence about the way particular activities within the institution have been carried out. The procedural concept is about proving that things have happened in accordance with predetermined specifications. It ensures that activities conform to requirements, although critics of the approach argue that it can stifle creativity and innovation. Quality management helps to provide leadership in all the sectors of development in a country. The management and sustenance of quality in higher education is a great challenge for the policy planners and managers in the changing scenario.

Education system in all over world is moving towards quality. Every one admits that quality of education is the base for the quality of human life. Every nation strives for improvement it the quality of education, and, aim is primarily to focus emphasis on the quality of education to realize the desired education. Enrollment of students is increasing rapidly in private institutions which shows trend of mobility of students towards quality education. Students are becoming more prompt and efficient in achieving their career goals there.

Student care is a collaborative approach to learning supports them. The quality education system helps, accepts and understand their difficulties and works to equip them with skills and strategies to overcome and deal with them in effective ways. Teachers play an important role by discussing their student's specific needs with the team at the institute and are guided with strategies to provide support, so that their students can make optimum progress in academic, social and emotional development. The team of quality education institute works to ensure that students receive appropriate developmental assistance and coordinates with teachers to provide supportive activities that relate to students' educational and personal needs. Apart from deployment of trained team to work with the students, the institute has provisions to take care as parent and friend.

2. Objective of Study:

- Finding of views of students regarding caring role of teachers
- Finding of views of students regarding quality of educational institutes

3. Hypothesis:

1. There are no significant views of students regarding caring role of teachers.
2. There is no significant views of students regarding quality of educational institutes

Table: 1- Student's View % for Caring Role of Teachers

Student Category	Caring Value		
	0-10	11-20	21-30
PG Boy Students	21	33	46
PG Girl Students	12	39	49
UG Boy Students	28	43	29
UG Girl Students	17	49	34

4. Methodology:

Descriptive survey method was used for present study. Sample was consists of 400 randomly selected students. In sample, 200 were post graduate and 200 were graduate students. In both groups 50% boys and 50% girls were taken. They were interviewed using self prepared questionnaire. Collected data was tabulated and comparatively analyzed using percentile as statistical tools. Values are categorized on the scale 0-10 as poor, 11-20 as moderate and 21-30 as excellent.

Finding and Analysis:

Table: 2- Student's View % for Quality of Educational Institutes

Student Category	Quality Value		
	0-10	11-20	21-30
PG Boy Students	24	37	39
PG Girl Students	15	43	42
UG Boy Students	31	46	23
UG Girl Students	22	51	27

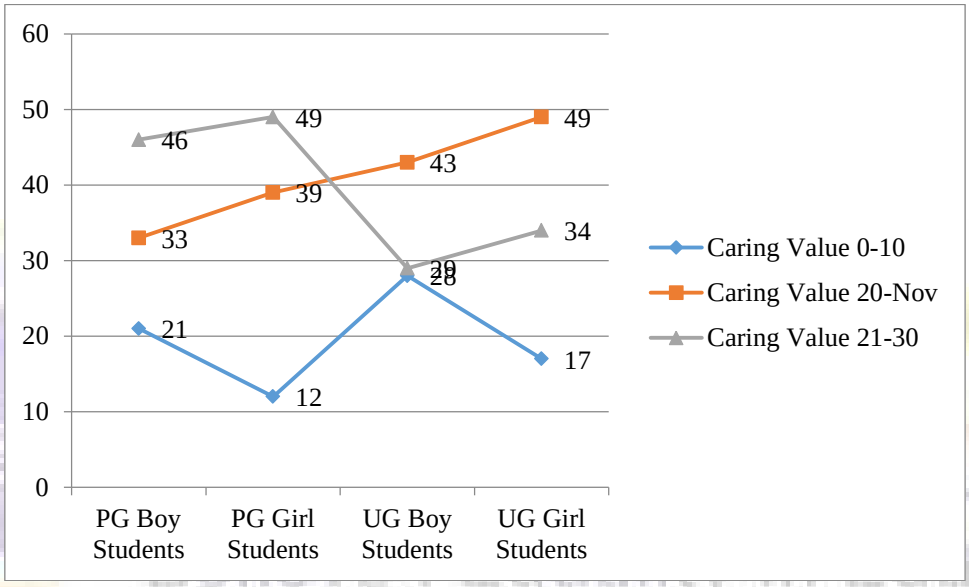

Figure: 1- Student's View % for Caring Role of Teachers

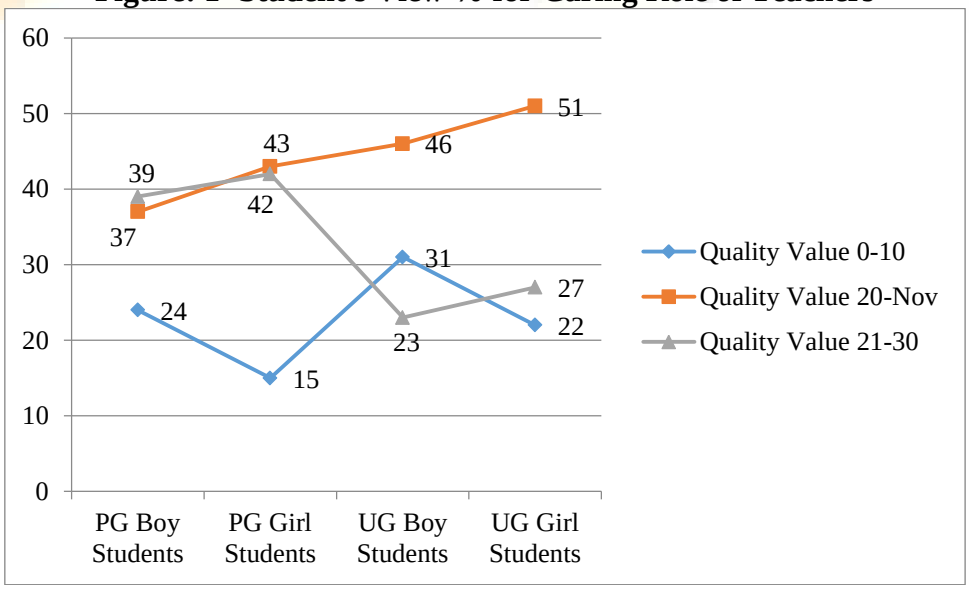

Figure: 2- Student's View % for Quality of Educational Institutes

Student's views regarding caring of teachers show that among PG boys 46% show value 21-30 point, 33% favor 11-20 point scale and 21% indicate 0-10 point value. PG girls show 49%, 39% and 12% respectively. Among UG students value deviates slightly from caring attitude of teachers.

Data regarding quality education of institute these students show that among PG boys 39% agree at scale about 21-30 point, among PG girls 42%, for UG boy 23% and for UG girls value reaches to 27% respectively.

Conclusion:

In student's view, teachers care is important as a tool of quality education. It is motivational for them like parents care. Quality education is a mission, it expects best at every level. Quality is not limited to infra structure, equipments, facilities etc. It is like a live system with care and feel for students. Every tool of quality education institute needs attention. Student care is a powerful tool to line up deviated students even and helpful for all. Parents, society also consider caring of institute. In present high tech age it is challenging also, society and government have minimized teachers, educational institute's rights. These are hurdles of quality education movement. However if an institute wants to become qualitative needs student's care.

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