

# AUTOMATIC INDEXING MECHANISM FOR DRILLING MACHINE

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## ABSTRACT

*Quality and productivity play important role in today's manufacturing market. Automation providing high end quality. Now a day's due to very stiff and cut throat competitive market condition in manufacturing industries. The main objective of industries reveal with producing better quality product at minimum cost and increase productivity. Drilling machine is most vital and common machine used for producing hole operation use for produce machine part with desire surface quality and cost constrain. To obtain main objective of company regards quality and productivity. In the present project an attempt is made to reduce the effect of machining idel time parameters because of mounting , dismounting, marking etc that are influences on responsive output parameters such as time of producing hole, quantity of job, quality of job. this is done by using indexing. The effort to investigate optimal time of producing hole and their contribution on producing better Surface quality and higher Productivity with less cost automation.*

**Key words:** Automation, indexing, Manufacturing industry, Productivity, Quality.

## I. INTRODUCTION

The process of drilling along PCD is quite commonly used. Most of TWO WHEELER vehicles have disc brakes which have holes along PCDs, couplings, flywheels etc. To meet the demand of such jobs, the manufacturing is carried on NCs, CNCs etc. The main difficulty in such machining technology is requirement of huge capital and skilled operators. Hence this Drilling Machine Indexing Mechanism focuses on designing simple drilling table where in the drill bit won't be carried from one position to other but the job itself will be aligned in such a fashion that on simple rotation of worm the new position will be achieved.

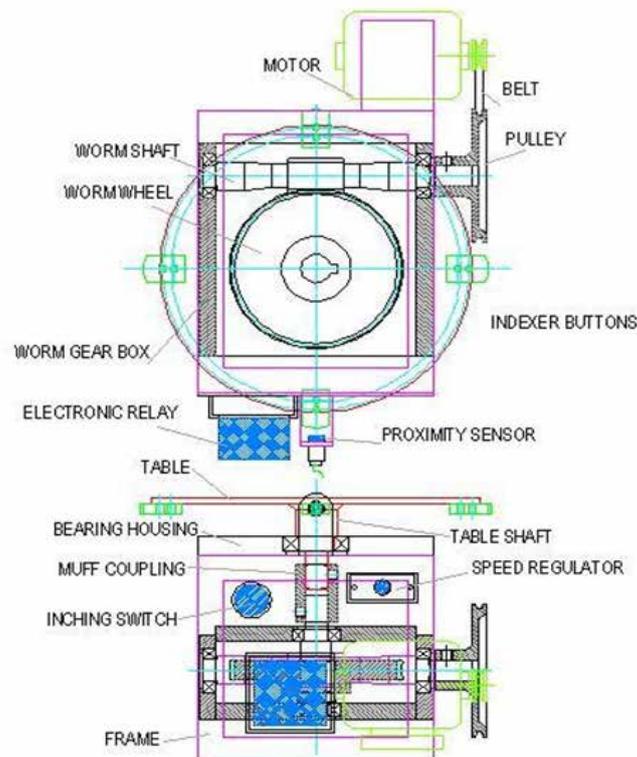
Based on simple engineering knowledge, assembly is designed and fabricated so as to reduce over head losses when it comes to drilling along PCD (Pitch Circle Diameter). Indexing process is well known to us when it comes to gear manufacturing but we are introducing same process but without bulky indexing plate assembly in drilling operation. The construction consists of assembly of worm and worm wheel mounted on vertical shaft which further carries Rotary round table on upper side with sensor. The indexing table is powered by small electrical motor. The speed of table is control by the speed regulator. The operator needs to rotate worm through few degrees to achieve desired Position of the job which contains the several holes.

Compared to available indexing mechanism the cost of this Drilling Machine Indexing Mechanism is quite less. Again, as compared to other automated machine the investment here is quite low. Hence this Drilling Machine Indexing Mechanism holds low initial cost, low operating cost, low maintenance cost & low construction cost.

Since no electricity is use to generate rotational motion there are no electric losses. These days manufacturing deal with automation and hi-tech processes consuming huge power supply. In such scenario our Drilling Machine Indexing Mechanism provides not only the speed but also Manual Handling.

## II. CONSTRUCTION OF INDEXING MECHANISM

Indexing mechanism is made up of mainly worm and worm wheel. In this setup the worm and worm wheel setup is coupled with vertical shaft on which detachable rotary table is connected. For the automatic rotation of worm and worm wheel setup small motor is coupled with help of v belt. The automatic rotation of the rotary table is control by using sensors according to requirement. As job which has to get drilled is mounted on the rotary table is have certain hole or clamping setups as per suited to job.



**Fig. 1 Construction of Automatic Indexing Mechanism**

## III. INSTALLATION OF INDEXING MECHANISM

The automatic indexing mechanism is portable device and gets mounted on any simple drilling machine. It can be placed rigidly on the work table of drill machine without any special arrangements.

#### **IV. WORKING OF INDEXING MECHANISM**

In this mechanism the upper round table is rotate which has marking according to requirement. Marking is in angle in which we have to index the table. This marking is nothing but metallic stopper which can detect by the proximity sensor and proximity sensor simply break the circuit of current to stop the rotary table. This causes the indexing in accurate angular displacement.

#### **V. LITERATURE SURVEY**

##### **5.1 Ranjeet Mithari and Amar Patil [1]**

Abstract - This paper describe the welding Positioner with auto indexing which is very important for mass production industries related with circular welding. As it depends upon the skill of worker to move electrode along the welding line. This special device can rotate the job at fixed rate to assist the welding process for circular components and ensure good profile and homogenous welding. This model has applications in small cylinder welding, compressors, and bottle filling plants etc. Automated welding Positioner machine for circular weld is totally satisfying the requirements. For this system Worm and worm wheel, Cummutator motor, Belt drive, Proximity sensor, Ball bearing, Electronic relay, Inching switch, inputs are required.

##### **5.2 Funaru, M[Arian]; Mihaila, L[Ucian]; Pascu, M[Arius] & Andrioaia, D[Ragos][2]**

Abstract: Growing performance demands in the mechanical manufacturing field have lead to a great development of the machine tools domain, during the past decades, regarding especially the productivity and the manufacturing precision. When equipping a machine tool with an automatic tool changer and an automatic pallet mechanism, the obtained result is a machining center. For single or small series products, multi-iaxis machining centers fulfill the precision and productivity requirements, through the advantages of a reduced auxiliary time and reduced operating errors. This paper presents a new technical solution of the index table mechanism used on multi-axis machining centers, which significantly helps reduce the auxiliary time in the manufacturing process. The mechanical structure of the table mechanism described in this paper offers the possibility to obtain a very high positioning precision, using a curvy coupling and a hydraulically driven table clamp/unclamp mechanism.

##### **5.3 V.J.Panchal, B.M.Garala, G.D.Acharya[3]**

Now a day's machining of component within single setup is more important concept for manufacturing of any product. As single set up machining results dimensional and geometrical tolerance within specific limit, this concept with specific product like rotary table, indexing table, work holding devices, special jig and fixtures etc. with machining center is more predominate. Single setup concept will increase productivity with cost effectiveness and consistent accuracy. The paper deals with the rotary indexing mechanism which is used for getting angular motion in required time. Different types of indexing mechanism are available in market like cylindrical cam with roller follower, duplex worm gear based, and Geneva mechanism. The Paper covers in

designing of indexing mechanism, cam and follower and its motion curve is major part for creating its profile for getting particular indexing with required time, accuracy and cost

## VI. RESULT & TESTING

A Round Job 160mm in diameter and 50mm in height on which 4 Holes is to be drilled in 90 degree in circular manner. It is made of Mild Steel (MS) material. The some jobs were drilled with using and without using indexing machine. During mass production on drilling it is found that job without indexing takes much time to complete the drilling than the job with indexing mechanism. Observation of drilling the holes with using and without using indexing mechanism is given in as-

### Observation of Total Machining Time

	Sr. no.	Material	No. of jobs	Total Time required (with marking & drilling hole) in hours
Without indexing mechanism	1	MS	1000	172.22
With indexing mechanism	2	MS	1000	160.55

Above result is for unskilled labor.

## VII. CONCLUSION

From above result we can say that we reduced the total indexing mechanism can reduce the total manufacturing time during mass production in simple drilling machine. So it reduces the cost of labor and increases the production. This mechanism also provides indexing in drilling operation.

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# A FRAMEWORK FOR PRECISE RECOGNITION OF INDIAN PAPER CURRENCY NOTE FOR VISUALLY IMPAIRED USERS

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## **ABSTRACT**

*With the increasing proliferation of advance technologies, there is an increasing possibility for assisting the visually impaired user with daily work. This paper has attempted to contribute a cost-effective technique in similar direction by introducing a framework that can automatically recognize the currency and can speak out the denomination for the visually impaired users. The prototype designed in Matlab considers the real-time feed of Indian paper currency notes of all the available denominations and applies three different types of algorithms to achieve the objective of performing recognition of currency. The prototype was tested on 20 different samples in different orientation of same currency under the denomination of Rs.10, Rs.50, Rs.100, Rs.500, and Rs.1000. The outcome of the study has been also found to have highly reduced storage and time complexity with precise recognition rate.*

***Keywords: Currency recognition, Indian Currency, Digital Image Processing, Orientation, Recognition Rate***

## **I. INTRODUCTION**

The extension of cutting edge managing account administrations in modern banking system requires the requirements for programmed money distinguishment and verification framework, subsequently urging numerous analysts to grow high precision, dependable and high handling rate systems. To identify the realness of coin note there are two systems i.e. first line review system and second line assessment strategy. First and foremost line review strategy incorporates changed thickness watermarks, bright fluorescence, intaglio printing, micro-text and visualization while the second line examination strategies incorporate isocheck/isogram, fiber based declarations of genuineness, shading and peculiarity investigation. Initially line examination technique is utilized for on-spot confirmation of notes yet is less demanding to fake than the second line investigation strategy while the second line review system requires an additional gadget to perform the assessment. The primary test for cash distinguishment is to distinguish coin note in a group of money notes where there is a likelihood of discovering diverse section note. Additionally a strong framework ought to have the capacity to perceive worn, blurry, ruined and even harmed note amid dissemination by person. Distinguishing the realness and distinguishment of money note has ended up imperative these days as a result of the predominating fake exercises as it hampers our economy. It is extremely helpful in the keeping money framework and in addition in other business applications. There are numerous techniques used to recognize validness and to perceive a note

which is being examined in this paper and everyone has its own goal and noteworthiness. In this paper we have talked about numerous devices that can be utilized to perceive diverse gimmicks of a note. Since a thing can't be impeccable and has specific impediment. So determination of gimmick and the choice of apparatuses to perceive that specific peculiarity are basic. To beat this limit and building an intuitive framework with high velocity, exactness and shabby is another test. The significant system of this framework is picture examination and picture transforming, which are a piece of cognitive and software engineering. Picture transforming is a sign handling after preprocessing. The yield can be either a picture or a set of qualities or parameters identified with the picture. Really the picture is dealt with as 2-dimensional flag and applies some standard sign preparing procedures with picture handling strategies included. Picture examination is an implies that the significant data from a picture is extricated principally from computerized pictures by method for advanced picture preparing strategies.

The research gap or the open issues of the proposed study identified are as follows: Some of the prior studies e.g. [1] [2], [3], [4] etc. has focused using neural network mainly for performing currency recognition.

- Neural networks are difficult to design. One must determine the optimal number of nodes, hidden layers, sigmoid function, etc.
- Neural networks are difficult to model analytically because a small change in a single input will affect the entire network,
- There is a great computational burden associated with neural networks. Neural networks require a large sample size in order to empirically fit data

Some of the prior studies e.g. [5] [2] have adopted optical character recognition system that have difficulty differentiating between characters, such as the number zero and a capital "O." Even if the scanned image of the original document is high-quality, additional steps must occur to clean up the OCR text. It is very labor-intensive to correct the errors created by OCR. Certain studies e.g. [6] have used Principle Component Analysis (PCA) for performing feature extraction. However, the prime issues in such implementations are that in PCA, the covariance matrix is difficult to be evaluated in an accurate manner and even the simplest invariance could not be captured by the PCA unless the training data explicitly provides this information. The other set of the studies e.g. [5] [6][7][8] etc. are quite similar with minor change in the techniques being adopted. Hence, this paper presents a unique and simple technique that uses digital image processing and performs recognition of Indian currencies on multiple orientation condition. Section 2 discusses about the problem identification followed by Section 3 that illustrates the proposed aim and objectives. Research methodology of the proposed system is discussed in Section 4 followed by Algorithm description in Section 5. Result discussion is done on Section 6 followed by conclusion in Section 7.

## II. PROBLEM IDENTIFICATION

The problem statement of the proposed project is – To design a robust prototype that can perform efficient and reliable recognition of the Indian currency notes applicable for Visually Impaired Subject (VIS). The problem identifications of the proposed study are as follows:

- Presence of noise while capturing the image of currency note and mitigating them.
- Computing extent of the threshold to be used for color matching for different type of denomination under challenging physical condition of notes (dented, skewed, variable illumination etc.

### III. PROPOSED AIM AND OBJECTIVES

The proposed project work to be carried out targets to design a prototype that can perform recognition of Indian currency notes using image processing techniques exclusively for visually impaired subject (VIS). The objectives of the proposed project are as follows:

- To acquire image of real-time Indian currency and perform digitization to create a dataset.
- To adopt simple image pre-processing steps for removing noise, performing normalization, and enhance the input image if required.
- To perform localization of the currency note from the input image using standard canny edge detector.
- To perform recognition of the processed input image using color matching.
- To generate voice of the identified currency note for better supportability of VIS.

### IV. METHODOLOGY

The proposed project work considers experimental based development methodologies to ensure that objectives cited in Section 1.6 are fulfilled. The base idea of this project was inspired from the significant work carried out by Aggarwal and Kumar by the title “*Indian Currency Note Denomination Recognition in Color Images*” which was published in IEEE-ICDSE and International Journal on Advanced Computer Engineering and Communication Technology in 2012. Therefore, the proposed system chooses to initiate the work carried by Aggarwal and Kumar bring out more productive contribution by introducing novel features. For better comprehensibility, the methodologies to be adopted in the proposed project work are categorized into 5 stages, which are as discussed below:

**Phase-1-Image-Acquisition:** In this phase, various Indian currency notes e.g. Rs. 1, Rs. 2, Rs. 5, Rs. 10, Rs. 20, Rs. 50, Rs. 100, Rs. 500, and Rs. 1000 will be collected. The considered currency notes will be subjected for digitization either using scanner or using HD image capturing device. All the digitized images are then stored as dataset as three dimensional array for the purpose of comparing with the queried image for validation. Each element of array stores an unsigned 8 bit integer (0-255). This captured image undergoes series of image processing techniques and accomplishment of this stage will successfully achieved 1<sup>st</sup> objective of project.

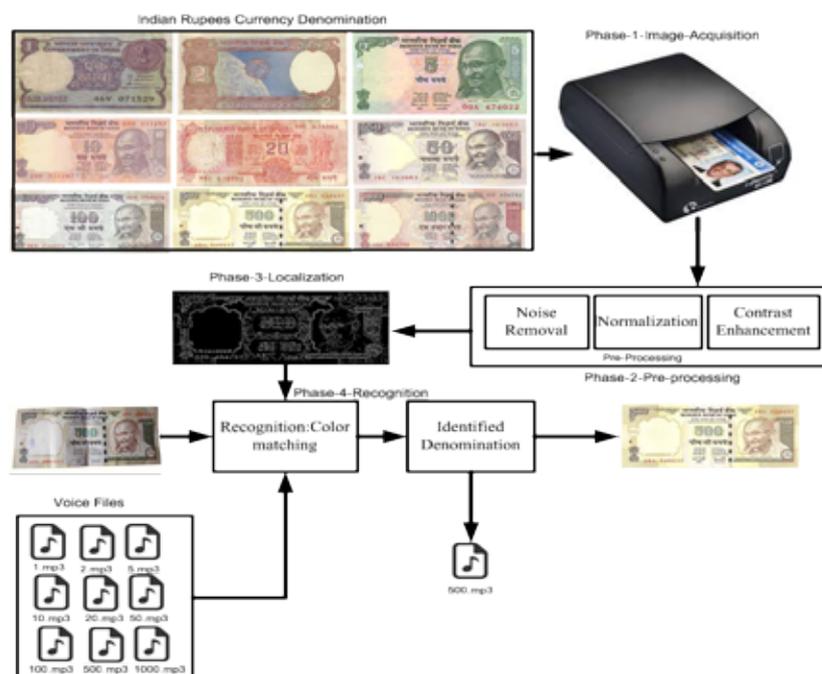
**Phase-2-Pre-processing:** This stage of the project work attempts to make the image more suitable for undergoing the series of techniques to be subjected in consecutive stages. As the project work considers real-time input images of Indian currencies, so there is quite a possibility that source image may have some artifacts that may reduce the performance of the system to perform evaluation. Hence, this step will adopt noise removal based on the extent of the noises to be explored. It will also be subjected to normalization as well as contrast enhancement depending upon the actual condition of the digitized input image of the currency note.

**Phase-3-Localization:** This is one of the crucial stage of the project development, where the success of the outcome will depend on. This stage will attempt to perform localization of the currency note from the input image. As the image will be captured from scanner device or HD image capturing device, the background of the image will come along in the digitization phase of Phase-1. Hence, the system will adopt background subtraction technique (or segmentation) that will attempt to quantify background from foreground. Therefore, this phase adopt standard canny edge detector which is highly resilient against noise and ensure higher

probability of identifying weak and strong edges. After setting up threshold, the system starts comparing it with number of pixels being identified.

**Phase-4-Recognition:** This stage of the project work will focus on the performing recognition of a queried image of a currency note (which is not present in the existing database) using color matching technique. The Color Threshold module is used to remove parts of the image that fall within a specified color range.

**Phase-5-Contribution: Supportability for VIS:** This phase of the study will implement novel techniques as a part of contribution to the proposed project to append certain value added features. The proposed project will be enhanced for a voice output to be exclusively designed for individuals who are blind or who have low vision. The system will be designed with higher scalability to recognize all Indian currencies currently in circulation. This added feature will make tasks such as recognizing the values of different rupees easier for visually impaired people. The application will first prompt users to capture an image of the holding bill, and the captured image will be transferred to the prototype computing device. Then the computing device will process the image in order to recognize the currency. Once the value of the currency denomination is determined, the computing device will select the appropriate audio file to play to the users. However, it is important to note that we designed the project with the assumption that the user is aware that the bank note is an Indian currency, and has the ability to get hold of an prototype computing device whether through their own power or the help from others.



**Fig. 1: Proposed Methodology of Project**

## V. ALGORITHM DESCRIPTION

The proposed system is designed on Matlab and consists of various components to accomplish the objectives of recognizing the Indian currency. The implementation of the proposed system is carried out by following the usual steps of digital image processing e.g. acquisition of an image, image pre-processing, extracting features, etc. More detailed explanation of the algorithms being implemented is discussed below:

## 5.1 Algorithm for Image Acquisition

**Input:** Image of currency, Snapshot of currency

**Output:** Digitizing the input file and accomplishing image (frame) acquisition

### START

1. Extract analog input data, time, and event information from data acquisition engine.
2. IF input\_type=image
  - 2.1  $I_{input}$  = read the original image.
  - 2.2 Convert the read image ( $I_{input}$ ) to grayscale.
3. IF input\_type=video
  - 3.1  $I_{input}$  = Construct a video input object.
  - 3.2 View the default color space used for the data
  - 3.3 Set the colorspace to RGB
  - 3.4 Configure video input object trigger properties
  - 3.5 Get the frame data
4. Show the input in axes.

### END

The Algorithm-1 is basically responsible for considering the input to the proposed framework designed on Matlab. There are two types of input files viz. i) Image of the currency note taken from datasets and ii) taking a video snapshot of currency note in real-time. The proposed system processes both the type of the input files in following manner e.g. i) Processing for image: the image file is directly taken as input and subjected to *imread* method in Matlab for reading the image file. Finally the original input image file is subjected to digitization, which will be further subjected to various algorithms for the purpose of recognizing Indian currency. ii) Processing for image: In this case, the system starts the integrated video capturing device, where the user is supposed to hold the currency notes in front of the camera. The system takes a quick snapshot of the currency, finally forming a digitized image (or frame) for further subjecting to algorithm.

## 5.2 Algorithm for Segmentation of Currency

**Input:** Digitized input Image ( $I_{input}$ )

**Output:** Segmented Image ( $I_{seg}$ )

### START

1. Create a function for performing segmentation
  - 1.1 Input arguments: Digitized input image (or frame)  $I_{input}$
  - 1.2 Output arguments: Segmented Image ( $I_{seg}$ ) and Angle of Rotation ( $A_{Rot}$ )
2. Convert  $I_{input}$  to grayscale.
3. Perform binarization for outcome in step-2
4. Fill image regions and holes
5. Morphologically open binary image
6. Measure Orientation properties of image regions
7. Concatenate arrays along specified dimension for Step-6 and measure  $A_{Rot}$ .
8. Rotate the image using  $A_{Rot}$ .

9. Binarize the outcomes received in Step-8.
10. Fill image regions and holes for outcomes received in Step-9
11. Morphologically open binary image for outcomes received in Step-10.
12. Perform Image Segmentation ( $I_{seg}$ ) by using min and max size of elements present in matrix formed in Step-11.

#### **END**

The above algorithm discusses about the significant steps of segmentation of the digitized input file to the system. For this purpose, a function is created in Matlab considering input argument of digitized image whereas the output arguments are in the form of segmented image and angle of orientation. The digitized input image is converted to greyscale, which is then further converted to binary image based on 0.3 threshold value (chosen by trial and error method). The binarized regions of image are then filled with holes, which are further subjected to morphological operations by removing from a binary image all connected components (objects) that have fewer than 500 pixels, producing another binary image. The resultant binary image is again subjected to evaluation for orientation properties of the regions. Finally, the concatenation operation is applied (1-dimension) for the recently accomplished binarized image to get angle of rotation. The algorithm then performs compensation of the orientation by using the method *imrotate* in opposite direction to counterbalance the view of orientation. Similar operation for binarization, image region filling, and morphological operation is performed to get the minimum and maximum value of the matrix. The segmented image is thereby accomplished in such way.

### **5.3 Algorithm for Recognition of Currency**

**Input:** Segmentation of queried Image ( $I_{seg}$ ) and name of currency from dataset ( $C_{name}$ )

**Output:** Recognition of currency in form of string.

#### **START**

1. Create a function for recognizing currency
  - 1.1 Input Arguments: Segmented image ( $I_{seg}$ ) and Currency name ( $C_{name}$ )
  - 1.2 Output Argument: Recognized Currency in string
2. Perform resizing of the  $I_{seg}$  using the scale of  $210 \times 445$
3. Convert the image to grayscale.
4. Perform Adaptive histogram equalization for the outcome of Step-3.
5. Load the dataset
6. For  $i=1:C_{name}$
7. For  $j=1$ : size of dataset
8. Convert all images to grayscale
9. Perform Adaptive histogram equalization
10. Compute Correlation Coefficient between queried image and dataset image
11. Rotate the dataset image to  $180^\circ$ .
12. Evaluate the maximum value for correlational matrix in Step-10 and Step-11.
13. Generate the output exactly based on matrix size of Step-12.
14. End
15. End
16. Recognize and Display the name of Currency in UI.

## END

The prime responsibility of the proposed algorithm is to perform an effective recognition of an Indian Currency note. After the queried image is being segmented it acts as an input argument for this algorithm. The design of the algorithm is done by creating a function for recognizing Indian currency considering segmentation of queried image and name of currency from the dataset as the input argument, whereas output argument is just to recognize and show the value of the currency under observation. This algorithm performs resizing of the segmented image to the dimension of 210 x 445, which is then subjected to grayscale. The outcome is then subjected to adaptive histogram that enhances the contrast of the grayscale image by transforming the values using contrast-limited adaptive histogram equalization. It operates on small regions in the image, called *tiles*, rather than the entire image. Hence, the queried image is read, resized, converted to grayscale and performed equalization. On the other hand, this algorithm in-parallel checks the indexes of the dataset of image. The dataset basically consist of all the digitized and saved records of the image or real-time snapshots of a currency before starting up the process of querying. A nested loop is constructed for this purpose for controlling the length of the currency name and size of 2D-images available in the datasets. All the images in the datasets are now converted to grayscale as well as adaptive histogram equalization method. The next part of the processing performs computation of the correlation coefficient between segmented image (query-image) and grayscale image from the dataset, where both the images are matrices or vectors of the same size. The images in the datasets are also subjected to rotation to 180°. The loop is iterated till it reaches its terminal point and now the system is in position to display the recognized image in the UI along with the display of currency value.

## VI. RESULT DISCUSSION

The previous section has discussed the algorithms that have been implemented for the purpose of recognizing the Indian currency. The discussion of the result is carried out with respect to creation of dataset, segmentation process, and finally the currency matching process.

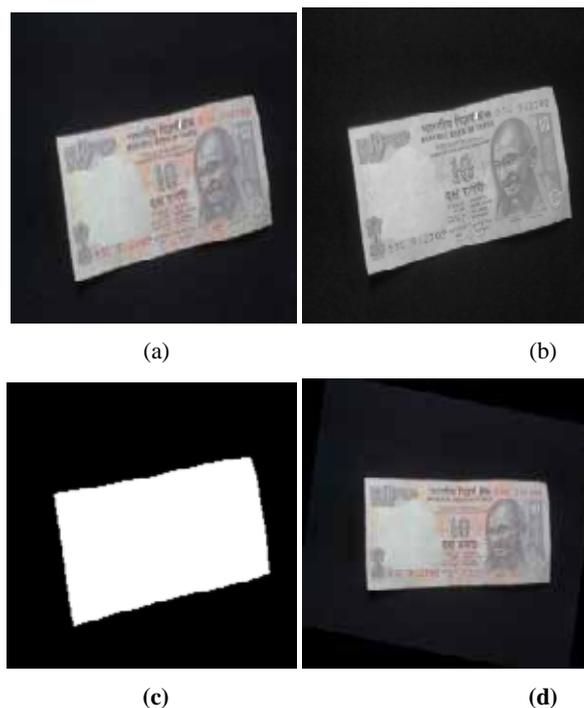
**Outcomes for creating the dataset:** The proposed system uses a normal webcam to capture the images from the real-time feed. For adding up complexities, the system uses both the sides of the currency as well as in multiple different orientations of the currencies. The outcome accomplished in this stage can be seen in Fig.2 that shows some of the patterns of orientation of currency by which the dataset is created. These images will be used for performing similarity check with the queried image of currency.

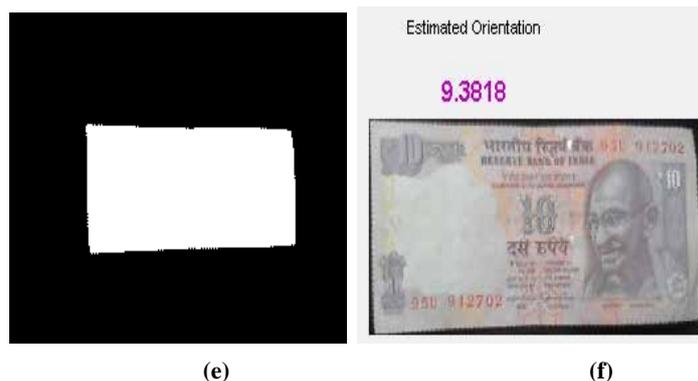




**Fig. 2: Visual Outcomes of Dataset Creation**

**Outcomes for Segmentation Process:** Fig.3 exhibits the outcomes of the segmentation process in the proposed system. Fig.3 (a) is the captured feed of input image of currency, Fig.3 (b) is the grayscale image of the same input image of currency, Fig.3 (c) is the segmented image of the grayscale image, Fig.3 (d) shows the correction of the orientation, while Fig.3 (e) shows the segmented portion of the rectified orientation. Finally, Fig.3 (f) shows the segmented currency in color with estimated orientation.





**Fig. 3: Visual Outcomes of Segmentation Process**

Fig. 3. shows the more visual outcomes of the segmentation process, which is carried out in various orientation patterns. The experiment has been carried out for 20 different samples of same currencies (Rs.10, Rs.20, Rs.50, Rs.100, Rs.500, and Rs.1000). All the possible orientation position has been screened to evaluate the effectiveness of the outcomes. Hence, a successful segmentation process is witness in this process.

**Outcomes for Currency Matching:** Table 1 highlights the visual outcomes of the currency matching process. A total of 20 samples of similar currencies were used to perform the testing of the proposed system. The outcome shows that almost at every condition of orientation of the Indian currency, the proposed system is able to perform a precise detection. Table. 1 also show that currency (input) were maintained with different patterns of orientation with diverse values of angle to show precise recognition process of Indian currency.

**Table. 1: Currency Matching Outcome**

Input Currency	Detected orientation Angle	Recognized Currency
	Estimate Angle is 25.2147	Recognised As <b>1000</b>
	Estimate Angle is -16.5447	Recognised As <b>500</b>
	Estimate Angle is 11.6392	Recognised As <b>500</b>
	Estimate Angle is -20.6008	Recognised As <b>100</b>

**Outcomes for Sound for VIS:** After the system performs effective and precise identification, the system generates a sound for the visually impaired users. The sound was found to be in very distinct and depends on the level of the volume of the integrated computer speakers. In future such systems can be incorporated on the machine that can perform precise recognition and generates a distinct pitch volume of sound for the currency that it has recognized.

**Numerical Outcomes:** From the previous section, various visual outcomes were discussed. This section discusses about the numerical outcomes. For the purpose of evaluating numerical outcomes, the proposed system is evaluated with respect to processing time as it is felt that such system should use less time to generate the outcomes.

**Table. 2: Analysis of Processing Time**

Currency	Processing time (Sec)
5	0.65
10	0.62
50	0.63
100	0.04
500	0.07
1000	0.63

Table 2 shows that all the 20 different samples of same currencies in multiple denominations are found to consume around 0.6 seconds of processing time, which is very less and almost instantaneous. Hence, lower time complexity can be ensured in this process. From the storage viewpoint also, the system only stores the few samples of data for performing testing of numerous denomination of queried currency image. Therefore, the proposed system ensures lower time and space complexity along with precise recognition of the Indian currencies.

## VII. CONCLUSION

The proposed system is completely functional for true input of Indian currency. False input will provide noisy or redundant output. The proposed system is designed for the recognizing the Indian currency only and is not meant for performing recognition of the fake currency. The proposed system includes color feature, binarization, morphological features, geometric transform, orientation, edge boundaries, and lightening conditions. The scopes of the proposed system are as follows: i) The project work will support identification of only Indian currency denomination and not for other countries, ii) The prototype application considers only currency and not the coins, iii) The currencies to be considered for the experimentation will be only Rs. 2, Rs. 5, Rs. 10, Rs. 20, Rs. 50, Rs. 100, Rs. 500, and Rs. 1000 (INR), iv) The generated voice will be only in English. At present there are various vending machines installed in various public locations. Till date all the vending machine gives the product only based on coins and very few on currencies. Hence, our future work direction will be toward precise identification of coins in the vending machine.

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# SOLAR OPERATED PESTICIDE SPRAYER

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## ABSTRACT

A Solar Operated Pesticide Sprayer is a pump running on electricity generated by photovoltaic panels or the thermal energy available from collected sunlight as opposed to grid electricity or diesel run water pumps. The operation of solar powered pumps is more economical mainly due to the lower operation and maintenance costs and has less environmental impact than pumps powered by an internal combustion engine (ICE). Solar pumps are useful where grid electricity is unavailable and alternative sources (in particular wind) do not provide sufficient energy. The solar panels make up most (up to 80%) of the systems cost. The size of the PV-system is directly dependent on the size of the pump, the amount of water that is required (m<sup>3</sup>/d) and the solar irradiance available.

The solar sprayer has many advantages. Besides reducing the cost of spraying, there is a saving on fuel/petrol. Also, the transportation cost for buying petrol is saved. The solar sprayer maintenance is simple. There is less vibration as compared to the petrol sprayer. The farmer can do the spraying operation by himself without engaging labour, thus increasing spraying efficiency.

**Keywords:** Solar Panels, Solar Pump, Sprayer, Photovoltaic Cell (PV), Electricity

## I. INTRODUCTION

Most of the increase in the area of irrigated land in the world has been through the increasing use of engine-driven pumps. However, the increasing price of oil-based fuel has reduced the margin to be gained by farmers from irrigation, since food prices have generally been prevented from rising in line with energy costs. Despite present short-term fluctuations in oil prices, conventional oil-based engine-driven power sources and mains electricity are expected to continue to increase in the longer term. If we are to decrease our dependence on imported oil, we have to find methods for energizing irrigation pumps that are independent of imported oil or centralized electricity.

Solar radiation as a source of energy is Of course, the epitome of the clean. Sustainable energy technology except for residues possibly arising out of the manufacture of solar component (e.g. semiconductors), solar technology have very low environmental impacts. The environmental impacts of solar system in operation are very low and the source is, for us inexhaustible.

## II. CONSTRUCTION

### 2.1 Solar Panel

A solar panel (also solar module, photovoltaic module or photovoltaic panel) is a packaged, connected assembly of photovoltaic cells. The solar panel can be used as a component of a larger photovoltaic system to generate and

supply electricity in commercial and residential applications. Each panel is rated by its DC output power under standard test conditions, and typically ranges from 100 to 320 watts. The efficiency of a panel determines the area of a panel given the same rated output - an 8% efficient 230 watt panel will have twice the area of a 16% efficient 230 watt panel. Because a single solar panel can produce only a limited amount of power, most installations contain multiple panels. A photovoltaic system typically includes an array of solar panels, an inverter, and sometimes a battery and or solar tracker and interconnection wiring.



**Fig.1 Solar Panel**

## **2.2 DC Water Pump**

For people living in remote areas, solar water pumps are usually the only solution as there is no access to diesel. If there is diesel, Solar Water Pumps are the only solution or an excellent alternative for diesel as the cost of running power lines or diesel pumping may be too great.



**Fig.1 DC water pump**

A solar powered water pump differs from a regular water pump only in that it uses the sun's energy to supply electricity for the pump. The solar panels absorb the sun's energy and convert it to electrical energy for the pump to operate. All the pumped water is stored in a water tank so that there is constant supply even in bad weather conditions and during night time where there is insufficient power to generate the solar water pumps. Solar powered

water pumps represent a higher initial investment, however, over a period of 5 years they represent a cost benefit due to minimal maintenance costs compared to AC pumps run with a generator.

### III. WORKING

This project operation on solar energy. The concoction is accomplished by the use of solar panel, a centrifugal pump which runs on dc supply is attached to the solar panel the solar panel generates the power that power is dc power its positive and negative charges are connected to a batter in order to save the power and use it when the sun raise are not present by using this device we can spray pest ices to the herbs and plants and any agriculture spraying it is economical as compared to the other means used like petrol/diesel pesticides sprayers. There is no much maintenance cost and no operating cost as it is using solar energy it is free of cost and there is no pollution its working principal is very simple and the it is economical of the farmers which has one more advantage that it can also generate power that power is saved in the battery and it can be used for both for spraying and well as to light in the house when there is no current supply. And where as in rainy season when the sun rays are not there that time we can charge the battery and use it to spray pesticides to the herbs and plants as compared to petrol/ diesel it is economical no efforts to human just he has to carry the device the device is light in weight so it is much feasible.

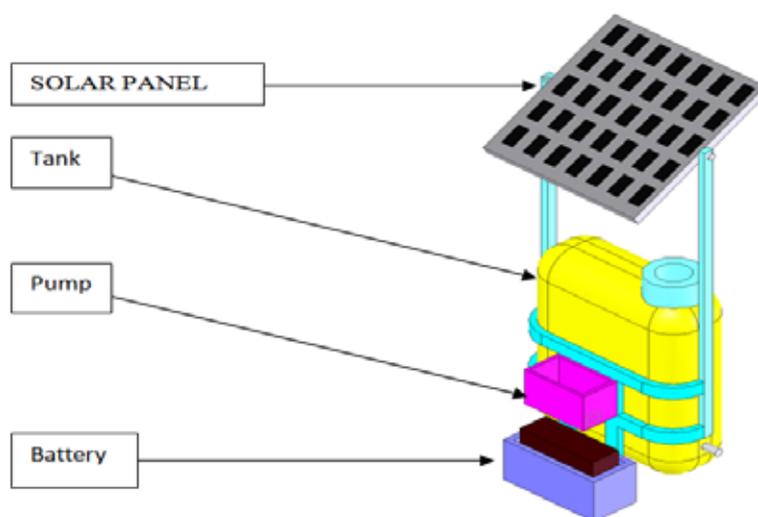


Fig. 3 Solar Operated Pesticide Sprayer

### IV. LITERATURE SURVEY

<sup>1</sup>ABHISHEK JIVRAG, <sup>2</sup>VINAYAK CHAWRE, <sup>3</sup>ADITYA BHAGWAT [1]

ABSTRACT - This paper illustrates invention and operation of multiple granulated pesticides duster with the use of solar energy. The concoction is accomplished by the use of solar panel, impeller type centrifugal blower, gear reduction mechanism, dispensers, D.C motors and batteries. In addition, the duster has been equipped with a facility to operate on an electric supply, which serves beneficial in the absence of sunlight. The device essentially works for disbursing solid granulated (powder) form of pesticide. The operator controls the rate and discharge of different

pesticides by means of push buttons and toggle switches. The technical specifications of the device are worked and examined in a way to minimize the weight of the device and deplete the feeder unit dispenser in a span of three hours. The duster is portable, low cost device and emerges a boon for small scale agriculture, nursery, horticulture, and community services including farms.

### **R.JOSHUA, V.VASU & P.VINCENT [2]**

Abstract:- “Energy –demand” is one of the major thread for our country. Finding solutions, to meet the “Energy-demand” is the great challenge for Social Scientist, Engineers Entrepreneurs and Industrialist of our Country. According to them application non conventional energy is the only alternate solution for conventional energy demand. Now-a- days the concept and technology employing this non conventional energy became very popular for all kinds of development activities. Solar energy plays an important role in drying agriculture products and for irrigation purpose for pumping the well water in remote village without electricity.

### **BART VAN CAMPEN DANELE GUIDI GUSTAVO BEST [3]**

Abstract: - Solar photovoltaic (PV) systems have shown their potential in rural electrification projects around the world, especially concerning Solar Home Systems. With continuing price decreases of PV systems, other applications are becoming economically attractive and experience is gained with the use of PV in such areas as social and communal services, agriculture and other productive activities, which can have a significant impact on rural development. There is still a lack of information, however, on the potential and limitations of such PV applications. The main aim of this study is, therefore, to contribute to a better understanding of the potential impact and of the limitations of PV systems on sustainable agriculture and rural development (SARD), especially concerning income-generating activities. It is, in fact, of paramount importance to identify the potential contribution of PV to rural development in order to gain further financial and political commitment for PV projects and programs and to design appropriate PV projects. One of the main lessons learnt through this study is that success of PV programmers is significantly enhanced when an integrated strategy is followed. Solar photovoltaic systems, through their flexibility in use, offer unique chances for the energy sector to provide “packages” of energy services to remote rural areas such as for rural health care, education, communication, agriculture, lighting and water supply. It is hoped that this document contributes to the generation of ideas and discussions among the different institutions involved in providing these services to rural areas and thereby to an "informed" decision on the PV technology option.

### **V. CONCLUSION**

The output of a solar pumping system is very dependent on good system design derived from accurate site and demand data. It is therefore essential that accurate assumptions are made regarding water demand/pattern of use and water availability including well yield and expected drawdown.

With a solar pump, energy is not available on demand, and the daily variation in solar power generation necessitates the storage of a surplus of water pumped on sunny days for use on cloudy days, solar energy needs to be reserved in

the form of either electricity in batteries of lifted water in a storage tank. The suitability of solar power for lifting water to irrigate plants is undeniable because of the complementary between solar irradiance and water requirements of crops. The more intensively the sun is shining the higher is the power to supply irrigation water while on the other hand on rainy days irrigation is neither possible nor needed.

Water pumping has long been the most reliable and economic application of solar-electric (photovoltaic, or PV) systems. Most PV systems rely on battery storage for powering lights and other appliances at night or when the sun is not shining. Most PV pumping systems do not use batteries – the PV modules power the pump directly.

## VI. ACKNOWLEDGEMENT

The author would like to express his gratitude to his supervisors, Mr. Patil D. D. and Mr. Malgave S. S., for their invaluable guidance, advice and encouragement throughout the course of this research and the writing of this report. Also, the author would like to express his sincere appreciation to Mr. Jagadale sir for his consistent help throughout the project.

Finally we wish to express our thanks to all those who have regularly helped us for the successful completion of project.

We also grateful to Mr. Gavade P. P. head of mechanical department and Principle Mr. Mahadik sir for providing all necessary facilities to carry out the project work and whose encouraging part has been perpetual of inspiration.

We are indebted to the library personnel's for offering all the help in the project work. Last but not list we are thankful to our colleagues and those helpful indirectly throughout this project work.

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# METAMATERIAL BASED MICROSTRIP PATCH ANTENNA FOR HIGH FREQUENCY APPLICATION

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## ABSTRACT

*This paper presents the design of metamaterial based microstrip patch antenna for high frequency application. Work is mainly focused on improving the characteristics of microstrip patch antenna. Metamaterials have been intensively researched due to their particular features such as negative permittivity and/or permeability and ultra-refraction phenomenon. To satisfy the demand of commonly used wireless communication systems, an antenna which can operate at higher frequencies and enhanced characteristics are desirable. The arrangement of all elements is done that they provide an improvement into return loss by which we can notice other factors of antenna. The frequency response of a metamaterial can be tailored by varying its characteristics. A new metamaterial structure using square and ring split ring resonator is proposed. Using this metamaterial structure, a microstrip patch antenna is designed with enhanced characteristics such as reduction in return loss from -20 dB to -36 dB with tunability is achieved.*

**Keywords:** *Left-Handed Materials, Metamaterial, Microstrip Patch Antenna, Return Loss, Split Ring Resonator.*

## I. INTRODUCTION

A microstrip antenna is one of the most commonly utilized printed antenna. It consists of a radiating patch on one side of a dielectric substrate and a ground plane on the other side. A microstrip patch antenna, in its most basic form, benefits from its low profile, low cost, simplicity, and omnidirectional radiation patterns. Narrow bandwidth is one of the main disadvantages of a microstrip patch antenna. The antenna has to operate over a wide bandwidth in case of multichannel applications. But at a given time it has to operate over only a small bandwidth to cover a single channel. In this case, a tunable microstrip patch antenna can be used, where the resonant frequency of the antenna can be tuned [1].

The common method to increase bandwidth is by increasing the height of the dielectric substrate while the other is to decrease the substrate dielectric constant. Over the years, indeed, several techniques have been proposed in order to enhance the gain of the antenna as well as other parameters such as return loss. The conventional approach to miniaturizing an antenna is to set the radiator on a high dielectric substrate. Obviously, there are two drawbacks to this [2]. One of the problems is that the electromagnetic field remains highly concentrated around the high permittivity region, and another one is that the characteristic impedance in a high permittivity medium is rather low, which creates difficulties in impedance matching.

We proposed a microstrip patch design antenna using metamaterial. Metamaterials are artificial materials synthesized by embedding specific inclusions in host media and they exhibit the properties of either negative

permittivity or permeability. If both negative permittivity and negative permeability happen at the same time, then the composite exhibits an effective negative index of refraction and is referred to as left handed metamaterials (LHMs). The “meta” refers to the resulting effective properties whose electromagnetic responses are “be-yond” those of their constituent materials. The idea of metamaterial was first proposed theoretically by Veselago in 1968 [3]. The negative permittivity was demonstrated and theorized with an array of metallic wires in 1996 by Pendry [4]. The structure had plasma frequency and thereby negative permittivity in the microwave regime. The structure of negative permeability was demonstrated and theorized in 1999 with Split Ring Resonator (SRR) structure [5]. The negative index of refraction existed in the region where both the real parts of the electric permittivity and magnetic permeability were simultaneously negative, typically in a structure composed of SRRs and metallic wires [6].

Metamaterial exhibits exceptional properties not readily observed in nature. The inclusion of metamaterial in the design improves the characteristics of a microstrip patch antenna due to these exceptional properties. Metamaterials and its utilization for antenna's techniques were identified [7], [8], [9].

## II. DESIGN SPECIFICATION

Microstrip patch antenna parameters are calculated from formula given below.

A. *Desired parameter analysis* [10] [11]

Calculation of Width ( $W$ ):

$$W = \frac{1}{2f\sqrt{\mu_0 \epsilon_0} \sqrt{\epsilon_r + 1}} = \frac{c}{2f \sqrt{\epsilon_r + 1}} \quad [1]$$

Where,

$c$  = Speed of light

$\epsilon_r$  = dielectric constant of substrate

Effective dielectric constant of a microstrip patch antenna:

$$\epsilon_{eff} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2} \frac{1}{\sqrt{1 + \frac{12h}{W}}} \quad [2]$$

Lengths of metallic patch ( $L$ ):

$$L = L_{eff} - 2\Delta L \quad [3]$$

Where,

$$L_{eff} = \frac{c}{2f \sqrt{\epsilon_{eff}}}$$

Calculation of length of extension:

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{eff} + 0.3) \left(\frac{W}{h} + 0.264\right)}{(\epsilon_{eff} - 0.259) \left(\frac{W}{h} + 0.9\right)} \quad [4]$$

Calculation of VSWR:

$$VSWR = S = \frac{1 + \Gamma}{1 - \Gamma} \quad [5]$$

Where,

$\Gamma$  = Reflection Coefficient

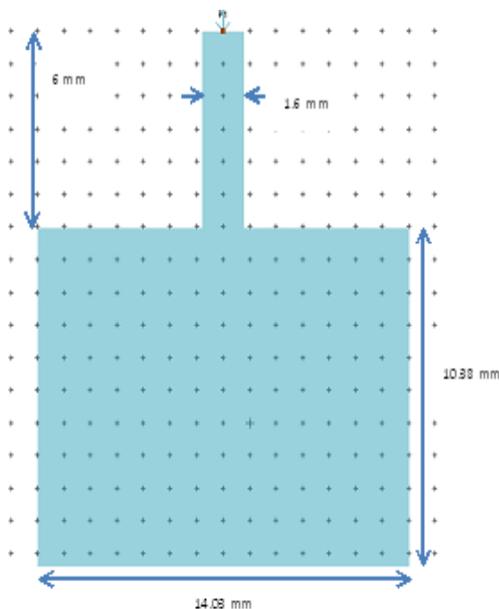
Calculation of Return Loss:

$$\text{Return Loss} = 20 \log |\Gamma| \quad [6]$$

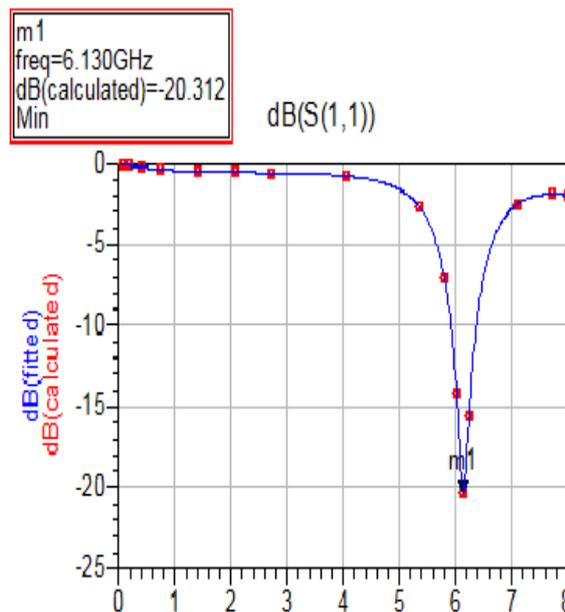
**Table I: Design Parameter of microstrip patch antenna**

	Dimension	Unit
Dielectric Constant of FR-4 (Lossy) ( $\epsilon_r$ )	4.4	-
Loss Tangent ( $\tan \delta$ )	0.02	-
Thickness of FR-4 (Lossy) ( $h$ )	1.6	mm
Operating Frequency	6.130	GHz
Length ( $L$ )	10.38	mm
Width ( $W$ )	14.08	mm
Path Length	6	mm
Width of Feed	1.6	mm

Dimensional view of microstrip patch antenna as shown in Fig.1 and simulated results of microstrip patch antenna without metamaterial as shown in Fig.2.



**Fig. 1: Microstrip Patch Antenna Without Metamaterial**



**Fig.2: Simulation Of Return Loss  $S_{11}$  Of Microstrip Patch Antenna Without Metamaterial**

In this paper a Split Ring Resonator (SRR) by combination of Square and Ring shaped metamaterial structure (Square-Ring SRR) has been introduced. Two dimensional views are shown in Fig.4. The structure gives negative refraction index.

### III. NICOLSON-ROSS-WEIR (NRW) APPROACH

In this work Nicolson-Ross-Weir (NRW) technique [12], [13] has been used to obtain value of permittivity and permeability. To convert  $S$ -parameter this provides easy as well as effective formulation and calculation. The simulated  $S$ -parameter are then exported to Microsoft excel program for verifying the double- negative

properties of proposed metamaterial structure. Equation used for calculating Permittivity and Permeability using NRW approach [14].

$$\mu_r = \frac{2c(1-v_2)}{\omega d i(1+v_2)} \quad [7]$$

$$\epsilon_r = \frac{2c(1-v_1)}{\omega d i(1+v_1)} \quad [8]$$

$$V_1 = S_{11} + S_{21} \quad [9]$$

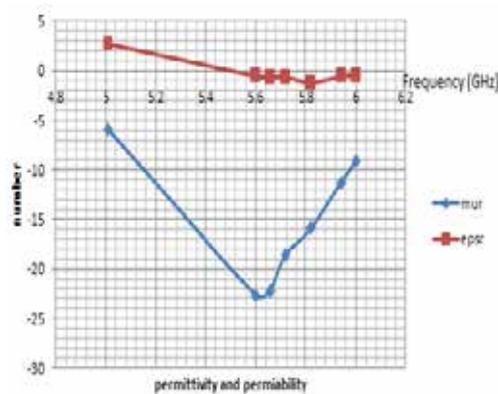
$$V_2 = S_{21} - S_{11}$$

Where,

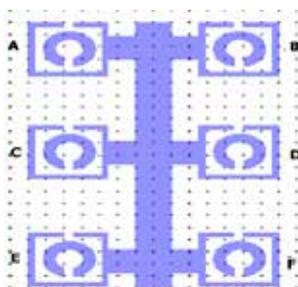
- $\mu_r$  = Permeability
- $\epsilon_r$  = Permittivity
- $c$  = Speed of light
- $\omega$  = Frequency in radian
- $d$  = Thickness of substrate
- $i$  = imaginary coefficient
- $V_1$  = Voltage maxima
- $V_2$  = Voltage minima

Frequency (GHz)	Re [ $\mu_r$ ]	Re [ $\epsilon_r$ ]
5.6	-22.6485	-0.545
5.655	-22.2522	-0.6117
5.716	-18.6286	-0.638
5.821	-15.8826	-1.1634
5.942	-11.2682	-0.5694
6	-9.1677	-0.4919

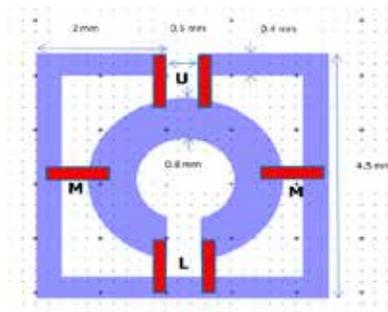
**Table II: Negative Value Permeability and Permittivity**



**Fig.3: Permeability and Permittivity Versus Frequency**



**Fig.4 (a)**



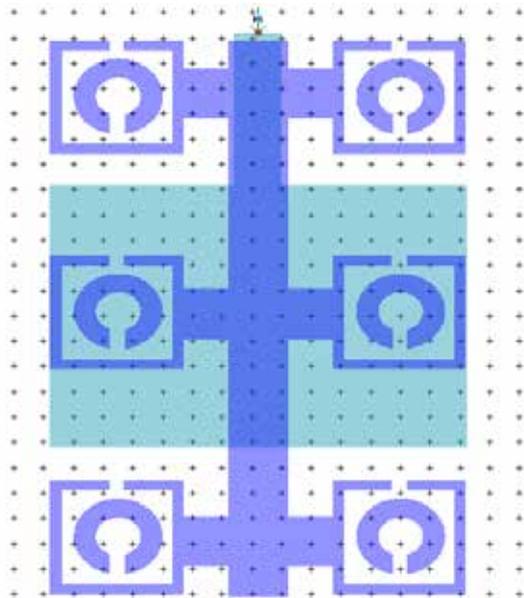
**Fig.4 (b)**

**Fig.4 (A): Design Of Proposed Square-Ring Metamaterial Structure, (B) One Cell Metamaterial Structure**

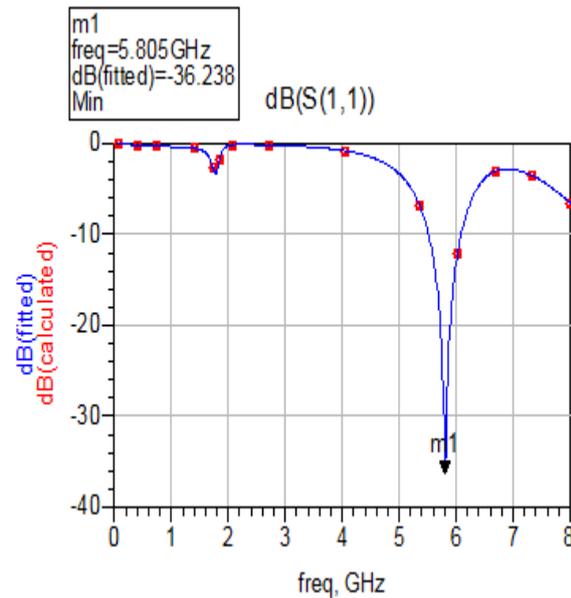
#### IV. ANALYSIS OF MICROSTRIP PATCH ANTENNA WITH METAMATERIAL STRUCTURE

##### STRUCTURE

Microstrip patch antenna with proposed metamaterial structure is given in Fig.5 and Return loss  $S_{11}$  of microstrip patch antenna with proposed square-ring metamaterial structure is as shown in Fig.6.



**Fig. 5: Microstrip Patch Antenna With Proposed Square- Ring SRR Metamaterial Structure**

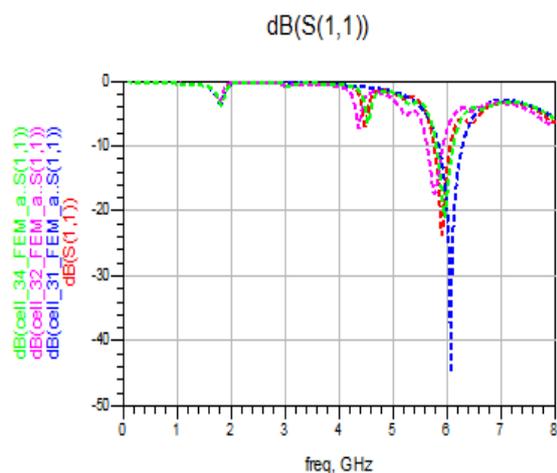


**Fig. 6: Simulation Of Return Loss  $S_{11}$  of Microstrip Patch Antenna With Proposed Square-Ring SRR Metamaterial Structure**

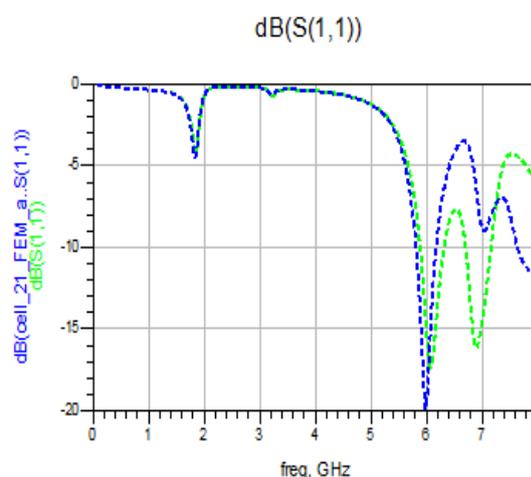
If we made connection as per below Table III then tuning is observed. Fig.7 show that only one frequency is observed when we load metamaterial patch, Fig.8 show that two frequency is observed when we load metamaterial patch, Fig.9 show that three frequency is observed when we load metamaterial patch.

**Table Iii: Result of Different Cell Loading with Metamaterial Patch**

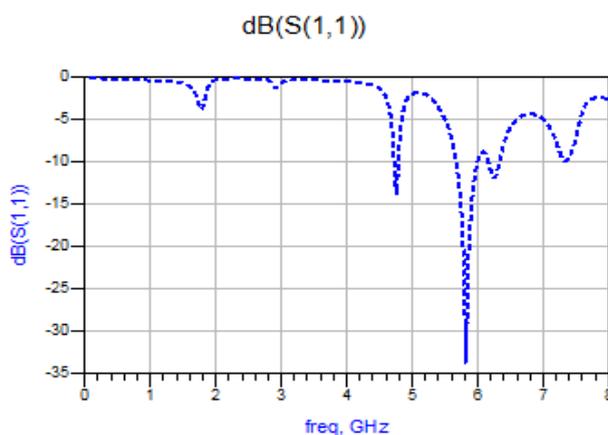
No. of Frequency obtain	Cell Loading	ON SWITCH	Frequency (GHz)
ONE	C	$S_{CU}$	5.910
	C	$S_{CL}$	6.076
	C	$S_{CM}$	5.751
	C	$S_{CULM}$	5.971
TWO	ABCDEF	$S_M$	6.093 & 6.863
	ABCDEF	$S_U$	5.980 & 8.000
THREE	ABCDEF	$S_L$	4.752 & 5.819 & 6.270



**Fig.7: One Frequency is Observed After Loading Metamaterial Patch**



**Fig.8: Two Frequency is Observed After Loading Metamaterial Patch**



**Fig.9: Three Frequency is Observed After Loading Metamaterial Patch**

## V. CONCLUSION

This paper presents the design of Square-Ring SRR based metamaterial structured microstrip patch antenna for high frequency application. The antenna was tested using ADS software (version 2011) for its return loss. The simulation result shows enhanced characteristics such as reduction in return loss from -20 dB to -36 dB with tunability is achieved.

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# COLLATION OF SECURITY FOR ASSORTED ATTACKS IN WIRELESS SENSOR NETWORKS

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College of Engineering Guindy, Anna University, Chennai, (India)*

## **ABSTRACT**

*The rise of wireless sensor networks (WSN) as one of the predominant innovation slants in the nearing decades has postured various one of a kind difficulties to scientists. The sensing innovation joined with handling force and wireless correspondence makes it lucrative for being misused in future. The incorporation of wireless correspondence innovation too brings about different sorts of security dangers. The aim of this paper is to explore the security related issues, the difficulties and to propose some answers for secure the WSN against these security dangers. While the set of difficulties in sensor systems are assorted, this paper concentrate just on the difficulties identified with the security of sensor networks. This paper likewise also proposes a percentage of the security objective for Wireless Sensor Networks (WSN).*

**Keywords:** *Attacks, Defense, Security, Wireless Sensor Networks,*

## **I. INTRODUCTION**

For any Wireless Sensor Networks (WSNs) to gather data from the physical world is the main objective. Advances in wireless correspondence made it conceivable to create wireless sensor networks (WSN). Presently a day's wireless sensor systems (WSNs) have been distinguished as one of the rising innovations. A WSN comprise of spatially circulated independent sensor hubs to helpfully screen physical or natural conditions. The hubs convey in wireless design. Source hubs transmit their information to destination hub either specifically or through middle hubs. These destination hubs are joined with a focal portal, otherwise called base station or sink node. Base station gives association with wired world where information can be gathered, prepared and broke down. These sensor hubs are utilized for occasion discovery and consistent sensing which comprise of handling unit (for information handling), Sensing unit, battery (for vitality). Contrasting with existing systems, wireless sensor networks can essentially work in any environment. WSNs are frequently sent to sense, transform and disperse data of focused on physical situations. As a rule, WSNs comprise of battery-worked sensor gadgets with registering, information handling, and conveying parts. The ways the sensors are conveyed can either be in a controlled situation where checking and observation are discriminating or in an uncontrolled situation.

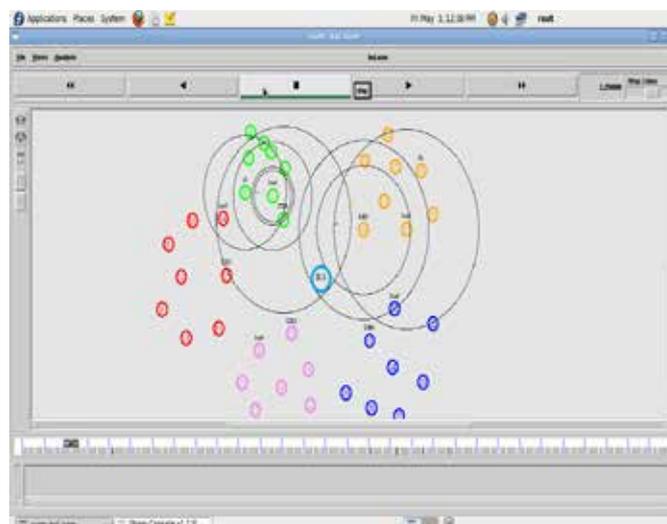
In the uncontrolled situations, security for sensor systems gets to be to a great degree essential. Its expense relies on upon its parameters like memory size, transforming velocity and battery [4]. As these sensor hubs are of minimal effort, a system of hundreds or a huge number of hubs are likewise conceivable which serves to

upgrade the scope zone and also unwavering quality of system. These sensors have information handling and correspondence capacities [23]. They sense the conditions in which they are encompassed and change their information to electronic signs. The electronic signs are transmitted over radio waves to the base station (BS). It is wasteful for all the sensors to send their information straightforwardly to the BS as sensor hubs are vitality compelled. Since information produced from neighboring sensors is excess, the measure of information created in expansive systems is normally gigantic for the BS to process. To take care of these issues, we can perform information collection in sensor hubs.

Data aggregation includes the combination of information from various sensor hubs at moderate hubs and transmission of collected information to the BS or Sink. Information accumulation can dispense with excess; minimize the quantity of transmissions and subsequently spare vitality. The utilization of wireless sensor systems is expanding step by step and in the meantime it confronts the issue of vitality limitations regarding constrained battery lifetime. As every hub relies on upon vitality for its exercises, it is important to enhance system lifetime of wireless sensor organizes by adequately diminishing vitality utilization. To accomplish this objective numerous directing calculations have been proposed. Among all the proposed strategies, progressive steering conventions extraordinarily fulfill the restrictions and imperatives in WSNs[1]. It is essentially considered as a two layer structural engineering where one layer is occupied with bunch head determination and the other layer is in charge of steering. A cluster head (CH) in progressive steering is the hub which is in charge of gathering information from different hubs in the group, amassing all information and sending the collected information to the base station.

WSNs are susceptible to different attacks especially physical attacks these are the most malicious and harmful attacks. Due to the unsafe defenceless nature of the communication channel, untrustworthy transmission media and limited resources many security techniques are not possible. Hence for the conventional networks, security is a vital requirement to put away from a range of attacks. The objective is to design an appropriate security mechanism for these networks that must be designed considering the various security dimensions of WSN's included confidentiality, integrity, availability and authenticity.

This is a wireless sensor network with five clusters where the data is being transmitted from one node and another node using LEACH (Low Energy Adaptive Clustering Hierarchy) protocol.



## II.ISSUES IN SECURITY FOR WSN

Security mechanisms in WSN are developed from considering certain constraints. There are few pre-defined security strategies; some are direct consequences of the hardware limitations of sensor nodes.

**2.1 Energy Efficiency:** The requirements for energy efficiency offer an idea that computation is favored over communication. This is because communication has three orders of magnitude which is more expensive than computation [10]. Security should never be overdone also tolerance is preferred to overaggressive prevention. Using computational power intensive algorithms should not be used to incorporate security as energy is considered [17].

**2.2 No public key cryptography:** Public key cryptographic algorithms are expensive on sensor nodes both in terms of storage and energy [8]. Security schemes should never rely on public key cryptography and this is more reliable for smaller networks [10].

**2.3 Physical tampering:** Sensor nodes are low cost hardware and are not built with tamper resistance, their strength in the number [7][9]. Even though few nodes go down, the network thrives. The network should be resilient to attacks [10].

**2.4 Multi layers of defense:** Security turns into a vital concern in light of the fact that attacks can happen on diverse layers of a systems administration stack[7]. Naturally it is apparent that a different layer of barrier is required i.e. a different resistance for every layer. The issues specified here are all in all pertinent to pretty much a wide range of area independent of their attributes.

## III.VARIOUS SECURITY DIMENSIONS

### 3.1 Availability

Sensors are emphatically compelled by numerous elements, e.g., constrained reckoning and correspondence capacities. Extra interchanges expend extra vitality and if there is no more vitality, information won't be accessible. Vitality is an alternate to a great degree constrained asset in expansive scale remote sensor systems. A solitary point disappointment will be presented while utilizing the essential issue plan. This extraordinarily debilitates the accessibility of the system. The prerequisite of security not just influences the operation of the system, additionally is exceedingly imperative in looking after the accessibility of the entire system. Besides, remote sensor systems are defenseless to different attacks[18]. The foe is expected to have more assets, for example, compelling processors and lavish radio transmission capacity than sensors. Outfitted with wealthier assets, the foe can dispatch significantly more genuine attacks, for example, DOS attack, asset utilization attack and hub bargain attack.

### 3.2 Confidentiality

Information confidentiality is the most essential issue in system security. Confidentiality, integrity and authentication security administrations are obliged to defeat the attacks from enemies specified in the above area. These security administrations are attained to by cryptographic primitives as the building pieces.[18]

Confidentiality implies that unapproved outsiders cannot read data between two conveying gatherings. A sensor system ought not spill sensor readings to its neighbors.

Particularly in a military application, the information put away in the sensor hub may be very delicate.

- In numerous applications, hubs convey exceedingly touchy information, e.g., key distribution; in this way it is to a great degree critical to construct a protected direct in a remote sensor system.
- Public sensor data, for example, sensor characters and open keys, ought to additionally be scrambled to some degree to ensure against traffic analysis attacks. For the most part, encryption is the most broadly utilized system to deliver confidential messages.

### **3.3 Classifiedness**

This implies that unapproved outsiders cannot read data between two conveying gatherings. A sensor system ought not to spill sensor readings to its neighbors. Particularly in a military application, the information put away in the sensor hub may be profoundly touchy. In numerous applications, hubs impart profoundly delicate information, e.g., key circulation; thus it is amazingly imperative to manufacture a safe divert in a remote sensor system [18]. Open sensor data, for example, sensor personalities and open keys, ought to likewise be scrambled to some degree to secure against movement investigation attacks. For the most part, encryption is the most generally utilized instrument to give secrecy.

### **3.4 Integrity and Authenticity**

Secrecy just guarantees that information cannot be perused by the outsider, yet it doesn't promise that information is unaltered or unaltered. Uprightness implies the message one gets is precisely what was sent and it was unaltered by unapproved outsiders or harmed amid transmission. Remote sensor systems are more helpless against eavesdropping and message modification [6]. Measures for ensuring trustworthiness are expected to recognize message adjustment and to reject infused message. Authentication guarantees that the sender was qualified for make the message and that the substance of the message has not been adjusted. In people in general key cryptography, computerized marks are utilized to seal a message as a method for authentication. In the symmetric key cryptography, MACs are utilized to give authentication. At the point when the collector gets a message with a confirmed MAC, it is guaranteed that the message is from a unique sender. Computerized mark is in view of asymmetric key cryptography (e.g., RSA), which includes significantly more processing overhead in marking/unscrambling and confirming/scrambling operations. It is less strong against DOS attacks subsequent to an aggressor may encourage an exploited person hub with countless fake marks to fumes the exploited person's calculation assets for confirming them.

### **3.5 Data Freshness**

Data freshness implies that the information is late and any old information has not been replayed. Information freshness criteria are an unquestionable requirement in the event of imparted key cryptography where the key needs to be invigorated more than a time of time. An aggressor may replay an old message to trade off the key. Security attacks in sensor systems can be comprehensively ordered into Passive attacks and Dynamic attacks. Passive attacks are in the way of eavesdropping on, or observing of, transmissions [22]. The thought process of the aggressor is to acquire data that is being transmitted. Two sorts of passive attacks are arrival of message substance and movement investigation. Dynamic attacks include some alteration of the information stream or

the formation of a false stream and can be subdivided into four classifications: masquerade, replay, alteration of messages, and disavowal of administration. Fundamentally we are predominantly looking at two sorts of security: assurance from dissent of-administration (DOS) attacks, and insurance of the mystery of data. Various barriers, each for one layer of the systems administration stack ought to be actualized. One layer is examined at once: The Physical layer alludes to mechanical, electrical, useful and procedural qualities to build, keep up and discharge physical associations (e.g. information circuits, radio interfaces) between information join substances. This layer characterizes certain physical qualities of the system, for instance the recurrence, the information rate, the sign tweak and the spread range plan to utilize.

#### **IV. TYPES OF ATTACKS ON WSN**

Since the nodes of a wireless sensor networks are placed in the hostile environment they are vulnerable to attacks.

Attacks on WSNs are classified are of two different levels

1. Attack against security mechanisms.
2. Attack against basic mechanisms.(e.g. routing)

In many cases, the information gathered by the sensing nodes has to be maintained confidential and it should be authentic [11]. In the non-attendance of security a malicious node could interrupt undisclosed information, or possibly will send fake messages in the network. The major attacks are: Sybil attack, Selective Forwarding attack, Denial of Service (DOS), Wormhole attack, Sinkhole attack, Passive information gathering, Node capturing, malicious node, Hello flood attack etc.

##### **4.1 DOS Attack**

It happens by the inadvertent disappointment of hubs or malevolent activity. The least complex DOS attack tries to fumes the assets accessible to the exploited person hub, by sending additional superfluous parcels and in this way keeps real system clients from getting to administrations or assets to which they are entitled[1][2]. DOS attack is implied not just for the adversary's endeavour to subvert, upset, or demolish a system, additionally for any occasion that reduces a network's ability to give an administration [2]. In remote sensor arranges, a few sorts of DOS attacks in distinctive layers may be performed. At physical layer the DOS attacks could be sticking and altering, at link layer, crash, weariness, shamefulfulness, at system layer, disregard and greed, homing, confusion, dark gaps and at transport layer this attack could be performed by malevolent flooding and desynchronization.

##### **4.2 Wormhole Attack**

One hub in the system (sender) makes an impression on the an alternate hub in the system (beneficiary node)[11].Then the getting hub endeavours to send the message to its neighbours. The neighbouring hubs think the message was sent from the sender node (which is for the most part out of extent), so they endeavour to send the message to the beginning hub; however it never lands since it is too far away.

Wormhole attack is a huge risk to remote sensor systems, on the grounds that, this kind of attack does not require bargaining a sensor in the system rather, it could be performed even at the introductory stage when the sensors begin to find neighbouring data [13]. Wormhole attacks are hard to counter in light of the fact that steering data supplied by a hub is hard to check.

### **4.3 Sybil Attack**

In this attack, a solitary hub i.e. a vindictive hub will seem to be a set of hubs and will send off base data to a hub in the system. The off base data can be an assortment of things [11], counting position of hubs, sign qualities, making up hubs that don't exist. Confirmation and encryption systems can keep a pariah to dispatch a Sybil attack on the sensor system. In any case, an insider can't be kept from taking an interest in the system; be that as it may he ought to just have the capacity to do as such utilizing the personalities of the hubs he has traded off. Open key cryptography can anticipate such an insider attack, however it is so lavish it couldn't be possible be utilized as a part of the asset compelled sensor systems.

### **4.4 Node Capturing Attack**

A specific node may be selected in random and that particular node might be captured and the data might be collected by the malicious node.

### **4.5 Sinkhole Attack**

In a sinkhole attack, the adversary's point is to bait almost all the activity from a specific territory through a traded off hub, making an allegorical sinkhole with the foe at the focal point [4]. Sinkhole attacks normally work by making a bargained hub look particularly appealing to encompassing hubs with deference to the directing calculation. Sinkhole attacks are hard to counter on the grounds that steering data supplied by a hub is hard to confirm. As a case, a laptop-class foe has an in number force radio transmitter that permits it to give a top notch course by transmitting with enough power to achieve a wide region of the system [3].

## **V. DEFENSIVE MECHANISM**

### **5.1 DOS Attack Prevention**

The instruments to avert DOS attacks incorporate instalment for system assets, pushback, solid confirmation and distinguishing proof of movement [1] [2]. One security strategy employments confirmation streams to secure the reinventing methodology. These partitions a system paired into a progression of messages, each of which contains a hash of the following message. This instrument guarantees that an interloper can't capture a progressing project transmission, regardless of the possibility that he or she knows the hashing system. This is on the grounds that it would be practically difficult to develop a message that matches the hash contained in the past message. A digitally marked notice, which contains the system name, variant number, and hash of the first message, guarantees that the procedure is safely launched [2]. We can vanquish numerous dangers utilizing existing encryption and validation systems, and different methods, (for example, distinguishing sticking attacks) can ready system chairmen of continuous attacks or trigger strategies to save vitality on influenced gadgets [1].

### **5.2 Wormhole Attack Prevention**

The instrument to battle the wormhole attack incorporate, DAWWSEN [14], a proactive directing convention based on the development of a various levelled tree where the base station is the root hub, and the sensor hubs are the inner or the leaf hubs of the tree. An incredible point of interest of DAWWSEN is that it doesn't require any topographical data about the sensor hubs, and doesn't take the time stamp of the packet as a methodology for recognizing a wormhole attack, which is essential for the asset obliged nature of the sensor.

### 5.3 Sybil Attack Prevention

The systems to avoid against Sybil attacks are to use character certificates [12]. The essential thought is extremely basic. The setup server, before organization, doles out every sensor hub some exceptional data. The server then makes a character declaration tying this node's character to the doled out exceptional data, furthermore downloads this data into the hub. To safely exhibit its personality, a hub first displays its character authentication, and afterward demonstrates that it has or matches the related exceptional data. This procedure requires the trade of a few messages Merkle hash tree can be utilized as fundamental method for figuring character certificates.

The Merkle hash tree is a vertex-marked parallel tree, where the mark of each non-leaf vertex is a hash of the linking of the names of its two tyke vertexes. The essential way of a leaf vertex is the situated of vertexes on the way from the leaf to the foundation of the tree. The validation way comprises of the kin of the vertexes on this essential way. Given a vertex, its verification way, and the hash work, the essential way can then be registered, up to and counting the base of the tree. This figured estimation of the root can then be contrasted and a put away esteem, to confirm the genuineness of the mark of the leaf vertex [12].

### 5.4 Node Capture Attack Prevention

On the off chance that a hub has been bargained then how to reject that hub furthermore that hub just, from the sensor system is at issue. This issue is illuminated by (LEAP). Jump (confined encryption and confirmation convention) is a proficient convention for between hub movement validations. This convention depends on a key imparting methodology that approves in-system transforming, and in the meantime mitigates various conceivable attacks.

### 5.5 Sinkhole Attacks Prevention

Such attacks are extremely hard to safeguard against. One class of conventions impervious to these attacks is geographic steering conventions. Geographic conventions develop a topology on interest utilizing just restricted associations and data and without launch from the base station [16].

### 5.6 Selective Forwarding Attacks

Multipath routing can be utilized to counter these sorts of selective forwarding attacks. Messages directed over ways whose hubs are totally disjoint are totally secured against selective forwarding attacks including at most traded off Allowing hubs to powerfully pick a packet's next jump probabilistically from a set of conceivable hopefuls can further lessen the shots of an enemy increasing complete control of an information[17].

## VI. PHYSICAL ATTACKS AND ITS EFFECTS ON WIRELESS SENSOR NETWORKS

WSN's are designed as a layered architecture which makes these kinds of networks susceptible. This acts as a wall against many kinds of attacks [23]. The following table presents the details regarding the physical attacks.

**Table 1 Physical Attacks And Its Effects**

Attacks	Description	Techniques	Effects
Signal/Jamming	This tries to transfer radio signals emitted	Deceptive jamming, reactive jamming,	Radio meddling ,resource fatigue

		random jamming	
DOS(Path-Based)	Combinations of attacks include jamming attacks	To the base station huge packets of data are sent.	Accumulator in the nodes get exhausted, network disruption reducing WSNs availability.
Eavesdropping	By overhearing the contents of the communication	Misusing the wireless character of the sensor networks transmission medium, interception	inducting few other assaults, extracting sensitive WSN data, Deleting privacy protection,
Node capturing attack, Device tampering attack	Direct physical access, captive and replaced nodes	Eavesdropping, Invasive attacks, non-invasive attacks,	smash up or transform physically alter node's services,
DOS attacks	Attacks in different layers of WSN's this reduces WSN,s availability.	Physical layer, Network layer, transport layer, application layer.	Effects of all the layer attacks(Physical layer, Network layer, transport layer, application layer)[14]

The table shows the various types of attacks in each layer, attack type, security mode and its best choice which might be given to the nodes in the wireless sensor nodes in order to control the attacks to a larger extent[23][3].

**Table 2 Different Types Of Attack**

Layer	Attack Type	Security mode	Optimal choice
Physical Layer	DOS attacks	DSSS/FHSS	FHSS around 1000 hops/second using Frequency Shift Keying
	Physical tampering		Use a hardware that is tamper resistant
Application layer	Assaults based on Aggregation		Aggregation
Data link layer	Jamming of data packets	Encryption	programme switching
Network Layer	Sybil	Pre-distribution of random keys,	Key management Architecture
	Black holes	Schemes based on Key Management	REWARD algorithm[19]
	Wormholes	TIK[20]	Symmetric cryptography

## VII. CONCLUSION

WSN security is a critical issue which is persuaded towards guaranteeing security under the strict requirements of computational force, vitality and other equipments. Besides, the accompanying focuses can be included. Security of a WSN is subject to securing for all the layers. From multiple points of view security has been seen as a standalone part of a framework's construction modeling or idea in retrospect, where a different module gives security. To attain a protected framework, security must be embedded into each part. As a rule not coordinating security to parts amid framework advancement outline, part has turned to be a state of assaults. The proposed methodology addresses a few viewpoints, being exceptionally adaptable and ready to be effectively adjusted to various types of situations when contrasted and the accessible methodologies. However a coordinated methodology of secured steering convention and key-administration construction modeling would without a doubt yield a superior security measure for the Wireless Sensor Networks.

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# GRANULATION PROCESS IN UASB REACTOR AND ITS ENHANCEMENT: A REVIEW

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## ABSTRACT

*The up flow anaerobic sludge blanket reactor (UASB) has been used successfully treat a variety of wastewaters. The aim of this review is to synthesize and analyze information on how the process of granulation is affected by environmental and operational conditions in the reactor. The factors reviewed are strength of substrate, nutrients, multivalent cations and heavy metals, exocellular polymer, and addition of natural and synthetic polymers. Careful temperature control and adequate alkalinity is required for generation and maintenance of granules. Nature and strength of substrate in conjunction with intra-granular diffusion to a large extent determines the microstructure of the granules. The addition of external additives as ionic polymers may enhance granulation in the upflow anaerobic sludge blanket reactors.*

**Keywords:** *Cations, Granulation, Polymers, UASB Reactor*

## I. INTRODUCTION

The upflow anaerobic as compared to other sludge treatment methods, such as incineration, composting an aerobic treatment, anaerobic digestion, despite its potential of producing a useful fuel, is more beneficial due to its small land requirement and low excess sludge production. Among the anaerobic digesters, high-rate digesters are popularly used in sewage treatment. This is because, unlike the conventional low-rate anaerobic digesters such as anaerobic ponds and septic tanks, high-rate anaerobic reactors are designed to operate at short hydraulic retention times (HRT) and long solids retention times (SRT) to incorporate large amounts of high-activity biomass, thus allowing improved sludge stabilisation and higher loading capacity[1].

The common high-rate digesters a upflow anaerobic sludge blanket, expanded granular sludge bed, anaerobic filter anaerobic baffled, anaerobic migrating blanket, sequencing batch, anaerobic hybrid, hybrid upflow anaerobic sludge blanket, as well as fully mixed liquid digesters such a continuous-stirred tank digesters. The upflow anaerobic sludge blanket (UASB) reactors are by far the most robust high-rate anaerobic reactors for sewage treatment and there have been more than 1000 UASB reactors installed worldwide [2].

One of the major drawbacks of anaerobic digesters has been the requirement of long solids retention time which is not associated with the increasing volume of sludge produced from industrialization and human activities. Other drawbacks have been the long start-up period, impure biogas and incomplete or insufficient removal of

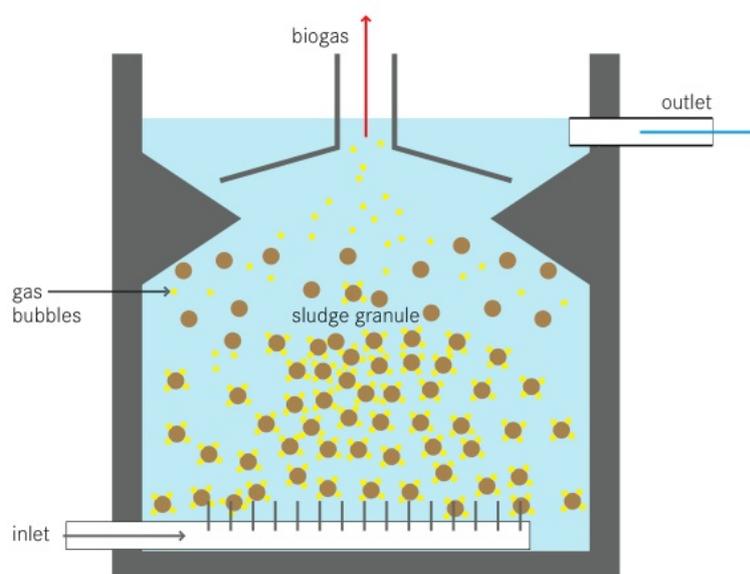
organic matters, pathogens and nutrients in the final effluent, thereby failing to comply with the local standards for discharge or reuse.

Therefore, researchers are trying to find out new technologies to enhance the performance of anaerobic digesters, especially on the effluent quality, start up and biogas purification, in order to develop a global sustainable wastewater treatment technology. Recent reviews mostly focused on anaerobic digestion [3], granulation [2] and post-treatment technology. There is still a lack of reviews and documentation on the enhancements of high-rate anaerobic digestion with collective information. There-fore, the goal of this review article is to compile the various advances made in addressing the performance enhancement technologies on high-rate anaerobic digesters, with emphasis on the UASB reactors, to serve as a database for the preliminary selection of the anaerobic digesters (type and/or method), as well as to provide perspectives for future improvement on domestic sludge treatment processes.

## II. THE UASB TECHNOLOGY

### 2.1. The UASB Reactor

The schematic diagram of a UASB reactor is shown in Fig. 1. The reactor consists of two parts: rectangular and cylindrical Column and a gas liquid solid (GLS) separator [1]. The UASB reactor is initially see(with inoculums such as digested, anaerobic, granular and activated sludge). Sludge enters from the bottom of the reactor. Under appropriate conditions, light and dispersed Particles will be washed out while heavier components will retain, thus minimizing the growth of finely dispersed sludge whilst forming granules or flocs consisting of the inert organic, inorganic matters and small bacterial aggregates in the seed sludge [1]. After a certain period (usually 2-8 months), depending on the operating conditions and the characteristics of the wastewater and seed sludge a very dense sludge bed which may be granular or flocculent in nature with high settling properties develops. Above the dense sludge bed, there is a sludge blanket zone with a much diffused growth and lower particle setting velocities [3].



**Fig. 1 Schematic Diagram of a UASB Reactor**

The biological reactions take place throughout the highly active sludge bed and blanket zone. As the flow passes upward, the soluble organic compounds in the influent are converted to biogas consisting of mainly methane and carbon dioxide. The produced biogas and the sludge buoyed by the entrapped gas bubbles are then separated from the effluent by the immersed GLS separator, in which the baffles prevent as efficiently as possible the wash-out of the viable bacterial matter or floating granular sludge by sliding the settled solids back to the reaction zone [1,4].

### **III. GRANULATION**

The effectiveness and stability of a UASB reactor depends strongly on the initial start-up, which in turn is mainly affected by numerous physical, chemical and biological parameters [5], such as the type of wastewaters, the operating conditions and the characteristics, availability and growth of active microbial populations in the seed sludge or inoculums. An acclimatization period is required before the full design organic loading rates can be applied to inoculate the seed sludge to the operating conditions. This period which is typically 2-8 months [6] is rather long and has been the major hitch of the industrial applications of UASB reactors.

### **IV. ENHANCING FACTORS OF GRANULATION**

#### **4.1 Substrate Characteristics**

No layer in the granules was reported to form with propionate, peptone, ethanol, and glutamate as substrates [7-9]. The granules also do not show any layered structure in the presence of an inhibitory substrate such as phenol or lindane [7]. Methano-genesis is reported to be the rate-limiting step in the anaerobic degradation of the non-inhibitory substrate whereas with the inhibitory substrate, acetogenesis, is identified as the rate-limiting step [10-12]. Low substrate concentration in the feed may result in substrate limitation at the core of the larger granules as majority of the substrate is utilized near the surface [13].

#### **4.2 Multivalent Cations and Heavy Metals**

The cations may accelerate this process through bridging between negatively charged groups on cell surfaces and linking exocellular polymers [1, 14, 15]. In addition, multivalent cations condense the diffused double layers and facilitate flocculation due to Vander Waals forces [15]. The predominant binding groups for metals on the surface of bacteria are carboxyl and amino groups in proteins.

#### **4.3 Inoculums**

In order to select the best inoculums source for a specific type of wastewater, the toxicity and biodegradability tests as reported in the literature can be used [16]. Although a UASB reactor can perform efficiently without granules, granule formation during start-up lends a decided advantage for its ability to provide high COD removal efficiency within a much shorter period, allowing treatment for larger volumes of wastewater. The importance of granules in the operation of UASB reactors has led to an increasing number of studies on the relevant theories and mechanisms of anaerobic granulation [1,15]. According to [15], the initial development of granules can be divided into four steps: (1) Transport of cells to a substratum (i.e. an un-colonized inert material or other cells); (2) Initial reversible adsorption to the substratum by physicochemical forces; (3) Irreversible

adhesion of cells to the substratum by microbial appendages and/or polymers; (4) Multiplication of the cells and development of granules.

#### **4.4 Different Types of Cations**

Previous studies have suggested that the presence of divalent and trivalent cations exert positive impact on granulation process by neutralizing negative charges on bacterial surfaces, serving as cationic bridges between bacteria. Investigators [16,17] successively studied the roles of a few specific multivalent cations on granulation using the same UASB reactor of 7.3 L in volume for treating synthetic wastewater with influent COD concentration of 4000 mg/L. They found that with an optimum concentration of iron ( $\text{Fe}^{2+}$ ) at 300 and 450 mg/L, the granulation process was accelerated; higher  $\text{Fe}^{2+}$  concentration in the feed (more than 450 mg/L) resulted in excessive deposition of minerals on the granules, therefore deteriorating the bacterial specific activity [16]. As with the addition of calcium ( $\text{Ca}^{2+}$ ), the optimum concentration of  $\text{Ca}^{2+}$  at 150-300 mg/L enhanced biomass accumulation and granulation process by accelerating the adsorption, adhesion and multiplication of the granulation process [17]. On the other hand, the addition of aluminium ( $\text{Al}^{3+}$ ) at 300 mg/L resulted in the formation of large granules and shortened the granulation time by approximately one month [18-19], who examined the effect of adding aluminium chloride on the treatment of low-strength (650-750 mg/L) synthetic wastewater, in contradiction to the earlier study [19], found that the addition of  $\text{Al}^{3+}$  at 200-300 mg/L (either continuously throughout the operation or during the start-up) adversely affected COD removal efficiency and growth of agglomerates. A smaller concentration of  $\text{Al}^{3+}$  at 50 mg/L on the other hand, did not affect the COD removal efficiency but adversely affected the growth of agglomerates [19]. These studies [18,19] have critically suggested that the optimum concentration of the studied multivalent cations is dependent on the influent COD concentration. Consequently more research studies are needed to determine their relationships and roles in the granulation process.

#### **4.5 Different Polymers**

##### **4.5.1 Moringa Oleifer Seeds (WEMOS)**

In addition to the use of multivalent cations, the addition of natural polymers, such as water extract of the Moringa Oleifer seeds (WEMOS) [20], Chitosan [2, 21], Reetha extract [2, 21] and powdered bamboo-charcoal [22], as well as commercial and synthetic polymers, such as the commercial cationic polymer "AA 180H" [23, 24] and organic-inorganic hybrid polymers [25] also showed promising results in enhancing the start-up and granulation in UASB reactors.

##### **4.5.2 Chitosan and Reetha Extract (Bulk, Cationic Fraction, and Anionic Fraction)**

Chitosan and Reetha extract (bulk, cationic fraction, and anionic fraction): Chitosan is a modified polysaccharide, mostly produced by alkaline deacetylation of chitin. In a UASB reactor, granules start to form with the aggregation of acidogens, and with methanogens enclosed inside, leading to the formation of an elastic hydrophilic layer and a hydrophobic inner core, thus decreasing the wash-out of methanogens. Due to this nature, Chitosan has shown positive results in enhancing sludge granulation and has exceeded Percol 763, as well as both the cationic and anionic fraction of Reetha extract in treating synthetic wastewater [2, 21]. In the

latter, large granules were formed and their stabilities were shown to be stable, indicating the low possibility of substrate-diffusion limitations with low organic loading.

#### **4.5.3 Commercial Cationic Polymer “AA 180H”**

Commercial cationic polymer “AA 180H”: [23, 24] demonstrated the impact of a commercial cationic polymer “AA 180H” at concentrations 5-20 mg/L on granulation and organics removal efficiency in treating synthetic sludge with COD 5000 mg/L. With dosage of 20 mg/L, the organic loading capacity of the UASB reactor was increased from 19.2 to 25.6 g COD/L/d (Wang et al., 2004); whilst with dosage of 80 mg/L, the start-up period was shortened and the granules in UASB reactors were strengthened and exhibited the best settleability at all studied organic loading rates (OLRs) (2-40 g COD/L/d), leading to increased organic removal efficiency and loading capacity of the UASB system [23].

#### **4.5.4 Organic-Inorganic Hybrid Polymers**

From [25] Synthesized organic-inorganic hybrid polymers and added to the UASB reactors. It was found that granular sludge was formed within 5 min. The granules were stable throughout the operation and the COD removal efficiency was as high as 90% at even up to 18 g COD/L/d of OLR.

### **V. CONCLUSIONS**

The presence of adequate nutrients and metals is essential for granulation. Calcium and iron may enhance granulation but are also capable of causing mass transfer limitation when present in large quantities. The effect of calcium is influenced by phosphate. Another challenge is to shorten the start-up time of the reactor by enhancing granule formation. Various external additives have shown promising results in this direction, however, most of these studies are limited to laboratory-scale reactor. The effect of these additives should be investigated in pilot-scale reactors along with the economics of the additives.

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# **SPEED CONTROL OF AN INDUCTION MOTOR USING FUZZY LOGIC AND PI CONTROLLER AND COMPARISON OF CONTROLLERS BASED ON SPEED**

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## **ABSTRACT**

*Induction motor drives are widely used in industries because of its high efficiency, reliability, and high robustness, low cost and self-starting capability. In spite of this popularity, the induction motor has two inherent limitations (1) The standard motor is a variable speed machine, its full load slip varies less than 1% and (2) It is not inherently capable of not providing constant speed operation. These kinds of limitations are now solved through the use of smart motor controllers and adjustable speed controllers. Fuzzy logic concept (FLC); one of the artificial intelligent methods has found high applications in most of the nonlinear systems like the electric motor drives. This can be used as controller for any system without requirement of the system mathematical model unlike that the conventional electrical drive control; which uses the mathematical model like FLC; proportional integral (PI) controllers are also used for high applications in the electric motor drives. But in this paper it has shown that FLC is more reliable; efficient and huge dynamic performance. Due the usage of the FLC concept, efficiency, reliability and performance of the AC drive increases. The proposed method improves the dynamic performance of the induction machine compare to the conventional speed control of the induction motor drives and has got a faster response time. The simulation is carried out using various tool boxes in MATLAB. The simulation results presented in this paper shows the effectiveness of the proposed method.*

**Keywords:** *Fuzzy logic concept (FLC), Induction Motor, MATLAB Simulink, PI Controller and Reliability.*

## **I. INTRODUCTION**

Induction motors are widely used in various industries as prime workhorses to produce rotational motions and forces. Basically, variable-speed drives for induction motors require both wide operating range of speed and fast torque response, regardless of load fluctuation. Normally, the classical control is used in majority of the electrical motor drives. Conventional control method makes use of the mathematical model for the controlling system when there is a system parameters variation or environmental disturbance and behavior of system is not satisfactory. In addition, usual computation of system mathematical model is difficult or impossible. The designing of conventional controller increases the implementation cost and adds additional complexity in the control system & thus, it may reduce the reliability of the control system. Hence, the fuzzy logic based techniques are used to overcome this kind of problems. DC motors are controllable more than AC motors but

the implementation cost required is more. And a DC motors has got higher volume and weight compared to the AC motors. Induction motors (one type of AC motors) are robust, require low maintenance and have many applications in industries.

Usually, the classical control used in motors drive design and implementation has many difficulties, which are as follows. It is on the basis of the mathematical accurate model of the system, that usual it is not known. Drives are nonlinear systems and classical control performance with this system performance decreases. Variation of machine parameters by load variation, motor saturation or thermal variations do not cause expectation performance. With the selected coefficients, classical control cannot receive acceptable results. Voltage source inverter-fed induction motors are most preferred for variable speed drive applications. The controller choice for a SVPWM drive is determined by the requirements of the type of application & is the most successful technique used in meeting the above requirements. The induction motors are commonly used nowadays due to advances in power electronics, microprocessors and variable-speed drives.

The SVPWM control has been widely used in many applications, such as electric vehicle drive systems AC servos and so on. Using this type of control, a highly coupled, multivariable nonlinear induction motor can be simply controlled through linear independent decoupled control of the flux and torque, similar to separately excited DC motors. SVPWM method is an advanced, computation intensive PWM method and possibly the best among all the PWM techniques for variable speed drives application. Because of its greater performance characteristics, it has been finding huge number of applications in recent years. With a machine load, the load neutral is normally isolated, which causes interaction among the phases. This type of interaction was not considered before in the PWM discussion. Recently, fuzzy logic control technique has found many applications in the past decades, which overcomes all these drawbacks. Hence, fuzzy logic control technique has the capability to control nonlinear, uncertain systems even in the case where no mathematical model is available for the controlled system. Recently, fuzzy logic control has found many applications in the past decades, which overcomes these drawbacks. Hence, fuzzy logic control technique has the capability to control nonlinearity, uncertain systems even in the case where no mathematical model is available for the controlled system. This project will focus on FLC techniques and the comparison with the classical PI controller.

## II. METHODOLOGY

The reliability and performance of the AC drives depends on the progress in power and microelectronics, artificial intelligent techniques, different control methods and so on. The vector control of ac drives has been widely used in high performance control system. Indirect field oriented control is one of the most effective vector control of induction motor due to the simplicity of designing and construction. Usually, the classical control is used in majority of the electrical motor drives. Conventional control technique makes use of the mathematical model for the controlling system, when there is a system parameters variation or environmental disturbance, behavior of system is not satisfactory. In addition, usual computation of system mathematical model is difficult or impossible. The design and tuning of conventional controller increases the implementation cost and adds additional complexity in the control system & thus, it may reduce the reliability of the control system. Hence, the Fuzzy and PI based techniques are used to overcome this kind of problems.

## 2.1 Induction Motor Modelling

In the control of any power electronics drive system, a mathematical model of the plant is required. This mathematical model is required further to design any type of controller to control the process of the plant. The induction motor model is established using a rotating ( $d, q$ ) field reference (without saturation) concept. The power circuit of the 3- $\Phi$  induction motor is shown in the Fig.2.1 the equivalent circuit used for obtaining the mathematical model of the induction motor is shown in the Fig.2.2 an induction motor model is then used to predict the voltage required to drive the flux and torque to the demanded values within a fixed time period. Finally calculated voltage is then synthesized using the space vector modulation.

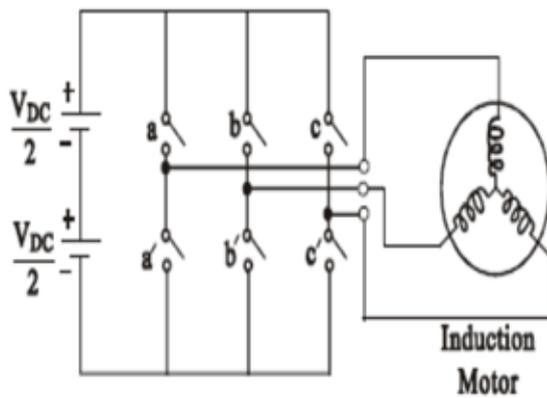


Fig.2.1 Power Circuit of The 3- $\Phi$

### Induction Motor

$$V_{sd} = R_s i_{sd} + \frac{d}{dt} \lambda_{sd} - \omega_d \lambda_{sq} \quad (2.1)$$

$$V_{sq} = R_s i_{sq} + \frac{d}{dt} \lambda_{sq} - \omega_d \lambda_{sd} \quad (2.2)$$

$$V_{rd} = R_r i_{rd} + \frac{d}{dt} \lambda_{rd} - \omega_{dA} \lambda_{rq} \quad (2.3)$$

$$V_{rq} = R_r i_{rq} + \frac{d}{dt} \lambda_{rq} - \omega_{dA} \lambda_{rd} \quad (2.4)$$

Where,  $V_{sd}$  and  $V_{sq}$ ,  $V_{rd}$  and  $V_{rq}$  are the direct axes & quadrature axes stator and rotor voltages.

The squirrel-cage induction motor considered for the simulation study in this project, has the  $d$  and  $q$ -axis components of the rotor voltage zero. The flux linkages to the currents are related by the Eq. (2.5) as

$$\begin{bmatrix} \lambda_{sd} \\ \lambda_{sq} \\ \lambda_{rd} \\ \lambda_{rq} \end{bmatrix} = M \begin{bmatrix} i_{sd} \\ i_{sq} \\ i_{rd} \\ i_{rq} \end{bmatrix}; M = \begin{bmatrix} L_s & 0 & L_m & 0 \\ 0 & L_s & 0 & L_m \\ L_m & 0 & L_r & 0 \\ 0 & L_m & 0 & L_r \end{bmatrix} \quad (2.5)$$

## III. FUZZY LOGIC TOOLBOX SOFTWARE

The Fuzzy Logic graphical user interface (GUI) tools are used to build a Fuzzy Inference System (FIS). The following GUI tools are used to build, edit, and view fuzzy inference systems:

Fuzzy Inference System (FIS) Editor is to handle the high-level issues for the system. Fuzzy Logic Toolbox software does not limit the number of inputs. However, the number of inputs may be limited by the available

memory of machine. If the more number of inputs present, or the lengthier membership functions, then it may also be difficult to analyze the FIS using the other GUI tools.

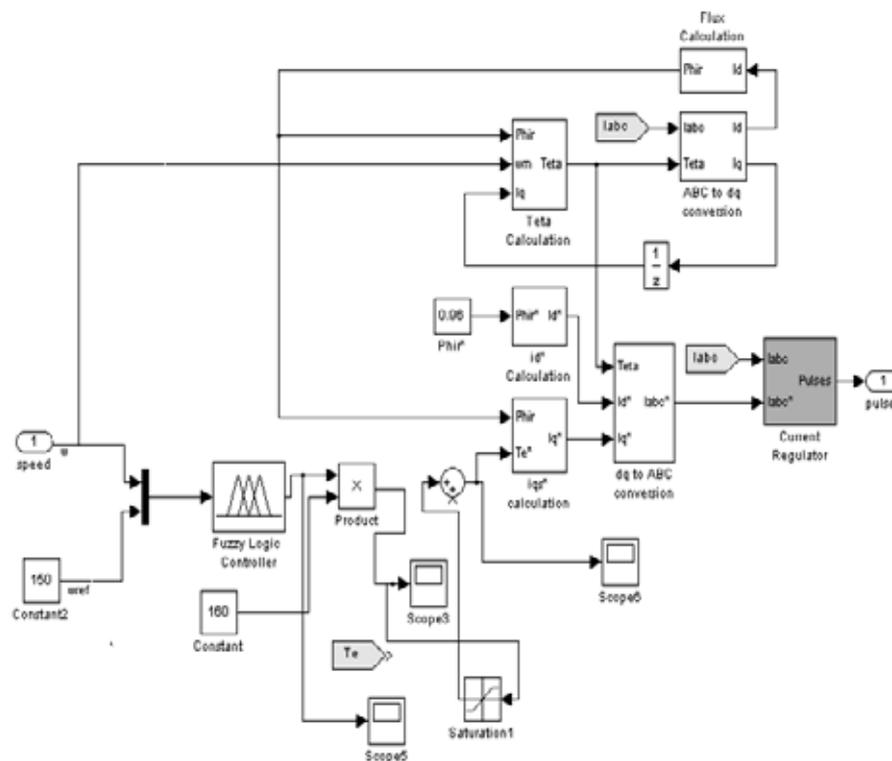
**Membership Function Editor** to define that the shapes of all the membership functions associated with each variable. **Rule Editor** is to edit the rules which are listed that, which defines the behavior of the system. **Rule Viewer** to view the fuzzy inference diagram. One can use this viewer as a diagnostic to see, for example, which rules are active, or how the individual membership function shapes influence the results.



**Fig.3.1 Fuzzy Logic Toolbox**

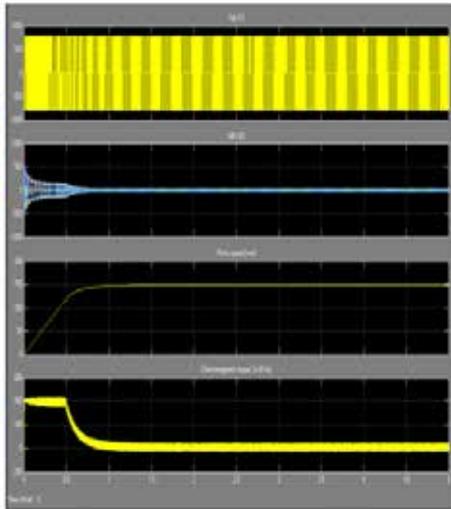
#### IV. SIMULATION CIRCUITS AND RESULTS

Fig. 4.1 shows the Simulink circuit for fuzzy model and Fig. 4.2 Proportional integral block.

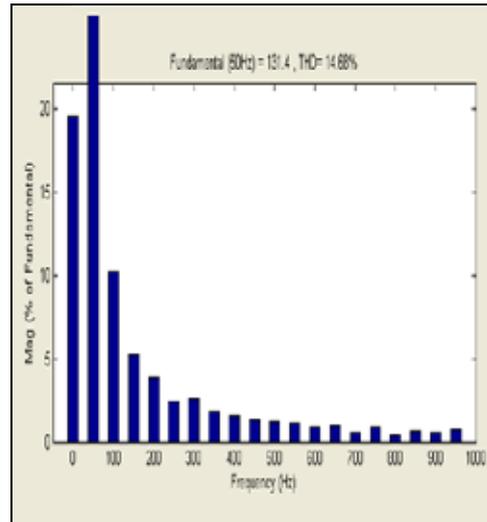


**Fig. 4.1 Fuzzy Simulink Block**





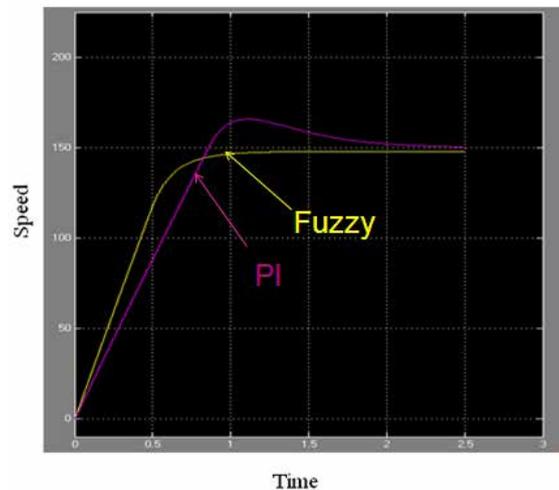
**Fig. 4.5 Voltages, Currents, Speed & Torque v/s Time of FLC**



**Fig.4.6 T.H.D at 0.5 second & 50 Hz Freq. of Fuzzy Controller**

#### 4.2 Observations

From the simulation results it is observed that the settling time taken by the FLC is less compared to that of PI controller and also from the T.H.D analysis carried out for different start time, it is observed that the percentage T.H.D associated with Fuzzy logic controller is less compared to PI as shown in table 4.1. From this we would come to know that fuzzy method is better than PI controller. In the Fig.4.7 pink line represents PI & yellow line represents fuzzy which settled early than that of PI controller.



**Fig.4.7 Speed Comparison of FLC and PI**

**Table 4.1 T.H.D Analysis of PI & Fuzzy Logic Controllers**

Sl. no.	Start time	PI		Fuzzy	
		Freq. (Hz)	T.H.D	Freq. (Hz)	T.H.D
1	0.08	78.33	64.88%	125.8	59.68%
2	0.18	89.3	73.26%	66.52	34.79%
3	0.28	81.15	67.16%	88.77	34.20%

4	0.38	56.29	37.37%	150.0	43.21%
5	0.48	77.23	36.07%	131.4	14.68%
6	0.58	102.6	35.33%	73.25	20.12%
7	0.68	110.8	23.73%	45.41	23.33%
8	0.98	43.6	21.17%	29.84	29.84%

## V. CONCLUSION

The speed control of an induction motor drive by means of the fuzzy and PI controller technique using SVPWM concept has been investigated in this project. A new FLC that improve the performance of scalar IM speed drives has been proposed. The method uses a new linguistic rule table in FKBC to adjust the motor control speed and FLC can achieve a good system performance of the IM scalar drive. The performance, reliability and efficiency of the induction motor drives are more in the case of FLC rather than that of PI Controller.

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# A COMPARATIVE STUDY OF CONTENT MANAGEMENT SYSTEMS: Joomla, Drupal and Wordpress

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## ABSTRACT

CMS (Content Management System) is a software program that helps us to develop and maintain the website easier and faster way. These days there are several CMS available varying based on functionalities and platforms. Joomla, Drupal and Wordpress are the three most popular content management systems (CMS). All three are open source and built on PHP + MySQL and vary significantly in terms of features, capability, flexibility and ease of use. This paper discusses about comparative study of most widely used content management systems Joomla, Drupal and Wordpress. This study attempt to analyze each CMS on the basis of usage, design, performance, scalability, compatibility with different platforms, security purpose, and search engine visibility This study will help an individual or organization to choose an appropriate CMS for their specific web application and shows the good CMS will be helpful for users to include different features in the website using plugging and the widget.

**Keywords:** CMS, Drupal, Joomla, Wordpress

## I. INTRODUCTION

CMS- Content Management System is a computer application. CMSs are mostly used to develop web application containing blogs, news, events and shopping. Many Govt. Organization, Corporate, Shopping and Marketing website use CMS. CMS is normally used to avoid to write the code. CMS provide the default structure of the website in which one has to create page, articles, news etc. and put the content in that and CMS automatically display the contents on the website. A content management system (CMS) is a stand-alone application to create, manage and the store content. As we know that a webpage's have text, graphics, photos, video, audio etc that display content or interacts with the user. CMS provides all above inbuilt features and many more.

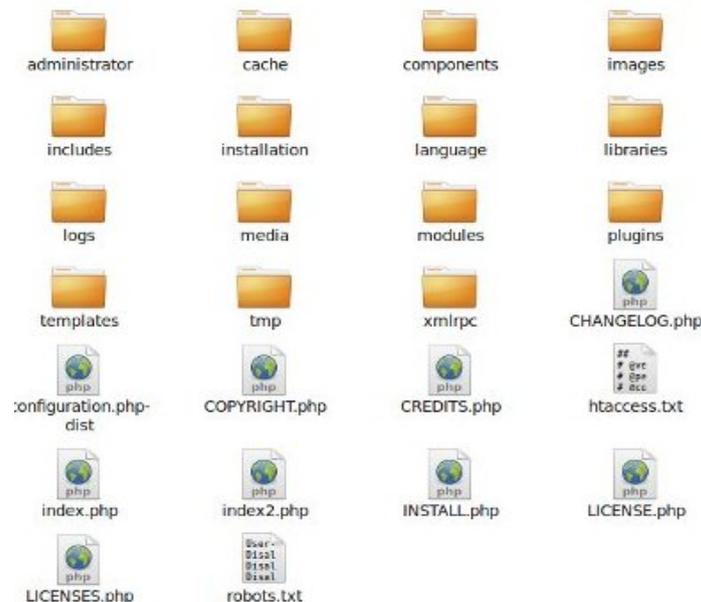
## II. JOOMLA

Joomla is a free open source content management system(CMS), which enables you to develop Web sites, web application and powerful online application that can also be used independently. Joomla is a class of Open Source CMSs written in scripting language PHP with using the techniques of OOP and MySQL database for the backend. Joomla provide us lots of inbuilt features that helps us to create or develop an attractive dynamic website with formatting features are like User Management, Media Manager, Languages Manager, Banner

Management, Contact, Polls, Search, Web Link, Content, Menu, Templates, Web services Management and Powerful Extensibility.

## 2.1 Joomla File Structure

It is essential to understand the directories and files structure in Joomla site. When Joomla is installed, there will be a default file structure either on the local machine or on the server. These days Linux server provides the one click installation or setup feature. Below is an example showing how each folder has all the important documentation structured and organized.



Joomla follow the Model-View-Controller (MVC) design pattern that separates the data gathering (Model), presentation (View) and user interaction (Controller) activities of a component from each other. Such separation allows for expanding or revising properties and methods of one section without requiring additional changes to the other sections. Joomla file loading system enables developers to work with separate files for controllers, views and models without worrying about placing the right file in the right place.

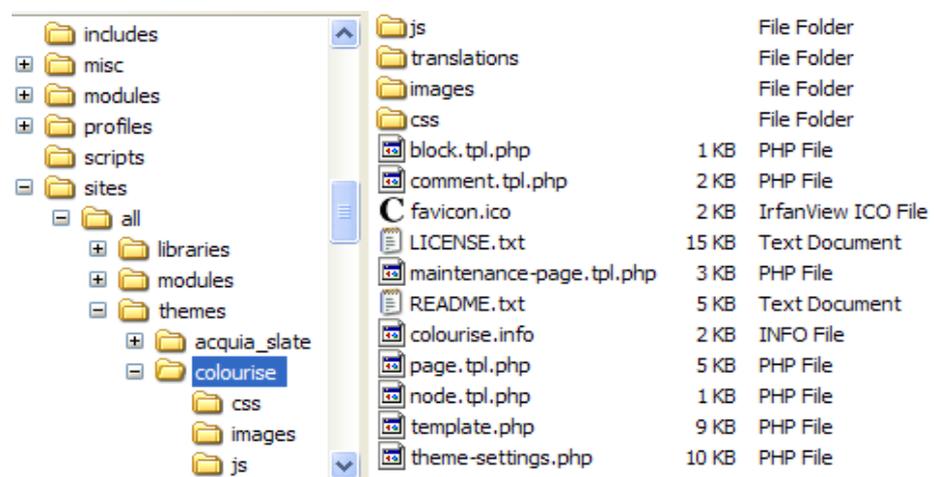
## 2.2 Joomla Core Features

1. Provide attractive graphical administrative interface.
2. Powerful WYSIWYG Editor.
3. Built-in site search engine.
4. Easy to create, publish, reorder and edit articles or pages with only clicks.
5. Easy to create menu, submenu, reordering and manipulation.
6. Preview the page content without publishing.
7. Content hierarchy structure fully editable and manageable.
8. Manage images from within system or externally through FTP.
9. Images banners, text rotation with impression and click counter.
10. Syndicate site contents in a variety of RSS formats.
11. No specialized tools or programming languages needed to update.
12. SEO Friendly URLs

### III. DRUPAL

Drupal is an Open Source CMS written in PHP and uses MySQL, PostgreSQL or MS SQL for database. Drupal can be setup on Linux, Windows or Macintosh OS. It is distributed under GPL (“GNU General Public License”) and is free to download. The architecture of the Drupal follows the PAC (Presentation-Abstraction Control). The architecture of Drupal is designed in such a way that the three different layers work independently and correlate with each other to give the final output. These three layers are the content which forms the website, the application algorithm that organizes this content for presentation, and the representation layer which is incorporated by the Drupal theme system. The webpage that comes to a viewer’s browser goes through a sequential process in which Drupal modules take all the relevant content from the databases and then the theme gets ready for the final presentation. Unlike Joomla, Drupal’s architecture does not follow the design pattern of MVC but instead follows the Presentation-Abstraction Control (PAC).

#### 3.1 Drupal File Structure



#### 3.2 Drupal Core Features

1. **Templates** – Easy to change the website template.
2. **Modules** - Install third party programs or functionalities very easily.
3. **Multiple-user** – Provide Multi-level permission user content creation and editing and enhance the security of web content.
4. **Multiple-level menu system** – Support the multiple level main menu, sub menu and nested submenu.
5. **Pages** – Easy to add /edit text, image, and other media content.
6. **Blog** – Also provide the full blog/articles with member comments capability functionality.
7. **Contact Form** - Provides the use of both personal and site-wide contact forms.
8. **Polls** - Provides the facilities to get votes on different topics in the form of MCQ.
9. **Search** - Provides site-wide keyword searching.
10. **Upload** - Allows users to upload and attach files to content.
11. **Statistics** - Provides Site Statistics Reporting.
12. **Taxonomy** - Provides the categorization of content

13. **FAQ Management** – FAQ module allows users, with appropriate permissions, to create question and answer pairs which they want displayed on the 'FAQ' page.
14. **Workflow Engine** - The Maestro module is a workflow engine/solution that will facilitate simple and complex business process automation.
15. **News Feed** - Provides syndicated content (RSS, RDF, and Atom feeds).
16. **Comment and Tracker** - Allow users to comment on and discuss published content and tracking of recent posts for users.
17. **Content translation** - Provide the translation of content in different language (This feature is an imperfect translation - Google translate feature is a better solution and easy to implement)
18. **Ping** – Provide the alert features when site is updated other sites when the site get the alerts of updation.
19. **Profile** –Easily add user and update user profile management.
20. **Trigger** - Provides the capability for actions to be generated on certain system events, such as when new content is created
21. **OpenID** – Allows users to log into the site using OpenID

## IV. WORDPRESS

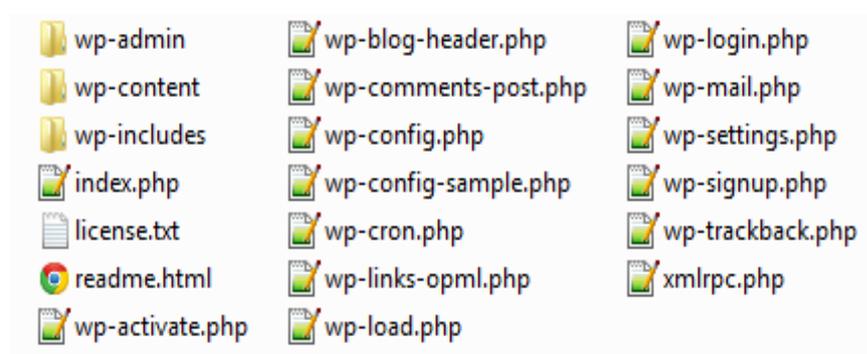
Wordpress is a completely free tool used to create dynamic website. Originally, Wordpress was developed for creating a Blogging software.

### 4.1 What is a Blog ?

A blog is a type of website or part of a website that is maintained on regular basis by it owner reviews, opinions, and video. In the verb form "BLOGGING" means to post to your blog.

WordPress is an open source blogging tool powered by PHP and MySQL. WordPress can be customized into a content management system. WordPress is easy to install and configure which allows businesses to set up and run a website or blog at a lower cost than hiring more web developers. WordPress provides good search engine optimization features which will help to increase the online presence of our company

### 4.2 Wordpress File Structure



### 4.3 Wordpress Core Features

1. **Simplicity** -Simplicity makes it possible for you to get online and get publishing, quickly.
2. **Flexibility**- you can create any type of website like blog or website, a business website, a professional portfolio, a government website, a magazine or news website, an online community, even a network of

websites.

3. **Easy to publish-** You can create Posts and Pages, format them easily, insert media, and with the click of a button your content is live and on the web.
4. **Publishing Tools** -Wordpress makes it easy for you to manage your content. Create drafts, schedule publication, and look at your post revisions. Make your content public or private, and secure posts and pages with a password.
5. **User Management-** Administrators manage the site, editors work with content, authors and contributors write that content, and subscribers have a profile that they can manage.
6. **Media Management-** Provide powerful media management with lots of media extensions
7. **Easy Theme System** - Wordpress have two default themes and there are theme directory with thousands of themes for you to create a beautiful website.
8. **Extend with Plugins-** Wordpress comes packed full of features for every user, for every other feature there's a plugin directory with thousands of plugins
9. **Multilingual** – Wordpress support more than 70 languages.
10. **Importers** - Wordpress comes with importers for blogger, LiveJournal, Movable Type, TypePad, Tumblr, and WordPress. If you're ready to make the move, we've made it easy for you.
11. **Freedom** -Wordpress is licensed under the GPL which was created to protect your freedoms. You are free to use WordPress in any way you choose: install it, use it, modify it, distribute it.
12. **Community-** Wordpress has a vibrant and supportive community.

See the comparison chart below for more insight into the differences in these top content management systems Joomla, Wordpress and Drupal.

	<u>Joomla</u>	<u>WordPress</u>	<u>Drupal</u>
Website	<a href="http://joomla.org">joomla.org</a>	<a href="http://WordPress.org">WordPress.org</a>	<a href="http://drupal.org">drupal.org</a>
Latest version	3.4.1	4.1.1	7.36
License	Open Source	Open Source	Open Source
Supported databases	MySQL, PostgreSQL	MySQL	MySQL, PostgreSQL
Platform	PHP	PHP	PHP
<b>Security</b>			
Content Approval			
Email Verification			
Granular Privileges			
Authentication methods	LDAP, Custom	LDAP (plugin), Custom	LDAP (plugin), NTLM (plugin), Custom
Session Management			
SSL Compatible			
Login History			

	<u>Joomla</u>	<u>WordPress</u>	<u>Drupal</u>
Modifications History			
<b>Support</b>			
Commercial Support			
Developer Community			
Public Forum			
Plugin API			
<b>Features</b>			
Drag & Drop Content			
Image Resizing			
Multiple Upload			
Spellchecker			
Style Wizard			
Subscriptions			
Undo			
WYSIWYG Editor			
Extensible User Profiles			
Interface Localization			
<b>Performance</b>			
Caching			
Load Balancing			
Database Replication			
Static Content Export			
Multilingual Content			
Multi-Site Deployment			
RSS (Content Syndication)			
<b>Management</b>			
Advertising Management			
Content Scheduling			
Inline Administration			
Sub-sites / Roots			
Themes / Templates			
Web Statistics			
Web-based Translation			

	<u>Joomla</u>	<u>WordPress</u>	<u>Drupal</u>
Management			
Workflow Engine	✗	✗	✓
<b>Interoperability</b>			
FTP Support	✓	✗	✓
UTF-8 Support	✓	✓	✓
XHTML Compliant	✓	✓	✓
<b>Built-in Applications</b>			
Blog	✓	✓	✓
Contact Management	✓	✗	✗
Forum (Discussion)	✗	✗	✓
Document Management	✗	✗	✓
FAQ Management	✓	✗	✓
File Distribution	✗	✗	✗
Graphs and Charts	✗	✗	✗
Help Desk / Bug Reporting	✗	✗	✗
Job Postings	✗	✗	✗
Link Management	✓	✓	✗
Mail Form	✓	✗	✗
My Page / Dashboard	✓	✓	✗
Photo Gallery	✗	✓	✗
Search Engine	✓	✓	✓
Polls	✓	✗	✓
User Contributions	✓	✓	✓
Web Services Front End	✓	✗	✓
<b>SEO Features</b>			
Metadata	✓	✓	✓
SEO Friendly URLs	✓	✓	✓
Site Map	✗	✗	✗

#### 4.4 So Which CMS is Right for You?

It's a difficult question to answer. Apples and oranges are both fruit, but it's hard to quantify one feature or another that makes either better. The same holds true for Joomla, Drupal and WordPress. It's easy for site creators to be passionate about one CMS or the other, depending upon the requirements of the user and ease

of individual usage, anyone can be use as CMS. However perusal of the data available on the net, Wordpress has more uses as compared to Joomla and Drupal

## V. CONCLUSIONS

Wordpress, Joomla and Drupal are the three most popular content management systems (CMS). All three are open source and built on PHP + MySQL. All three vary significantly in terms of features, capability, flexibility and ease of use. Joomla enables you to build a site with more structural stability and content than Wordpress, and has a fairly intuitive interface. If user want a standard website with standard capabilities – a blog, a static/dynamic front-end, a forum, etc. then use Joomla. Joomla is also a good option for small to mid-tier e-commerce stores and want something more powerful for organizational use, consider Drupal. WordPress is often called a ‘mini CMS’. It isn’t nearly as powerful or capable as Drupal or Joomla, but is easy enough for any lay user. Use WordPress if the user want a simple, easy to use blogging solution that looks good and can accommodate multiple authors easily. If a user is building a much more complex site, though, he should turn to Drupal first. Though it's harder to learn, it has much more flexibility to scale a site in terms of complexity. It also has the ability to scale up into very complex sites to be used for a variety of business needs. Free and often powerful, open source content management systems can help you create a powerful website on a limited budget. Wordpress and Joomla are well suited to build smaller sites quickly, while Drupal support robust and complex functionality. Each CMS platform has a very strong developer community.

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# DATA INTEGRITY AND AVAILABILITY FOR CROSS CLOUD ENVIRONMENT BY USING CPDP SCHEME

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## ABSTRACT

*In recent years, cloud storage service has become a faster profit growth point by providing a comparably scalable, position-independent, low -cost platform for client's data. Since cloud computing environment is constructed based on open architectures and interfaces. It has the capability to incorporate multiple internal and external cloud services together to provide high interoperability there can be multiple accounts associated with a single or multiple service providers (SPs).so, Security in terms of integrity is most important aspect in cloud computing environment. Cooperative Provable data possession (CPDP) is a technique for ensuring the integrity of data in storage outsourcing. Therefore, we address the construction of an efficient CPDP scheme and dynamic audit service for distributed cloud storage as well verifying the integrity guarantee of an entrusted and outsourced storage which support the scalability of service and data migration.*

**Keywords:** Availability, Cloud Admin, Integrity, Multicloud, TTP, Verification

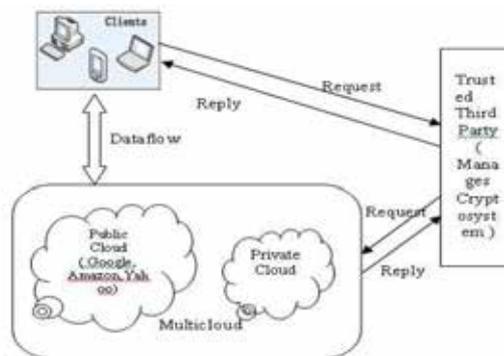
## I. INTRODUCTION

Cloud Computing, which is an Internet-based development and use of computer technology. Consider the large size of the outsourced electronic data and the client's constrained resource capability, the core of the problem can be generalized as how can the client find an efficient way to perform periodical integrity verifications without the local copy of data files.

The main objective of this paper is to provide security in terms of integrity and availability of client's data which is stored on cloud. This paper shall not put any burden on to computation and communication and further, performance guarantee shall also be taken care of by allowing trusted third party to verify the correctness of the cloud data on demand without retrieving a copy of the whole data or introducing additional on-line burden to cloud users. Several schemes are proposed to solve the problem. Those schemes focus on achieve the following requirements: high efficiency, stateless verification, retrievability of data, unbounded use of queries and public verification. In general, if one scheme supports private verification, it can possess higher efficiency, new challenges and new problems.

One of the most important and most attention issues, that is in the cloud environment, servers within the data storage with security in terms of integrity verification. For example, storage service providers may order their own interests to save the data to hide an error, more seriously, storage service providers in order to save cost and storage space, deliberately remove rarely accessed data, and then who, due to extensive confidential information, outsourcing and limited computing power users.

Therefore, how to backup data files in the user not the case, found an efficient and securely ways of good information to perform periodically verification, allowing users to know his information file is stored securely on the server, this data storage is cloud computing environment is an important security issue (fig 1).



**Figure 1: Verification of Integrity**

## II. EXISTING SYSTEM

Although existing CPDP schemes offer a publicly accessible remote interface for checking and managing the tremendous amount of data, the majority of existing CPDP schemes is incapable to satisfy the inherent requirements from multiple clouds in terms of communication and computation costs. To address this problem, we consider a multi-cloud storage service.

### 2.1 Disadvantage

- Integrity with lower computation and communication.
- Integrity is affected by the bilinear mapping operations due to its high complexity.

## III. PROPOSED SYSTEM

Clients who have a large amount of data to be stored in multiple clouds and have the permissions to access and manipulate stored data Cloud Service Providers (CSPs) who work together to provide data storage services and have enough storages and computation resources. And Trusted Third Party (TTP) who is trusted to store verification parameters and offer public query services for these parameters.

We consider the existence of multiple CSPs to cooperatively store and maintain the clients' data. Moreover, a cooperative PDP is used to verify the integrity and availability of their stored data in all CSPs. The verification procedure is described as follows: Firstly, a client (data owner) uses the secret key to pre-process a file which consists of a collection of  $n$  blocks, generates a set of public verification information that is stored in TTP, transmits the file and some verification tags to CSPs, and may delete its local copy; Then, by using a verification protocol, the clients can issue a challenge for one CSP to check the integrity and availability of outsourced data with respect to public information stored in TTP.

### 3.1 Advantages

- Making information storage, bandwidth and computational smaller, more efficient.
- Unlimited number of storage server authentication.
- Provides a public authentication method.
- Entrusted storage server.

## IV. DESIGN OF THE SYSTEM

### 4.1 Input Design

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- Ø What data should be given as input?
- Ø How the data should be arranged or coded?
- Ø The dialog to guide the operating personnel in providing input.
- Ø Methods for preparing input validations and steps to follow when error occur.

### 4.2 Objectives

1. Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.
2. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.
3. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow.

### 4.3 Output Design

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2. Select methods for presenting information.
3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

- ✓ Convey information about past activities, current status or projections of the
- ✓ Future.

- ✓ Signal important events, opportunities, problems, or warnings.
- ✓ Trigger an action.
- ✓ Confirm an action.

## **4.4 Module Description**

### **4.4.1 Number of Modules**

After careful analysis the system has been identified to have the following modules:

- ∅ **Cloud Computing Module.**
- ∅ **Cooperative Provable Data Possession Module.**
- ∅ **Data Storage Module.**
- ∅ **Integrity Verification Module.**

#### **4.4.1.1 Cloud Computing Module**

Cloud Computing, which is an Internet-based development and use of computer technology. Consider the large size of the outsourced electronic data and the client's constrained resource capability, the core of the problem can be generalized as how can the client find an efficient way to perform periodical integrity verifications without the local copy of data files. The main objective of this paper is to provide security in terms of integrity and availability of client's data which is stored on cloud.

#### **4.4.1.2 Cooperative Provable Data Possession Module:**

Proposed a data storage proved cooperative Provable Data Possession (CPDP) system, which applies to of cloud in an entrusted storage server, based on Diffie-Hellman protocol systems of main plant with state verify that the label is used to check the integrity of the data stored in the cloud, which allows unlimited number of storage server authentication, and also provides a public authentication method,

#### **4.4.1.3 Data Storage Module:**

A data storage service involves three different entities: Clients who have a large amount of data to be stored in multiple clouds and have the permissions to access and manipulate stored data Cloud Service Providers (CSPs) who work together to provide data storage services and have enough storages and computation resources and Trusted Third Party (TTP) who is trusted to store verification parameters and offer public query services for these parameters.

#### **4.4.1.4 Integrity Verification Module**

Integrity verification in Multi cloud that is provided by improving the existing proof of storage models by manipulating the classic Merkle Hash Tree construction for block tag authentication. To support efficient handling of multiple auditing tasks, this paper further explore the technique of bilinear aggregate signature to extend the main result into a multiuser setting, where TPA can perform multiple auditing tasks simultaneously.

## **V. CONCLUSION**

We focused the core issues, if an untrusted server to store customer information. We can use cooperative provable data possession scheme, which reduce the data block access, and amount of computation on the server and client. Also decreases server traffic.

Our design and development on the CPDP program is mainly based on the usage of Public and Private Key encryption system. It exceeds what we did in the past; the improvement has brought to the bandwidth, computation and storage system. And it applied the public (trusted third party) verification. Finally, we also

expect our program; it supports dynamic outsourcing of information make it a more realistic application of cloud computing environment.

## VI. ACKNOWLEDGEMENT

I consider it is a privilege to express my gratitude and respect to all those who guiding me in the progress of my paper.

I wish my grateful thanks to *Mrs. Pushpa.S.Tempad* M.Tech project guide, for invaluable support and guidance.

**KHUDAIJA NAZHATH M R**

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# CALIBRATION CURVES AND ANALYTICAL AREAS OF MEASUREMENT FOR A WIDE AREA OF THE ANIONIC DETERGENT CONCENTRATIONS

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## ABSTRACT

SDS is mainly used in detergents for laundry with many cleaning applications.<sup>[3]</sup> SDS is a highly effective surfactant and is used in any task requiring the removal of oily stains and residues. For example, it is found in higher concentrations with industrial products including engine degreasers, floor cleaners, and car wash soaps. It is found in toothpastes, shampoos, shaving creams, and bubble bath formulations in part for its thickening effect and its ability to create a lather.<sup>[4]</sup> Pepsodent toothpaste at one time used the name "Irium" for its sodium laurel sulfate ingredient. For the time being there is no surfactant which is 80% biodegradable and has these properties. The methods used for the determination of AD can be divided into two major groups: a) Methods for the determination of the total content of AD. These methods are mainly used for the evaluation of the environmental pollution) Methods for the determination of the specific components of AD. They are mainly new and expensive methods as GC-MS, HPLC, IR-Spectroscopy, ionic chromatography, etc., and they are used mainly in scientific research. We are interested in the first group of methods, in particular in those that use common analytical techniques, as UV-VIS spectroscopy, SAA and electro analytical techniques, ion-selective potentiometer, etc. The difficulty of determination of AD in environmental samples is due to the wide range of the concentrations, insufficient selectivity and sensitivity of the analytical procedures and the lack of the standard samples.

**Keywords:** *Anionic Detergent, Standard Samples, Spectroscopy, Ion-Selective*

## I. INTRODUCTION

Studies conducted before the Section of Analytical Chemistry for the determination of total content detergente ve anionic (DA) in waters have been concentrating on previous extraction methods (the DA complexes with ketone) in organic solvents and subsequent measurements with the spectrophotometer or spektometer atomic absorption. These methods, which usually recommended in the literature, provide high sensitivity, but they are relatively complex; takes time and health danger (since used organic solvents, such as klorofrom, izobutimetilketon, toluene, etc.).

Following this work, we set ourselves to order:

- *To experiment some direct method of determining the DA (which do not require prior extraction); The main advantages of these methods are simple procedure, short time and removal of the use of organic solvents.*

- To experiment the possibility of using these methods in the determination of DA in seawater. It is known that almost all urban and industrial discharges to DA terminate in marine waters, especially near the coast, causing pollution and affecting marine ecosystems. Analytical methods of determining the DA in marine waters do not provide satisfactory results.

## II. MATERIALS AND METHODS

### 2.1 Apparatus Used

Measurements turbidimetrik (photometric) are performed with UV-VIS spektrophotometer type Pye-UNICAM SP6-550, we wavelengths 700nm and using glass container  $l = 1,0$  cm. Time measurement is calculated from the moment of casting the last jet (PVA). Results are reported in absorbance A (which in this case is equivalent to perturbation).

### 2.2 Cleaning of Glass Vessels

A special care was devoted to glass containers cleaning. The glass containers that are going to be used for the AD determination should not be cleaned with powdered or liquid detergent. In our work we have followed this procedure to improve cleaning before we use these glass containers:

- water-washing
- washing with hypochlorite solution
- rinse out water and distilled water
- washing with  $\text{HNO}_3$
- rinse out distilled water
- sponge the mixture HCl + alcohol (ethyl or methyl) 1: 1
- rinse out distilled water.

In some cases we have made rinses with acetone.

### 2.3 Results and Discussion

#### Experiment.1 Lakoret e kalibrimit dhe zona analitike e matjeve.

Eshte perseritur ndertimi I lakoreve te kalibrimit per  $l=1,0\text{cm}$  dhe  $l=2,5\text{cm}$ , por ne ndryshim nga matjet e eksperimentit 4/1 eshte perdorur zone me e gjere e perqendrimeve te DA: deri  $7,5\text{mg/liter}$  SDS per  $l=1,0\text{cm}$  dhe deri ne  $5,0\text{mg/liter}$  per  $l=2,5\text{cm}$ .

**Pasqyra 1 Rezultatet e lakoreve te kalibrimit per  $l=1,0\text{cm}$ .**

<i>Mg/l</i> SDS	0	0,5	1,0	2,5	5,0	7,5
A 30'	0,030	0.046	0.062	0,163	0,410	0,677
(A-A <sub>FB</sub> ) 30'	0,000	0.016	0,032	0,133	0,380	0,647
A 45'	0,029	0.043	0,056	0,157	0,408	0,662
(A-A <sub>FB</sub> ) 45'	0,000	0.014	0,027	0,128	0,379	0,633
log C	-	-0,301	0	0,397	0,698	0,875

<b>log</b> <b>(A-A<sub>PE</sub>)30'</b>	-	<b>1,204</b>	<b>1,505</b>	<b>2,1238</b>	<b>22,579</b>	<b>2,810</b>
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**Pasqyra 2: Rezultatet e lakoreve te kalibrimit per 1=2,5cm.**

<b>Mg/l SDS</b>	<b>0</b>	<b>0,2</b>	<b>0,5</b>	<b>1,0</b>	<b>2,0</b>	<b>5,0</b>
<b>A 30'</b>	<b>0,056</b>	<b>0,075</b>	<b>0,099</b>	<b>0,165</b>	<b>0,379</b>	<b>1,169</b>
<b>(A-A<sub>PE</sub>) 30'</b>	<b>0,000</b>	<b>0,019</b>	<b>0,043</b>	<b>0,109</b>	<b>0,323</b>	<b>1,113</b>
<b>log C</b>	-	<b>-0,698</b>	<b>-0,301</b>	<b>0</b>	<b>0,301</b>	<b>0,698</b>
<b>log</b> <b>(A-A<sub>PE</sub>)30'</b>	-	<b>1,7212</b>	<b>-1,366</b>	<b>-0,962</b>	<b>0,490</b>	<b>0,0464</b>

### III.CONCLUSIONS

It is noted that measured Absorbance changes with time and this influence is more noticeable at high concentrations of SDS solution. The change of Absorbance with time scan be explained by changing the size of DA-EV associate; It may be accepted that measured absorbance varies a little in the range of 15(20)min to 45 minutes, for this reason we have choose as optimal measured time 30 minutes .

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