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# Design of Precast Insulated Wall Panel that can be Altered with Conventional Burnt Brick

Mohammed Zaki\*, Pooja Thakur, Samreen Saba, Mohammad Aazam Siddiqui, Faizan Ali

Civil Department, A.C.E.T, Nagpur, Maharashtra, India

## ABSTRACT

The modern day construction techniques have made the rate of development so high, that all the conventional construction methods and materials has been altered with new ideas and implementations. Every aspects of the constructions has been benefited because of this. When we say about walls, especially in India, a large market is depended on the conventional burnt brick which are made from soil clinkers. Installation of these bricks is a costly affair which required lots of skilled labour and handsome amount of time. So, this project contributes in modern construction techniques which can be opted at the basic practice level in the market. The project includes designs for the precast walls panels for framed structures along with an insulation which can contribute as a part of green building. The panels were tested for the compression test and thermal resistivity test. As the framed structures does not transfer load through walls. In this case these panels could be handy and could reduce a lot of time and labour for installation of walls. Moreover this panels reduces the thermal power requirements of a building contributing into green building along with a smooth finishing.

**Keywords:** Precast wall Panels, Framed Structure, Green Building, Insulation, Smooth Finishing.

## I. INTRODUCTION

In India, a large portion of market is depended on soil clinker bricks as an element of brick walls. The problem with these soil bricks is they required a lots of process which need to be done before final installation. They need to be soaked in water to remove air voids, placing one by one which consumes lot of time, need more skilled labour for installation, cement mortar is need to smooth the walls surface commonly known as “plaster”. Due to all the above listed phenomena this soil brick become a hectic for their use.

This project has come up with a lot of aspect to avoid all the above listed problems. These precast panels has been designed to be used in framed structure in the building. These panels are divided into 2 parts i.e. the wythe and the core. The outer layers of the panels are of concrete and the core is filled with polystyrene sheets. Since the load passing through the walls in framed structure is negligible as compared to that of load bearing structure,

these panels possess a quite good strength when subjected to compression. The polystyrene sheets acts as a heat reflector which reflect the sunrays in hot summer season reducing the thermal demand of the building. In winter season again these polystyrene sheets traps the heat inside which again result into reduction in thermal energy demand of the building.

### A. Design of Precast Panels

This particular design panel is a typical sandwich wall panel and the 2 main component of the panels are

1. Concrete wythe
2. Insulation.
3. Connector.

The dimensions of the panel is 30.5 cm\* 30.5 cm\*7cm.  
**Classification of thickness** - (20-30-20) mm where 30mm & 40 mm are thickness of concrete wythe and thickness of insulation respectively.

### 1. Concrete Wythe

The strength of the panel is totally depended on the 2 outer layer of the concrete. These layer are to resist all the compressive forces which are created in between the structural element in the framed structure.

#### Characteristic of concrete

- Design mix- M20 i.e. (1:1.5:3) cement: sand: aggregate.
- Water cement ratio- 0.5.
- Size of aggregates – 10-15mm.
- Sand – locally available.

### 2. Insulation

The main properties of the precast panel was achieved with the help of insulation provided in between 2 layer of concrete. The insulation used for this was ‘sheets of polystyrene’.

#### Characteristics of Insulation

- Thickness of material- 30mm
- Length & width – (28\*28) cm respectively.

### 3. Connector

In order to hold all the sub layers of the panels they were connected with straight thin steel bars of 5 mm diameter. During the time of casting the panel the connector was installed and which was resulted in increase in strength of the panel.

### 4. Wire Mesh

In order to hold the concrete wythe layer stiff each layer of concrete was fixed with wire mesh in it. The mesh was of steel wire of diameter 2mm. The mesh was flexible in texture.

#### Casting of Panel

Dimension of panel- (30.5\*30.5\*7) cm  
Quantity of material raw materials-

Cement- 1 kg  
Sand – 1.5kg  
Aggregate- 3 kg  
Water 0.5 litre

#### The line of action of casting the panel is as follows

- Calculation of volume of concrete required.
- Weight batching of raw materials.
- Dry mixing of cement, sand, aggregates.
- Addition of water in interval and mixing it.
- Casting the panel horizontally
- Laying one layer of concrete
- Applying insulation sheets with connector.
- Applying second layer of concrete.
- Allowing it for settlement.
- Curing for 28 days by immersing in water.

### B. Testing of Panel

As the panels were designed to be used as an alternative to burnt brick walls so it was necessary that the panels should resist more compressive pressure as compared to that of burnt brick masonry wall.

There is a comparative test were conducted between a brick panel and concrete panel the compressive strength of a burnt brick wall masonry was very poor as it involves failure of mortar joints. The mortar joint is not that strong as compared to concrete panels. So the panels were showing satisfactory results when were compared with burnt brick panels.

#### Thermal Resistivity of Panel

**Insulation** level are specified by **R-Value**. **R-Value** is a measure of **insulation**' stability to resist heat traveling through it. The higher the **R-Value** the better the thermal performance of the **insulation**

The standard R-value for polystyrene is **3.9-4.4**<sup>20</sup>

#### Compression Testing of Panels

The panels were tested in compression testing machine in the college campus. The panels were tested in compression testing machine.

Sr.no	Size of panel	Load(N)	Strength(Mpa)
-------	---------------	---------	---------------

	(cm)		
1	30.5*30.5*7	205	17
2	30.5*30.5*7	210	17



## II. CONCLUSION

The results of this project shows that the use of these panels would reduce a lot of time in constructions, along with this it would reduce the overall thermal power requirement of the building. One of the silent feature of this project is these panels provide a smooth finishing surface as a result need of plastering is avoided. Due to all the above factors it can be concluded that these precast insulated concrete panels could be altered with conventional burnt bricks.

## III. REFERENCES

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- [2]. [http://inspectapedia.com/insulation/Insulation\\_Values\\_Table.php#Styrene](http://inspectapedia.com/insulation/Insulation_Values_Table.php#Styrene)



## Prediction of Discharge of Simple Conical Flume by using Artificial Neural Network (ANN) Tool of Matlab Software

Shubhangi Larokar, Rani Sayam, Vikrant Mate, Rajaram Jogpethe, Rushabh Bhiwapurkar,  
Vallabh Hadge, Shubham Rangankar

Civil Engineering Department, KDK College of Engineering, R.T.M. N.U., Nagpur, Maharashtra, India

### ABSTRACT

MATLAB is a high-level language enables us to perform computational intensive tasks faster than with traditional programming language. This paper presents some of the positive aspects of MATLAB software. In this paper, MATLAB software is used for the prediction of discharge of simple conical flume by using Artificial Neural Network (ANN) Tool. A simple portable conical flume in the form of cone inserted axially into the channel is referred as simple conical flume. ANN is one of the tool of MATLAB software which is used for development of the ANN model for various purposes. ANN model can provide reasonable accuracy for civil engineering problems, and more effective tool for engineering applications. Predicted discharge by ANN model is compared with the measured discharge. It has been observed that the ANN model results are in close agreement with the measured data except one reading.

**Keywords :** MATLAB, Flume, ANN

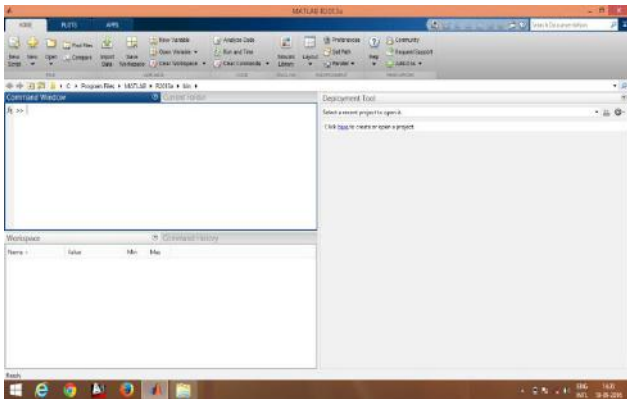
### I. INTRODUCTION

Water is precious resource and water demand is very much high. Hence, improvement of water management can encourage the conservation and make best use of our limited water resources. Water management depends upon the ability to precisely measure and manage the flow of water at important points in canal irrigation system. A simple portable conical flume in the form of cone inserted axially into the channel is referred as simple conical flume, can be used for such purpose. MATLAB software is used for the prediction of discharge of simple conical flume by using Artificial Neural Network (ANN) Tool of MATLAB software. ANN is one of the tool of MATLAB software which is used for the prediction of discharge of simple conical flume. ANN model can provide reasonable accuracy for civil engineering problems, and more effective tool for engineering applications.

### II. MATLAB

The name MATLAB stands for MATrix LABoratory

MATLAB is a high performance language for technical computing. It integrates computations, visualization and programming environment. It has a sophisticated data structures, contains built in editing and debugging tools and supports object oriented programming. MATLAB, MATrix LABoratory is a programming package specially designed for quick and easy scientific calculations. It has literally hundreds of built-in functions for a wide variety of computations and many tool boxes design for specific research disciplines, including statistics, optimization, solution for partial differential equation, data analysis.



**Figure 1 :** starting window of MATLAB

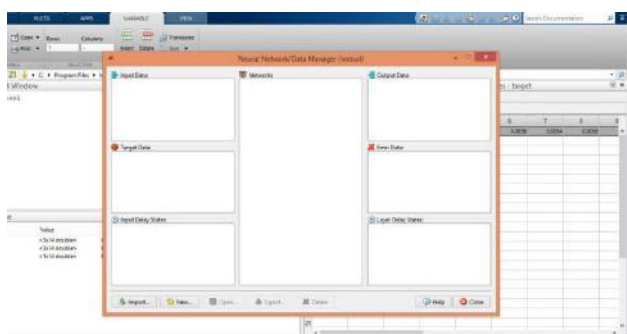
### III. ARTIFICIAL NEURAL NETWORKS

Artificial neural network emerged from the studies of how brain performs. The human brain consists of many millions of individual processing elements called neuron that are highly interconnected. ANNs are made up of simplified individual models of biological neurons that are connected together to form a network. Information stored in the network in the form of weight or different connecting strengths associated with the synapses in the artificial neuron models.

Many different type of neuron networks are available and multi-layered neural network are the most popular which are extremely successful in pattern reorganization problems. Each neuron input is weighted by  $w_i$ . Changing the weights of an element will alter the behaviour of the whole network. The output  $y$  is obtained summing the weighted inputs and passing the result through a non-linear activation function.

### IV. DATA MANAGER

By using this window input, Training & Target file are imported to ANN tool of Matlab.

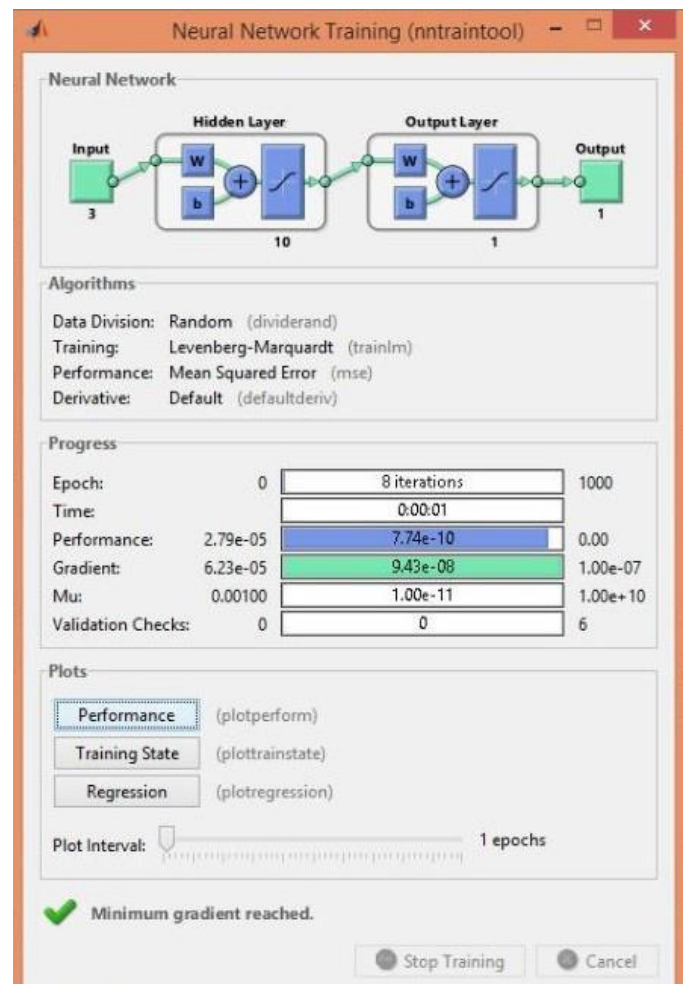


**Figure 2 :** NN tool data manager

### V. NEURAL NETWORK TRAINING

Next, we create a training vector for the neural network in order to match the input accepted by the neural network function. The steps performed in creating and training the neural network has been illustrated below:

The 'nntool' of Matlab opens a dialog box where we required to Import the Inputs and Targets files from the MATLAB workspace. After importing files, the created network appears in the network list. Open the network and select training tab. Here, we can choose the training parameters and data (inputs and targets) and finally click on Train option to train the network. we used feed forward back propagation neural network. There were two hidden layers used with TANSIG (tan-sigmoid) function.



**Figure 3 :** Network training

Calculation of percentage error between measured and predicted discharge for 151mm diameter cone (NN Tool)

Table 1 shows the measured discharge  $Q_m$  and discharge predicted by ANN model and percentage error between measured discharge and predicted discharge by 'nntool' of Matlab.

**Table 1 :** Comparison of Measured & Predicted Discharge

$Q_m$	$Q_p$	% Error
0.0146	0.0133	0.1394
0.0129	0.0122	0.0146
0.0116	0.0032	69.041
0.0107	0.0063	32.404
0.0098	0.0071	0.0024
0.009	0.0060	8.0939
0.0081	0.0055	4.3410
0.0069	0.0049	9.8556
0.0062	0.0039	0.0002
0.0047	0.0033	0.0039
0.0037	0.0027	0.1728
0.0031	0.0022	3.7472
0.0024		

## VI. CONCLUSION

The predicted flow rates based on the ANN model were compared with the corresponding measured ones. The comparison showed a good agreement. The proposed model predicted measured flow rates with a maximum error of  $\pm 10\%$  except one reading out of thirteen. Based on the results of case study it is evident that ANNs perform well than conventional methods.

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## Smart Time Table

Aafrin Siddiqui, Adeeba Sameen, Ibtesam Ali, Latika Lakkerwar, Rizwana Parveen

Department of computer science & engineering, Anjuman College of Engineering, RTMNU, Nagpur, Maharashtra, India

### ABSTRACT

Timetable creation is a very arduous and time consuming task. To create timetable it takes lots of patience and man hours. Time table is created for various purposes like to organize lectures in school and colleges, to create timing charts for train and bus schedule and many more. To create timetable it requires lots of time and man power. In our paper we have tried to reduce these difficulties of generating timetable by Genetic Algorithm. By using Genetic algorithm we are able to reduce the time require to generate time table and generate a Timetable which is more accurate, precise and free of human errors. The first phase contains all the common compulsory classes of the institute, which are scheduled by a central team. The second phase contains the individual departmental classes. Presently this timetable is prepared manually, by manipulating those of earlier years, with the only aim of producing a feasible timetable.

**Keywords :** Genetic Algorithm, Timetable, Constraints, Chromosomes

### I. INTRODUCTION

The Time generation is the most Fundamental activity in any Educational institution. It is also the most difficult and time-consuming process.

The basic aim of our project is to automate the timetable generation process. Our aim is to design a user interactive program that generates the timetable according to the given constraints. The program is designed with special emphasis on the engineering college requirements. The program can simply be extended to suit to the requirements of other kinds of institutions also.

Most colleges have a number of different courses and each course has a number of subjects. Now there are limited faculties, each faculty teaching more than one subjects. So now the time table needed to schedule the faculty at provided time slots in such a way that their timings do not overlap and the time table schedule makes best use of all faculty subject demands. We use a genetic algorithm for this purpose. In our Timetable Generation algorithm we propose to utilize a timetable object. This object comprises of Classroom objects and

the timetable for every them likewise a fitness score for the timetable. Fitness score relates to the quantity of crashes the timetable has regarding alternate calendars for different classes.

Classroom object comprises of week objects. Week objects comprise of Days. Also Days comprises of Timeslots. Timeslot has an address in which a subject, student gathering going to the address and educator showing the subject is related also further on discussing the imperatives, we have utilized composite configuration design, which make it well extendable to include or uproot as numerous obligations. In every obligation class the condition as determined in our inquiry is now checked between two timetable objects. On the off chance that condition is fulfilled i.e. there is a crash is available then the score is augmented by one.

### II. METHODS AND MATERIAL

The problem under consideration is to automate the process of timetable scheduling in an educational institution subjected to the given constraints. The user will specify the constraints and these constraints will



drive the scheduling of timetable. The user may specify some of the following constraints.

- The number of departments in his institution.
- The number of staff personnel available in each department.
- The number of classes in each department.
- The number of subjects to be dealt for each class.
- The minimum number of hours required completing each subject.
- The total number of available hours for each day.
- The number of laboratories available.
- The number of practical sessions per week that are necessary for each class.
- Along with the above-mentioned constraints the user may specify some of the weak constraints such as
  - A teacher should not engage two consecutive slots. i.e. he should be provided with an interval of at least one slot between two classes.
  - The workload on all teachers should be uniform.
  - The practical should be continuous for three consecutive slots.

The teacher who is assigned with the subject having practical must be engaged with the lab slots during practical session i.e. he should not be engaged with other slots while the practical session is going on.

## Background

When you make a class schedule, you must take in consideration many requirements (number of professor students, classes and classrooms, size of classroom, laboratory equipment in classroom, and many others). These requirements can be divided into several groups by their importance. Hard requirements (if you break one of these, then the schedule is infeasible)

- A class can be placed only in a spare classroom.
- No professor or student group can have more than one class at a time.
- A classroom must have enough seats to accommodate all students.
- To place a class in a classroom, the classroom must have laboratory equipment (computers, in our case) if the class requires it. Some soft requirements (can be broken, but the schedule is still feasible)
- Preferred time of class by professors.
- Preferred classroom by professors.

- Distribution (in time or space) of classes for student groups or professors. Hard and soft requirements, of course, depend on the situation. In this example, only hard requirements are implemented. Let's start by explaining the objects which makes a class schedule

## Objects of Class Schedule

### Professor

The Professor class has an ID and the name of the professor. It also contains a list of classes that a professor teaches.

### Section

Group the Section Group class has an ID and the name of the student group, as well as the number of students (size of group). It also attends.

### Classroom

The Room class has an ID and the name of the classroom, as well as the number of seats and information about equipment (computers). If the classroom has computers, it is expected that there is a computer for each seat. IDs are generated internally and automatically.

### Course

The Course class has an ID and the name of the course.

### Class

CourseClass holds a reference to the course to which the class belongs, a reference to the professor who teaches, and a list of student groups that attend the class. It also stores how many seats (sum of student groups' sizes) are needed in the classroom, if the class requires in the classroom, and the duration of the class (in hours).

## Algorithm

The genetic algorithm is fairly simple. For each generation, it performs two basic operations:

Randomly selects N pairs of parents from the current population and produces N new chromosomes by performing a crossover operation on the pair of parents.

Randomly selects N chromosomes from the current population and replaces them with new ones. The algorithm doesn't select chromosomes for replacement if it is among the best chromosomes in the population.

And, these two operations are repeated until the best chromosome reaches a fitness value equal to 1 (meaning that all classes in the schedule meet the requirement). As mentioned before, the genetic algorithm keeps track of the M best chromosomes in the population, and guarantees that they are not going to be replaced while they are among the best chromosomes.

```
// Genetic algorithm
class Algorithm
{
private:

// Population of chromosomes
vector<Schedule*> _chromosomes;

// Indicates whether chromosome belongs to
// best chromosome group
vector<bool> _bestFlags;

// Indices of best chromosomes
vector<int> _bestChromosomes;

// Number of best chromosomes currently saved in
// best chromosome group
int _currentBestSize;

// Number of chromosomes which are replaced in
// each generation by offspring
int _replaceByGeneration;

// Pointer to algorithm observer
ScheduleObserver* _observer;

// Prototype of chromosomes in population
Schedule* _prototype;

// Current generation
int _currentGeneration;

// State of execution of algorithm
AlgorithmState _state;

// Synchronization of algorithm's state
CCriticalSection _stateSect;

// Pointer to global instance of algorithm
```

```
static Algorithm* _instance;

// Synchronization of creation and destruction
// of global instance
staticCCriticalSection _instanceSect;

public:

// Returns reference to global instance of algorithm
static Algorithm&GetInstance();

// Frees memory used by global instance
staticvoidFreeInstance();

// Initializes genetic algorithm
Algorithm(intnumberOfChromosomes,
intreplaceByGeneration,
inttrackBest,
Schedule* prototype,
ScheduleObserver* observer);

// Frees used resources
~Algorithm();

// Starts and executes algorithm
void Start();

// Stops execution of algorithm
void Stop();

// Returns pointer to best chromosomes in population
Schedule* GetBestChromosome() const;

// Returns current generation
inlineintGetCurrentGeneration() const { return
_currentGeneration; }

// Returns pointer to algorithm's observer
inlineScheduleObserver* GetObserver() const { return
_observer; }

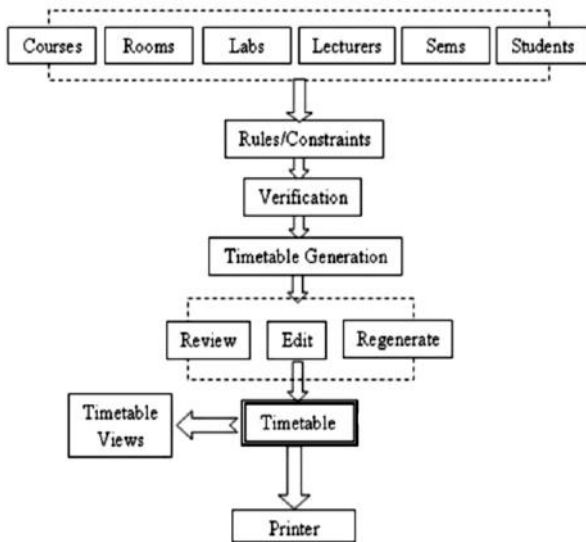
private:

// Tries to add chromosomes in best chromosome group
voidAddToBest(intchromosomeIndex);

// Returns TRUE if chromosome belongs to best
chromosome group
boolIsInBest(intchromosomeIndex);

// Clears best chromosome group
voidClearBest();

};
```



**Figure 1:** General view of Smart Timetable

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## Literature Survey

Trying to develop a software which helps to generate Timetable for an Institution automatically. By looking at the existing system we can understand that timetable generation is done manually. Manually adjust the timetable when any of the faculty is absent, and this is the big challenge for Automatic Timetable Generator that managing the timetable automatically when any of the faculty is absent. As we know all institutions) organizations have its own timetable, managing and maintaining these will not be difficult. Considering workload with this scheduling will make it more complex. As mentioned, when timetable generation is being done, it should consider the maximum and minimum workload that is in a college. In those cases timetable generation will become more complex. Also, it is a time consuming process.

## III. CONCLUSION

As discussed, an evolutionary algorithm, genetics algorithm for time tabling has been proposed. The intention of the algorithm to generate a time-table schedule automatically is satisfied. The algorithm incorporates a number of techniques, aimed to improve the efficiency of the search operation. By automating this process with the help of computer assistance timetable generator can save a lot of precious time of administrators who are involved in creating and managing various timetables of the institutes.



## A Review on Search Scheme over Cloud Data

Akshay Shirbhate<sup>1</sup>, Aniket Waghmare<sup>2</sup>, Prof. P. H. Govardhan<sup>3</sup>

<sup>1,2</sup>Students, Department of Computer Science and Engineering, Priyadarshini Institute of Engineering and Technology, Nagpur, Maharashtra, India

<sup>3</sup>Assistant Professor, Department of Computer Science and Engineering, Priyadarshini Institute of Engineering and Technology, Nagpur, Maharashtra, India

### ABSTRACT

Organizations are showing great interest in storing data on cloud. This could be the result of the unprecedented growth of data stored in the last few years. However for the security of sensitive data, it should be encrypted before outsourcing, which performs traditional data utilization based on plaintext keyword search. Because of the several numbers of data owners and documents in the cloud, it is required to allow multiple keywords in the search request and retrieve documents in the order of their relevance to these keywords. So far, several works have been studied to achieve various search functionality, such as single keyword search, multi-keyword Boolean search, ranked search, multi-keyword ranked search, etc. Among them, multi key word ranked search found more efficient to sort the search results.

**Keywords :** Sensitive Data, Single Keyword

### I. INTRODUCTION

Currently we have a tendency to square measure in associate degree information explosion era wherever perpetually getting new hardware, software and coaching IT skilled is turning into a nightmare for virtually each IT person. Coincidentally, we square measure witnessing associate degree enterprise IT design that shifted to a centralized, more powerful computing paradigm famous as Cloud Computing, in which enterprise's knowledge bases and applications square measure stirred to the servers within the massive data centres (i.e. the cloud) managed by the third-party cloud service providers (CSPs) in the web. Cloud computing has been recognized as the most momentous turning purpose within the development of data technology throughout the past decade. People square measure attracted by the advantages it offers, such as personal and versatile access, on-demand computing resources configuration, considerable capital expenditure savings, etc. Therefore, many firms, organizations, and individual users have adopted the

cloud platform to improve their business operations, research, or everyday needs. With the remunerative option of pay-as-you-use, general and private knowledge square measure outsourced by several individual users and organizations to 3rd party CSPs. A knowledge owner will source their knowledge to the cloud and either he will question on it outsourced data or will attest a shopper to perform question.

### II. LITERATURE SURVEY

#### 2.1 Secure and privacy preserving keyword search

Qin Liuy [1] proposed in this paper that the search provides keyword privacy, data privacy and linguistics secure by public key coding. CSP is involved in partial decoding by reducing the communication and machine aerial in secret writing method for finish users. The user submits the keyword trapdoor encrypted by users private key to

cloud server firmly and retrieve the encrypted documents. But the communication and machine price for encryption and secret writing is much higher.

## 2.2 Secure and Efficient Ranked Keyword Search

Cong Wang [2] proposed stratified search that will increase system usability by sanctioning search result connection ranking instead of causing uniform results, and further guarantees the file retrieval accuracy. Specifically, they explore the statistical live approach, i.e. relevance score, from information retrieval to build a secure searchable index, and develop a one-to-many order-preserving mapping technique to properly secure those sensitive score information. The resulting style is in a position to facilitate economical server-side ranking while not losing keyword privacy. But it will not perform multiple keyword searches.

## 2.3 Efficient and Secure Multi-Keyword

Search on Encrypted Cloud Data This proposed technique by C. Orensik has defined and resolved the drawback of effective however safe and sound hierarchal keyword search over Encrypted cloud knowledge [2]. Ranked search greatly enhances system usability by returning the matching files in a hierarchal order concerning to bound vital criteria (e.g. keyword frequency) thus creating one step nearer towards wise consumption of secure knowledge hosting services in Cloud Computing. These pers has defined and resolved the difficult drawback of privacy protective and economical multi keyword hierarchalsearch over encrypted cloud knowledge storage (MRSE), and establish a set ofstrict privacy requirements for such a otedcted cloud knowledge utilization system to become a reality. The proposed ranking technique proves to be economical to go back extraordinarily relevant documents admire submitted search terms. But it lacks dynamic updation and deletion of the document from the cloud.

## 2.4 A Secure and Dynamic Multi keyword

Ranked Search Scheme over Encrypted Cloud Data This proposed methodology [4] by Z. Xia suggest a secure tree-based search theme over the encrypted cloud storage, which supports multi keyword hierarchal search on with dynamic operation on document assortment obtainable at server. The vector space model and term frequency (TF)  $\times$  inverse document frequency (IDF) model area unit jointly used in the development of index and generation of question to supply multi keyword hierarchal search output. To obtain high search potency results, author construct a tree-based index structure and proposed a Greedy Depth-first Search algorithmic program based mostly on this index tree. Because of this special structure of treebased index, the proposed search themeill flexibly accomplish sub linear search time and will effectively handle the deletion and insertion of documents. The kNN algorithm is applied to write in code the index and question vectors, and till then guarantee correct connection score alculation between encrypte index and question vectors.

## III. TECHNIQUES AND ALGORITHMS

Some of the models, techniques and algorithms being used within the existing system are mentioned and summarized as follows.

### 3.1 Vector area Model

This model is used to represent the text by a vector of functions. The terms are the words and phrases. If words are thought of as terms, every word becomes associate freelance dimension in a terribly high dimension vector area. If term represents a text, it gets a non- zero value n the text-vector on the dimension like the term. Text vectors are terribly area and no term is allotted a negative worth.

### 3.2 Searchable secret writing rule

An rule that consists of the polynomial time randomized algorithms. They are:  $eyGen(s)$  -  $s$  is a security parameter taken and wont to generate a key pair either public or personal.  $PEKS(A_{pub}, w)$  -  $A_{pub}$  may be a public key and  $w$  is a word which square measure wont to manufacture a searchable secret writing.

$Trapdoor(A_{priv}, w)$  -  $A_{priv}$  may be a private key and  $w$  is a word that square easure wont to manufacture a trapdoor  $Tw$ .

### 3.3 Term Weight

Term weighting is a technique that depends upon the higher estimation of assorted chances. The main three factors play in term weight formulation is: Term Frequency - Words that repeat multiple times in a document. Document Frequency - Words that appear in several documents square measure thought of common. Document Length - hen assortment have documents ofvariable lengths, longer documents influence to score higher since they contain additional words and more repetition.

### 3.4 Cipher Text Security

It is a method that's wont to provide security for the encrypted knowledge. A cipher text attacker might simply break linguistics security by rearrangement the keywords and submitting the ensuing cipher text for secret writing. A standard technique is employed to interrupt this and this system is termed the cipher text security.

### 3.5 Non-Public Key Searchable Encoding

A model called non-public key searchable encoding is used to look on a personal key encrypted knowledge. The user himself encrypts data, so as to organize in Associate in Nursing impulsive manner.

3.6 Public Key Searchable encoding Public key searchable cypherion is a model that permits user to

encrypt knowledge and send it to the server. The owner provides decryption key might be completely different.

## IV. CONCLUSION

In this review paper, we have summarized totally different reasonably looking out techniques for the encrypted information over cloud. A systematic study on the privacy and data utilization problems is roofed here for numerous looking out techniques. Some of the important roblems to be handled by the looking out technique for providing the information utilization and security area unit keyword privacy, Data privacy, Fine-grained Search, Scalability, Efficiency, Index privacy, Query Privacy, Result ranking, Index confidentiality, Query confidentiality, Query Unlinkability, semantic security and Trapdoor Unlink ability. The limitations for all the searching techniques mentioned during this paper area unit mentioned in addition. From the above survey, we will conclude that multi-keyword stratifiedb search theme provides the economical, secure and dynamic search results.

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# Design of Single Phase Five Level Inverter

Akshay Awale, Jyotsna Atram, Amarjeet Pandey

Electrical Department, S.B.J.I.T.M.R Nagpur, Maharashtra, India

## ABSTRACT

This paper focuses on the result of simulation by using MATLAB and initial phase of hardware implementation of single phase flying capacitor clamped multilevel inverter in which output of triggering has been completed. This inverter has wide application for low and medium voltage DC-DC converter for renewable energy application. It is not only achieve high power rating operation but also enable their use in non-conventional power generation. The elementary concept of a multilevel converter is to achieve higher power by using a series of power semiconductor switches with several lower voltage sources. The power conversion is performed by synthesizing a staircase voltage waveform. It has better performance of medium voltage and high power electric drive, the  $dV/dt$  and harmonic should be minimized by introduction of more level in the output voltage.

**Keywords :** Multilevel Inverter, Simulation Result, Triggering Waveform, Hardware

## I. INTRODUCTION

The advancement in the field of power electronic has increased the usage of high power medium voltage drive applications in the industrial arena. In order to get better performance of medium voltage and high power electric drive, the  $dv/dt$  and the harmonic should be minimized by the introduction of more levels in the output voltage. This has initialized the theory of multilevel inverter for industrial drive to overcome the above disadvantages. In multilevel inverter the output voltage are generated at high frequency and low switching frequency with low distortions. In case of high power and medium voltage situation such as laminators, SVC, HVDC Pumps, blowers, compressors and so on. Multilevel inverter plays an important role in the area of electronic and it is widely used in industrial and renewable energy applications for converting dc to ac. It not only achieves high power rating but also enables the use of renewable energy source. There are several configurations available for forming the multilevel inverter.

1. Diode clamped multilevel inverter
2. Flying capacitor clamped multilevel inverter
3. Cascade H-bridge multilevel inverter.

Flying capacitor multilevel inverter usage of extra capacitor clamped to the power switches phase rail to provide the dc voltage level. The structure allow for the inverter to supply high capabilities especially during the power outages due to reducing the switching states providing by clamping capacitor.

## II. FIVE LEVEL FLYING CAPACITOR MULTILEVEL INVERTER

The main concept of this inverter is to use capacitors. It is of series connection of capacitor clamped switching cells. The capacitors transfer the limited amount of voltage to electrical devices. In this inverter switching states are like in the diode clamped inverter. Clamping diodes are not required in this type of multilevel inverters. The output is half of the input DC voltage. It is drawback of the flying capacitors multi level inverter. It also has the switching redundancy within phase to balance the flaying capacitors. It can control both the active and reactive power flow. But dur to the high frequency switching, switching losses will takes place[5,6].

**BASIC FEATURES**

The topology consists of diodes, capacitors and switching devices. Although theoretically this topology has been designed to give infinite levels, but due to practical limitations this only gives up to six levels of voltage. Each leg consists of switching devices which are generally transistors. Capacitors nearer to the load have lower voltage. Capacitors nearer to the source voltage ( $V_{dc}$ ) have higher voltage. The number of level depends upon the number of conducting switches in each limb.

**CALCULATION**

The formula to find number of devices needed for obtaining five level multilevel inverter is

An 'n' level inverter needs:

Number of voltage sources  $N_{dc} = (n-1)$

Number of switching devices  $N_{sd} = 2(n-1)$

Number of balancing capacitors  $N_{bc} = (n-1)(n-2)/2$

Number of DC bus capacitors  $N_c = (n-1)$

In a five level flying capacitor inverter:

$N = 5$

Therefore:

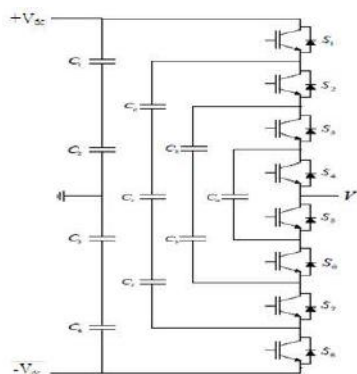
$N_{dc} = (5-1) = 4$

$N_{sd} = 2(5-1) = 8$

$N_{bc} = (5-1)(5-2)/2 = 6$

$N_c = (5-1) = 4$

The following one phase leg of a five level flying capacitor multilevel inverter to produce a staircase output voltage is shown below



**Figure 1.** One Phase of a Five Level Flying Capacitor Multilevel Inverter

**OPERATION**

For an output voltage level  $V_0 = V_{dc}$ , turn on all upper half switches S1 through S4. For an output voltage level  $V_0 = V_{dc}/2$ , turn on three upper switches S1 through S3 and one lower switch S5. For an output voltage level  $V_0 = 0$ , turn on two upper switches S1 & S2 and two lower switch S5 & S6. For an output voltage level  $V_0 = -V_{dc}/2$ , turn on one upper switch S1 and three lower switches S5 through S7. For an output voltage level  $V_0 = -V_{dc}$ , turn on all lower half switches S5 through S8.

Table 1 shows the voltage levels and their corresponding switch states. State condition 1 means the switch is on, and state 0 means the switch is off.[1]

**Table 1 :** The Switching State of Flying Level Multilevel Inverter

$V_0$	S1	S2	S3	S4	S5	S5	S5	S8
$V_{dc}$	1	1	1	1	0	0	0	0
$V_{dc}/2$	1	1	1	0	1	1	1	0
0	1	1	0	0	1	1	1	0
-	1	0	0	0	1	1	1	0
$V_{dc}/2$								
$-V_{dc}$	1	0	0	0	1	1	1	1

**III. SIMULATION**

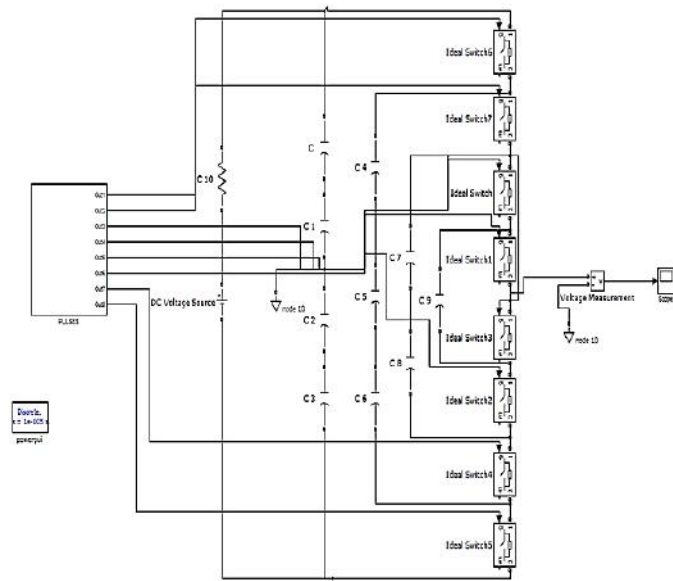
The whole research has been carried out to find out about the performance of single phase five level multilevel inverter using MATLAB/SIMULINK simulation software. Matlab/ Simulink is software for modelling, simulating, and analysing. It supports linear and nonlinear systems, modelled in continuous time, sampled time. The simulation process is performed on circuit having two different switches i.e IDEAL switch and IGBT switch. The working procedure is same in both the type of switches[3,10].

**SIMULINK MODEL USING IDEAL SWITCH**

The Ideal Switch block does not correspond to a particular physical device. When used with appropriate switching logic, it can be used to model simplified semiconductor devices such as a GTO or a MOSFET. The Ideal Switch block is fully controlled by the gate signal ( $g>0$  or  $g=0$ ). It has the characteristics like it blocks any forward or reverse applied voltage with zero



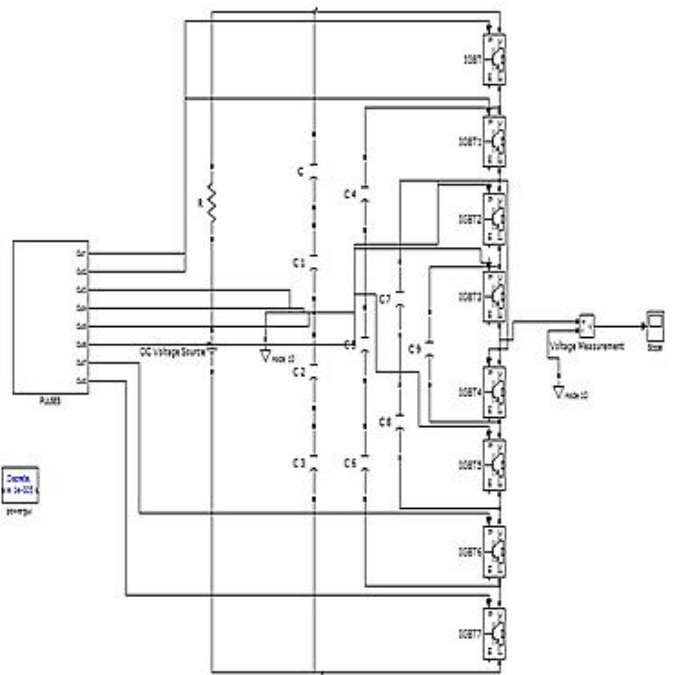
current flow when  $g=0$ , conducts any bidirectional current with quasi zero voltage drop when  $g>0$ , switches instantaneously between on and off state when triggered.



**Figure 2.** Simulink Model Using Ideal Switch

**SIMULINK MODEL USING IGBT SWITCH**

The simulation is then performed using IGBT switch. The main advantages of IGBT compared with various kinds of transistors are low ON resistance, high voltage -capacity, fast switching speed, ease of drive and joined with zero gate drive current creates a good option for sensible speed, and various high voltage applications like PWM, SMPS, variable speed control, AC to DC converter powered by solar and frequency converter applications which operates with a hundred's of KHz. The main disadvantages are: The speed of the Switching is lower to a Power MOSFET and higher to a BJT.[10]



**Figure 3.** Simulink Model Using IGBT Switch

**TRIGGERING OF SWITCHES**

In the triggering circuit, basically for generating pulses OR GATE logic is used. In the triggering circuit there are total 8 OR gate are used in which 4 OR gates are used for positive half cycle and other 4 OR gates for negative half cycle.[7]

For generating 8,6,3 and 1 input signals we need to trigger 1<sup>st</sup>, 2<sup>nd</sup>,3<sup>rd</sup> and 4<sup>th</sup> OR gates respectively. In triggering circuit total 9 pulse generators are used. The phase angle delay for one half cycle is as follows:

For generating output voltage at  $V=0$  instant pulse generator 1,2 and 3; phase delay of  $0^0$ ,  $180^0$  and  $360^0$  is given respectively. For generating output voltage at  $V=V_{d/2}$  instant pulse generator 1 and 2; phase delay of  $45^0$  and  $135^0$  is given respectively. For generating output voltage at  $V=V_d$  instant pulse generator 1 the phase delay of  $90^0$  is given[2,4].

The triggering simulation block diagram is shown below

## HARDWARE

### 1. Driver Circuit

A driver circuit is an electrical circuit used to control another circuit or to regulate current flowing through a circuit or to control other factors such as electronic components in the circuit. The need of a driver circuit is to switch a power semiconductor device from OFF state to the ON state and vice versa. In the ON state the driver circuit must supply adequate drive power (gate source voltage in case of MOSFET) to keep the power switch in the ON state. The driver circuit needs to provide reverse bias to the gate to minimize turn off times and to ensure that the device remains in the OFF state and is not triggered ON by stray transient signals generated by the switching of other power devices. Driver circuit interfaces between the control circuit and power circuit. It provides isolation between control circuit power circuit. Gate drive circuit also helps for protection to the power device from over current and short circuit.

Below figure(7) shows the circuit diagram of simple gate driver circuit with the help of optocoupler to drive gate of the MOSFET. A 5V dc supply is given to optocoupler through a resistance R1, resistance R1 is the current limiting resistance which is required to protect optocoupler because it requires only voltage from 1.2V to 1.5V. Optocoupler has two internal parts LED and Photo transistor there is isolation between them. Initially contact between LED and photo transistor. When 5V dc supply is ON then LED in the optocoupler will glow and the contact between photo transistor and LED closes and MOSFET gets the power circuit voltage i.e. 12V.

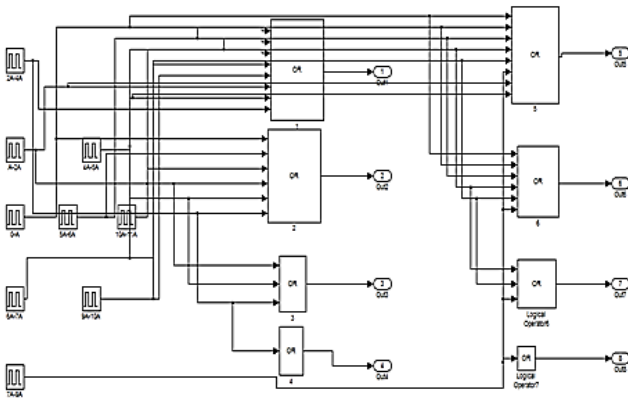


Figure 4. Simulink Model Of Triggering Circuit

### SIMULATION RESULT

The analysis of timing diagram in figure (4) and from table (1), the switching time of IGBT shows relationship among the IGBT which reduces the voltage stress of the multilevel inverter by using the MATLAB Software[8,9]. The output waveform of output voltage of 460 V, 50Hz, 1ph from the input voltage 460V dc supply and also the waveform nearly equal to sine wave.

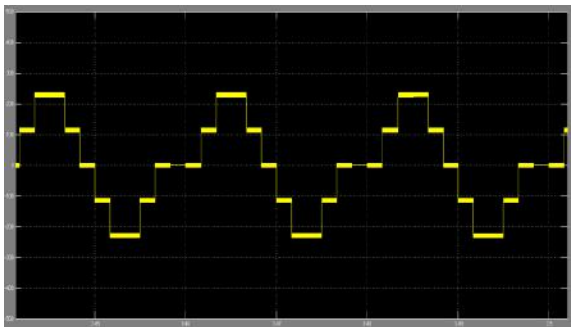


Figure 5. Waveform Obtained After Triggering of the IGBT Switches

The output waveform of simulation of multilevel inverter using IGBT switch is shown below.

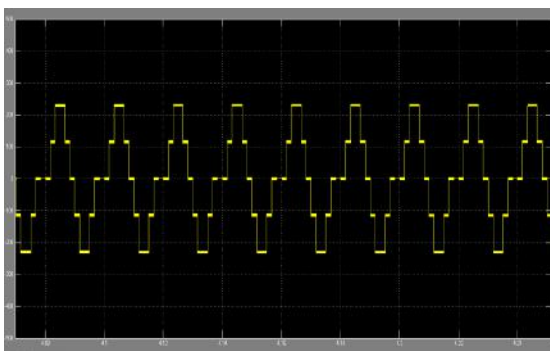


Figure 6. Waveform of Output Voltage Against Time(S)

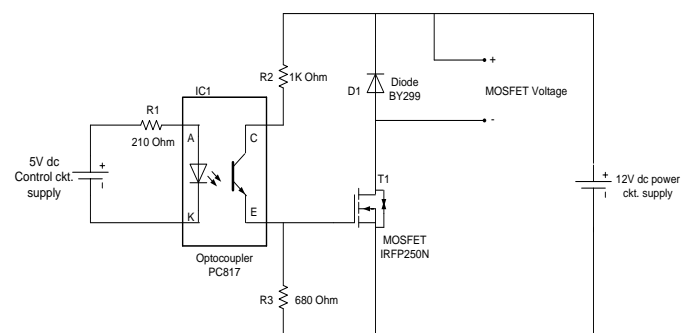
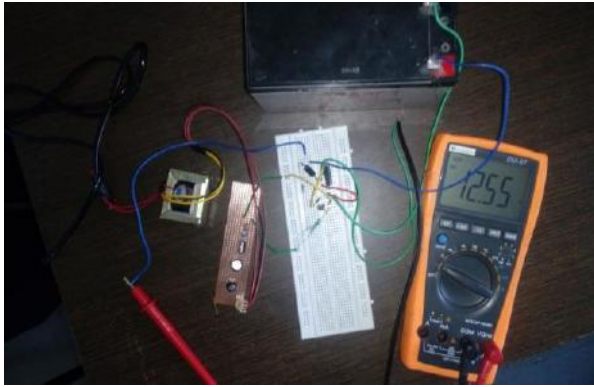


Figure 7. Circuit Diagram of Driver Circuit



**Figure 8.** Experimental Arrangement of Driver Circuit

In above figure(8) multimeter shows the MOSFET voltage 12V when control circuit is in ON state and multimeter shows 0V when control circuit is in OFF state (if control circuit gives the signal to the optocoupler it closes the contact and MOSFET switch is get turn ON)



**Figure 9.** Output Waveform of Programmed Microcontroller IC of Pin 4

Above figure(9) shows the output waveform of ATMEGA16 microcontroller IC .The microcontroller IC is programmed by BASCOM software, it is the software used for programming of ATMELs microcontroller. ATMEGA16 microcontroller IC is an 8 bit high performance microcontroller having features of low power consumption. ATmega16 need voltage supply of 5V.The triggering signal from the microcontroller is given to MOSFETs of the multilevel inverter for proper switching to get an appropriate output. For the programming of microcontroller IC first we check switching timing in the pulse generator by connecting scope to the 8 terminal of the gate pulse generator in the MATLAB triggering model(2) , then done the

programming of microcontroller IC. Output waveform of microcontroller IC(10), having the magnitude of 5V and frequency near about 100Hz. This is because due to we done the programming for only positive half cycle and waveform (10) is showing for positive as well as negative half cycle. And the waveform of pin4 will matches the waveform of the first terminal of the gate pulse generator s first terminal in MATLAB triggering model(2).

#### IV. CONCLUSION

In this paper, analysis of five levels Inverter has been carried out. They are widely acceptable for power application ranges in medium and high power due to their advantages. With the help of Matlab/Simulink the simulation of five levels was carried out with the help of a simple control strategy. A simple approach was used to trigger the switches at appropriate firing angle with suitable delay. The output waveform obtained from an IDEAL switch and IGBT switch is almost similar. The design of five levels Inverter was successfully done with respect to the resistive load.

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## Paper on Hybrid Operated Cascade Thrust Reversal

Manish Kumar, Amit Singh, Sumit Shinde

Mechanical Engineering Department, Wainganga College of Engineering, RTM Nagpur University, Nagpur,  
Maharashtra, India

### ABSTRACT

Through this paper an attempt is made to focus on a special technology based on application of cascade thrust reverser in turbofan engine which is common to the aviation industries but an uncommon in general. The airlines accept that cascade thrust reverser is necessary for safe operations because it provides an added margin of safety for transport aircraft operations. In this technology, forward thrust produced by turbofan engine of aircraft is diverged to reverse direction so as to provide an additional deceleration effect during landing and power back effect. Technical aspects such as engine power reverse thrust characteristics, modes of operation and speed limits of thrust reverser mechanism along with technical problems are discussed. As this mechanism is crucial for safety of aircraft therefore thrust reverser & engine maintenance-schedule is also discussed further. Basically here we introduce modified version prototype for cascade shell type thrust reversal incorporated with guide vane to deflect air in forward direction. Here we are implementing hybrid functioning of thrust reversal in addition with Automatic plus manual application by using micro-controller. Micro-controller basically programmed to sense speed of air or speed of aircraft during landing (applicable to operate thrust reversal) and this passes signal to linear actuator connected to thrust reversal and allow thrust reversal duct to open the vane and deflect the air flow in forward direction.

**Keywords :** Landing Run, Turbofan Engine, Thrust Reverser, Microcontroller

### I. INTRODUCTION

Now a day cascade thrust reversal having important role during landing of aircraft. It acts as one of deceleration device. Cascade thrust reversal, also called cold stream thrust reversal. It is the temporary diversion of an aircraft engine's exhaust so that it is directed forward, rather than backwards. Reverse thrust acts against the forward travel of the aircraft, providing deceleration. Cascade thrust reverser systems are featured on many jet aircraft to help slow down just after touch-down, reducing wear on the brakes and enabling shorter landing distances. Such devices affect the aircraft significantly and are considered important for safe operations by airlines. There have been accidents involving cascade thrust reversal systems. Cascade thrust reverser use in high bypass turbofan engine. During normal operation, the reverse thrust vanes are blocked. On selection, the system folds the doors to

block off the cold stream final nozzle and redirect this airflow to the cascade vanes. This technique is employed for improving aircraft runway performance and it is observed that by using cascade thrust reverser especially in wet runway there is considerable reduction in landing run which is responsible for safety of passenger aircraft.

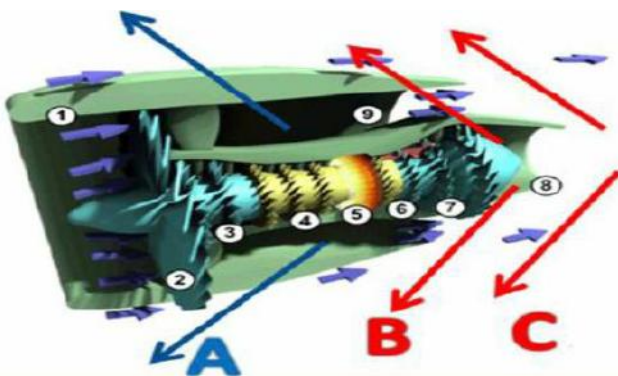
Here we introduce modified version for cascade shell type thrust reversal incorporated with guide vane to deflect air in forward direction. Here we are implementing hybrid functioning of thrust reversal in addition with Automatic plus manual application by using micro-controller. Micro-controller basically programmed to sense speed of air or speed of aircraft during landing (applicable to operate thrust reversal) and this passes signal to linear actuator connected to thrust reversal and allow thrust reversal duct to open the vane and deflect the air flow in forward direction.



**Figure 1.** Boeing 777 with cascade thrust reverser deployed

Cascade thrust reversal is one of the types of thrust reversal. There are various types of mechanism use in cascade thrust reversal as given below.

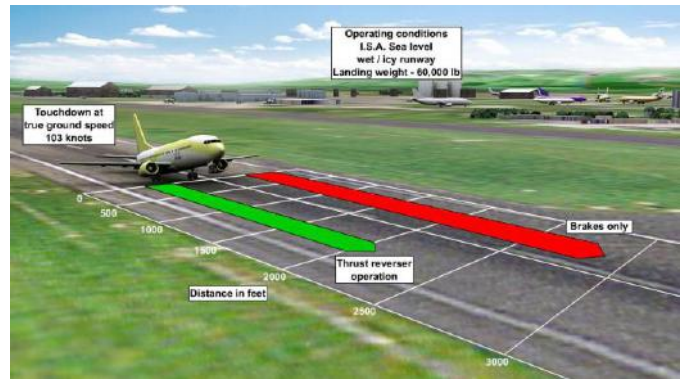
1. Fan duct.
2. Fan.
3. Low pressure compressor.
4. High pressure compressor
5. Combustor
6. High pressure turbines
7. Low pressure turbine
8. Nozzle
9. Fan airflow
10. Cascade vane



**Figure2.**Component of Boeing 777 with cascade thrust reverser ge 4 of 10

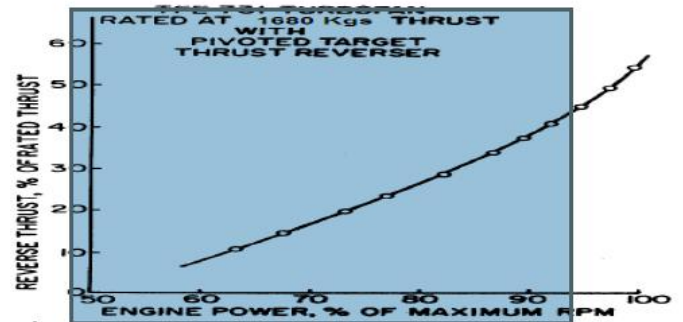
## II. NECESSARY OF CASCADE THRUST REVERSER

1. A cascade reverser is a reverse thrust system most typically installed on high bypass ratio turbofan engines. Cascade Thrust reverser mechanism are requires by an airplane to reverse maximum amount of Thrust available, to reduce brake wear, to reduce taxi distance, to reduce certified Landing field lengths,



**Figure 3.** Necessary of cascade thrust reverser

2. To provide additional stopping force on wet, slushy and icy Runways, for refused takeoffs (RTO), to reverse maximum thrust for power back and in Addition to brakes and spoilers, an airplane's engines can also be used to help bring the Vehicle to a stop by reversing its thrust.



## III. HYBRID OPERATED CASCADE THRUST REVERSER

In this type of thrust reversal prototype, we are using microcontroller which sense the speed of duct fan and send the signal to microcontroller which allows linear actuator to actuate the translating cowl (Cascade duct). In this type we are actuating thrust reverser manually as well as automatically.

### A. COMPONENT OF HYBRID OPERATED CASCADE THRUST REVERSER

1. Duct fan (Blower Fan)

The fan is a device which is use to pass the air. The air will be pass from duct fan. Fan we are using is blower fan as to provide the air flow to initiate thrust.

2. Electric motor

Electric motor is a device which is use to convert electric energy to mechanical energy. Electric motor is use to drive the Blower fan.

3. Microcontroller with Speed sensor

Microcontroller is programmed with speed sensor is order to actuate Actuator rod during landing speed when aircraft touches ground.

This actuation of rod with progress ducts to move back.

4. Cascade vane/Duct

Translating cowl with linear actuator. It is in conical duct shape opened from both side to bypass air. Vane use to cover the pocket at forward thrust and uncover the same when duct moves back due to spring force at hinged point. it also guide the air in reverse direction.

6. Nozzle

Nozzle is incorporated with engine end to get effective thrust for aircraft for flight motion. Nozzle function is to amplify velocity to get sufficient amount of air velocity.

7. Linear Actuator

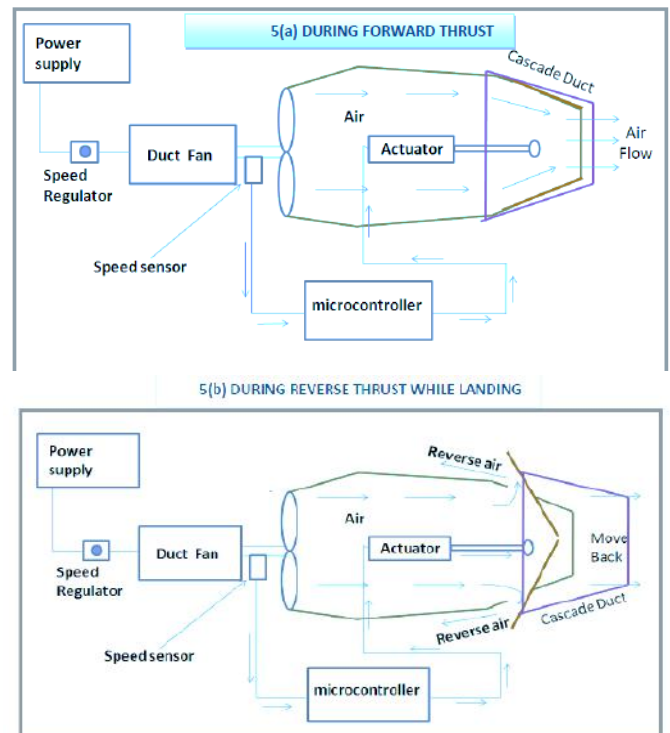
Actuator plays the significant role in this prototype. Linear actuator which is linked with Microcontroller. The rod of linear actuator is signaled by microcontroller after accessing Fan speed/Landing Speed.

**B. DESIGN OF HYBRID OPERATED THRUST REVERSER**



**Figure 4.** Fabricated Hybrid Cascade thrust Reversal Prototype

**C. WORKING OF HYBRID OPERATED CASCADE THRUST REVERSER**



**Figure 5.** Working Principle Hybrid Cascade thrust Reversal Prototype

As shown in fig 5(a) & 5(b), external electric motor connected to blower fan. The electric motor rotates the blower fan. The air will passed through casing due to forced action of blower. Air will pass through the nozzle to provide the high velocity and create the thrust as shown in Fig 5(a).The speed sensor installed in front of blower fan. Blower fan is set to provide max thrust at 1500 rpm which can be recorded through speed sensor connected directing fan shaft.

As shown in fig 5(a) & 5(b), the speed sensor senses the speed and gives the signal to microcontroller. When speed less 200 RPM recorded by sensor provide signal to microcontroller. Microcontroller judge the signal that it comes below landing speed and pass on signal to actuator to progress the rod connected with Cascade duct. Linear actuators slide the translating cowl and the cascade duct which allows Cascade vane to retract and uncover the pocket to bypass the air in reverse direction as shown in Fig 5(a). The compressed air from the engine will bypass through pocket in guidance with cascade vane and reverse thrust generated. When the speed goes at taxi speed then speed sensor sends the

signal to microcontroller. The microcontroller actuate the linear actuator which slide the translating cowl and cover the cascade vane then air will pass straight backward through Nozzle.

Microcontroller has a provision to set this operation in manual mode with the help of lever which directly provide signal in actuator to actuate the rod at our need during landing run. This make this thrust reversal to work in **Hybrid mode** (Automatic +Manual).

**D. OBSERVATION AND CALCULATION**

Formulae required for the calculation of mass flow rate and thrust is mentioned below:

$$Mass\ flow\ rate(m) = \rho \times A \times v$$

$$Thrust(F) = m \times v$$

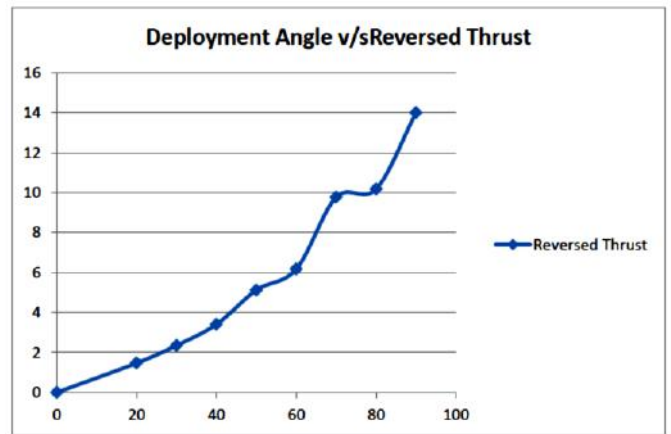
Here we get the variation of reversed thrust at different bucket angle.

Table: 1 Readings at different deployment angle at the outlet of upper and lower buckets

Angle of Deployment (In Degree)	Velocity at different points before and after deployment (In m/s)		
	Central Outlet point	Upper outlet point	Lower outlet point
At Nozzle Outlet	23.9	-	-
0	21.8	-	-
20	19.1	0.6	1.9
30	18.2	2.0	2.0
40	17.8	3.0	2.8
50	16.1	4.3	4.4
60	14.2	4.7	5.8
70	11.2	8.4	8.2
80	8.0	9.8	7.5
90	2.5	12.5	12.4

Table: 2 Calculated Reversed thrust at different deployment Angles

Deployment Angles(degree)	Total Thrust reversed(Newton)
0	0
20	1.47
30	2.35
40	3.41
50	5.12
60	6.18
70	9.77
80	10.18
90	14



**E. ADVANTAGE OF CASCADE THRUST REVERSE**

1. The efficiency of thrust reversal will increase.
2. With the use this technique we can reduce the attention of pilot during landing
3. We can apply thrust reversal automatically & manually.
4. It has better maneuvering effect especially in case of military aircraft.

**IV. CONCLUSION**

1. With the proper implementation of this technique of additional braking system provided.
2. More accident can be avoided in adverse climatic condition and other technical issue in landing gear brake.
3. This technique also shows how the energy that would go in vain would be utilized in such positive manner.
4. By making use of hybrid technique, pilot need not to worry in applying additional braking manually via lever in cockpit.
5. Microcontroller is well programmed to access speed of fan via speed sensor and actuate rod at required time during landing.

**V. FUTURE SCOPE**

1. By using microcontroller we can operate thrust reverser automatically.
2. We can simultaneously use both automatically & manually operate.
3. In co-operation of better avionics system to link this hybrid system to actual aircraft engine.



4. Microcontroller in actual aircraft required to control with landing gear retraction system and speed of air during landing

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## Remotely Controlled E-Notice Board

**Ankita Ingale, Bhavika Thakre, Sujata Bagde, Sanjivani Bhade, Prof. Preeti Mankar**

Department of Electronics & Telecommunication Engineering, S. B. Jain Institute of Technology Management And Research, Nagpur, Maharashtra, India

### ABSTRACT

Sharing information is the main motto of any communication technology. The Notice board is a common display for effective mode of providing information to the people, but this is not easy for updating the messages instantly. This project is about advanced wireless notice board. The project is built around ARM controller raspberry-pi which is most important in this system. It acts as heart of the project. The aim of this project is to provide a well flexible and reliable wireless Notice board which can be used in any institution or public utility places like bus stations, railway stations, schools, colleges, malls, etc. Wireless communication is the transfer of information or power between two or more points that are not connected by an electrical conductor. The data is received from authorized user. In this project android phone is used as client which sends text data to server from remote place. Then it sends to raspberry pi. A LCD display is attached to raspberry pi. The message received by server is then displayed on LCD display interfaced to raspberry pi over HDMI.

**Keywords :** Android phone, LCD display, Raspberry Pi3, Web server.

### I. INTRODUCTION

Notice Board is primary thing in any institution / organization or public utility places like bus stations, railway stations and parks. But sticking various notices day-to-day is a difficult process. A separate person is required to take care of this notices display. This project deals about an advanced hi-tech wireless notice board. A authenticated person can send message from a remote place which is visible on the LCD/LED Monitor.

In this world everyone needs a comfort living life. Man has researched different technology for his sake of life. In today's world of connectedness, people are becoming accustomed to easy access to information. Whether it's through the internet or television, people want to be informed and up-to-date with the latest events happening around the world. Wired network connection such as Ethernet has many limitations depending on the need and type of connection. Now a day's people prefer wireless connection because they can interact with people easily and it require less time. The main objective of this project is to develop a wireless notice board that display message sent from the user (phone) and to

design a simple, easy to install, user friendly system, which can receive and display notice in a particular manner. With respect to date and time which will help the user to easily keep the track of notice board every day and each time he uses the system. Wi-Fi is the wireless technology used

### II. LITERATURE SURVEY

**1) GSM based display toolkit [2012]:** The wireless communication has announced its arrival on big stage and the world is going mobile. We want to control everything. This remote of appliances is possible through embedded systems. This project designs a SMS driven automatic display toolkit which can replace the currently used programmable electronic display.

**2) Smart Notice Board [2013]:** This technical paper provides a discussion on present trends in technology and how exactly, simple carry-to-use devices play a vital role in day-to-day life. Using the present technological devices, how an efficient and smart notice board can be made is explained in this paper.

**3) Bluetooth based notice board [2014]:** It is an android based application. In this application, user sends the message from the android application device, and then the message is received and retrieved by the Bluetooth device. The Bluetooth access password will only be known to the user. It is then sent to the microcontroller that further displays the notice sent from the user on to the electronic notice board which is equipped with a 16X2 LCD display. It uses a microcontroller from 8051 family.

**4) Digital–Notice Board [2015]:** In this GSM supported E-Notice Board, the module comprises of two major units. The first unit is a simple user’s mobile handset. The second unit is the control unit. For instance, this system can be achieved with the help of android application, GSM modem and LCD display. The control unit will be placed in remote places. Whenever any information or messages have to be displayed the user can send message via user’s android mobile phone to the control unit.

**3. Displaying Notice on Notice Board**

To display a notice, first user will have to enter it in an android application which will be displayed directly on a digital notice board. This happens with the combination of software and hardware. The notice is entered in a software device and displayed on a hardware device. The interface between software and hardware will be raspberry-pi. The message to be displayed is sent through a remote place from an authorized transmitter.

**4. Clearing Notice Board**

There’s an another module called clearing notice board where notice board is being cleared so that another notice can be updated.

**5. Logout**

When the notice updating work has been completed, users can logout

**III. PROBLEM STATEMENT**

Traditionally, there were notice boards where any information or notice had to be stick daily. This becomes tedious and requires daily maintenance. Notice Board is primary thing in any institution/organization or public utility places like bus stations, railway stations and parks. But sticking various notices day-to-day is a difficult process. A separate person is required to take care of this notices display.

**IV. METHODOLOGY**

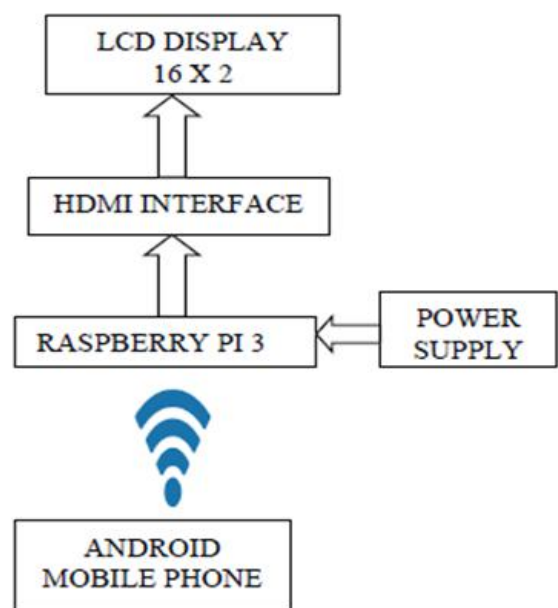
**1. Login**

User needs to get logged in for uploading the notice. By using this module the user can be able to update the notice directly from android phone that will be automatically updated on the digital notice board.

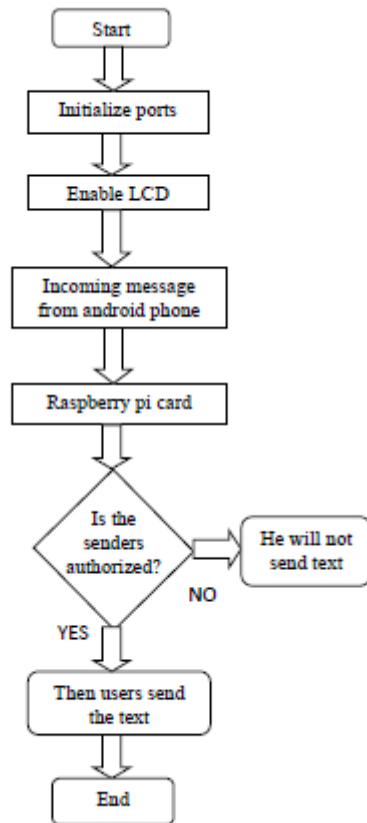
**2. Authentication**

The purpose of authentication is to see whether the user who logged in is the one who has been given the user id and password by admin. Authentication is used so that only the faculties of the college or an individual who is responsible for updating the notice is able to update the notice on digital notice board.

**Block Diagram:**



Flow chart:



## V. CONCLUSION

Electronic notice board using Wi-Fi is a collaboration of Software and Hardware through which most of the complexity reduces, even systems size and cost also reduced. This system is very efficient as anyone can send the message from remote place without any human intervention. The android application developed in this project makes the user experience great as it is very simple and easy to use.

## VI. FUTURE SCOPE

1. Power Raspberry pi using a solar panel in order to save power.
2. It may be modified for an announcing purpose by adding speaker to it.
3. Display multiple pages with a particular delay.
4. Features to upload images on raspberry pi server.

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## Adaptive Smart Antenna using Neural Network (SMI Algorithm)

Bhagyashri B. Hedau, Rupali S. Pardhi, Sanjeevani A. Hiradkar, Dhanshri S. Borkar, Prof. Sonia V. Hokam

Electronics & Telecommunication, RTMNU/SRMCEW, Nagpur, Maharashtra, India

### ABSTRACT

Smart antenna systems are of great importance in wireless communications and RADAR applications, They effectively enhance the system capacity and reduce the co-channel interference. Smart antenna is an array antenna that uses adaptive beam forming algorithms to steer the main beam towards the desired signal direction and reject the interfering signals of the same frequency from other direction without moving the antenna. This is achieved by continuously updating the weights of each radiating element (antenna). An algorithm with low complexity, low computation cost, high speed convergence rate and better performance is usually preferred. This paper introduces a new performance investigation and comparison between five different beam forming algorithms : Least Mean Square(LMS), Normalised Least Mean Square(NLMS), Sample Matrix Inversion(SMI), Recursive Least Square(RLS) and Hybrid Least Mean Square/ Sample Matrix Inversion (LMS/SMI). In this investigations, the number of array element and the displacement among them are changed in each algorithm is optimized and demonstrated using MATLAB software package.

**Keywords:** MATLAB, LMS, NLMS, RADAR, CDMA, SMI

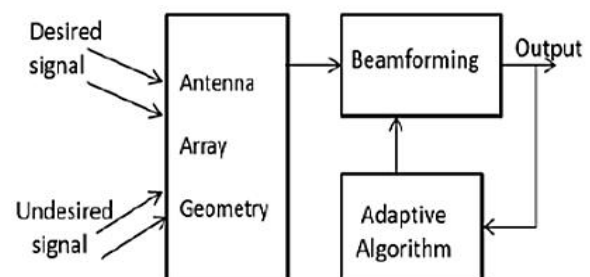
### I. INTRODUCTION

Due to the globalisation, the modern wireless communication services are spreading rapidly. This necessitates to improve the coverage area, quality of the signal, and capacity of present network by the service providers. The upcoming technologies (Third Generation-3G and Fourth Generation-4G) are adopting the Space Division Multiple Access (SDMA) technique with smart antenna system. With this antenna architecture, the weights of the antennas are adopted to point the main beam in the desired directions and place nulls in the interference directions. Different algorithms are used to adjust the weights in the Smart Antenna Systems. A comparison of Least Mean Square(LMS) and Recursive Least Square (RLS) algorithms for smart antennas in a Code Division Multiple Access(CDMA) mobile communication environment has been presented.

### II. Mathematical Model

A Smart antenna system consists of a number of element which are arranged in different geometries (like Linear, Circular etc.,) and whose weights are adjusted with

signal processing technique and evolutionary algorithm to exploit the spatial parameter of wireless channel characteristics under noisy environment. Fig.1 shows the block diagram of smart antenna system.



**Figure 1.** Block diagram of Smart antenna system

### III. SMI Algorithm

One of the drawback of the LMS algorithm is the rate of convergences of weights is slow since it must go through many iteration before satisfactory convergence is achieved. So we have another algorithm called SMI algorithm, The sample matrix is a time average estimates of the array correlation matrix using K-time sample. If the random process is ergodics in the correlation, the

time average estimate will equal the actual correlation matrix. The SMI algorithm has a faster convergences rate since it employ direct inversion of the correlation matrix  $R_{xx}$

where  $\bar{R}_{XX} = E[\bar{x}\bar{x}^H]$

Here  $x$  represent array signal vector of size  $1 \times M$ , where  $M$  represent number of antennas in array.  $H$  represents Hermitian transpose of  $x$ . SMI is also known as Direct Matrix Inversion (DMI). The samples matrix is a time average estimate of the array correlation, matrix using  $K$ -time sample. In this algorithm, the input samples

where  $\bar{r} = E[d * \bar{x}]$

are divided into “ $k$ ” number of block and each number of block is of length  $K$ . The optimum weights can be calculated directly by calculating correlation matrix  $R$  and cross-correlation vector  $r$ ,

The optimum weight vector is given by

$$\bar{w}_{opt} = \bar{R}_{xx}^{-1} \bar{r}$$

$w_{opt}$  = it is the Wieners solution. We can estimate the correlation matrix by calculating the time average such that

$$R_{XX} = \frac{1}{k} \sum_{k=1}^k \bar{x}(k)\bar{x}^H(k)$$

The correlation vector  $r$  can be estimated by

$$r = \frac{1}{k} \sum_{k=1}^k d^*(k)\bar{x}(k)$$

where  $d(k)$  represents the desired signal. Since we use a  $K$ -length block of data, this methods is called a block-adaptive approach. We are thus adapting the weights block-by-block. It is easy in MATLAB to calculates the array correlation matrix and the correlation vector by the followings procedure. Define the matrix  $x$   $K(k)$  as the  $k$ th block of  $x$  vectors ranging over  $K$ -data snapshots

$$\bar{X}_k(k) = \begin{bmatrix} x_1(1+kK) & x_1(2+kK) & \dots & x_1(K+kK) \\ x_2(1+kK) & x_2(2+kK) & & \vdots \\ \vdots & & \ddots & \\ x_M(1+kK) & \dots & & x_M(K+kK) \end{bmatrix}$$

Here where  $k$  is the block numbers and  $K$  is the block length. Thus, the estimate of the array correlation matrix is given by

$$\bar{R}_{xx}(k) = \frac{1}{K} \bar{X}_K(k)\bar{X}_K^H(k)$$

the desired signal vector can be define by

$$d(k) = [d(1+kK) \ d(2+kK) \ \dots \ d(K+kK)]$$

the estimate of the correlation vector is given by

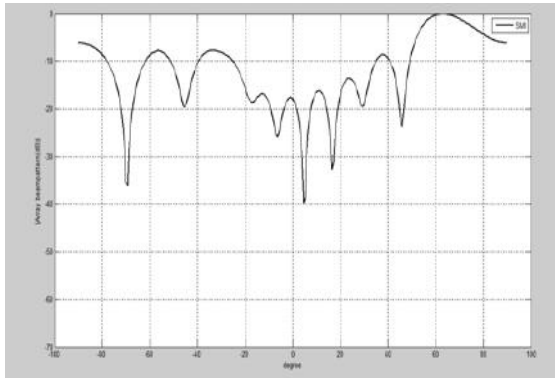
$$f(k) = \frac{1}{K} d^*(k)\bar{X}_K(k)$$

for the  $k$  th block of length  $K$  The SMI weights can then be calculated as

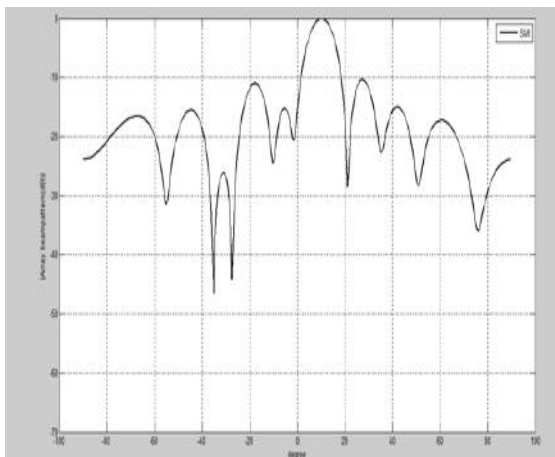
$$\bar{w} SMI^{(k)} = \bar{R}_{xx}^{-1}(k)\bar{r}(k) = [\bar{X}_K(k)\bar{X}_K^H(k)]^{-1} d^*(k)\bar{X}_K(k)$$

The SMI algorithm was simulated using MATLAB Software. Let us take Case1: An array of antenna with 8 element,  $N = 8$ . Let the spacing between each antenna in the array be  $d = 0.25$ . Suppose that the desired signal is arriving at an angle  $\theta_0 = 25^\circ$  and an interferer is arriving at an angle  $\theta_1 = -65^\circ$ . Case2: An array of antenna with 30 element,  $N = 30$ ,  $d = 0.25$ . the desired signal is arriving at an angle  $\theta_0 = 25^\circ$  and an interferer is arriving at an angle  $\theta_1 = -65^\circ$ . Case3: An array of antenna with 30 elements,  $N = 30$ ,  $d = 0.15$ , then the desired signals is arriving at an angle  $\theta_0 = 25^\circ$  and an interferer is arriving at an angle  $\theta_1 = -65^\circ$ . Case4: An array of antennas with 30 elements,  $N = 30$ ,  $d = 0.15$ , then the desired signal is arriving at an angle  $\theta_0 = 45^\circ$  and an interferer is arriving at an angle  $\theta_1 = -65^\circ$ . Case5: An array of antennas with 30 elements,  $N = 30$ ,  $d = 0.15$ , the desired signal is arriving at an angle  $\theta_0 = 45^\circ$  and an interferer is arriving at an angle  $\theta_1 = -85^\circ$ . Now calculate the beam strength at those angles by applying optimum weights to received signals and also observe the beam patterns at different angles in a Cartesian plot.

#### IV. Output of SMI



At =60°



At =10°

#### V. CONCLUSION

In this work, SMI algorithms are used for interference rejection by an adaptive antenna array with various numbers of elements. The effect of number of elements in the array of antenna on the interference rejection is observed. As expected from antenna theory, the main lobe and other lobes widths are reduced. The Simulation results show that SMI is capable of nullifying the interference sources and its convergence is faster than LMS algorithm. The null depth performance of the SMI algorithm is better than that of the LMS algorithm.

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## Automated Plant Disease Analysis

Bhawana Moon, Nigkhat Sheikh, Shahana Sadaf, Amrin Khan

Electronics & Telecommunication, ACET, Nagpur University, Maharashtra, India

### ABSTRACT

We propose and experimentally evaluate a software solution for automatic detection and classification of plant leaf diseases. The proposed solution is an improvement to the solution proposed in [1] as it provides faster and more accurate solution. The developed processing scheme consists of four main phases as in [1]. The following two steps are added successively after the segmentation phase. In the first step we identify the mostly green coloured pixels. Next, these pixels are masked based on specific threshold values that are computed using Otsu's method, then those mostly green pixels are masked. The other additional step is that the pixels with zeros red, green and blue values and the pixels on the boundaries of the infected cluster (object) were completely removed. The experimental results demonstrate that the proposed technique is a robust technique for the detection of plant leaves diseases. The developed algorithms efficiency can successfully detect and classify the examined diseases with a precision between 83% and 94%, and can achieve 20% speedup over the approach proposed in [1]. General Terms Artificial Intelligence, Image Processing.

**Keywords:** Image processing; Plant disease detection; Classification

### I. INTRODUCTION

Agriculture has become much more than simply a means to feed ever growing populations. Plants have become an important source of energy, and are a fundamental piece in the puzzle to solve the problem of global warming. There are several diseases that affect plants with the potential to cause devastating economic, social and ecological losses. In this context, diagnosing diseases in an accurate and timely way is of the utmost importance.

There are several ways to detect plant pathologies. Some diseases do not have any visible symptoms associated, or those appear only when it is too late to act. In those cases, normally some kind of sophisticated analysis, usually by means of powerful microscopes, is necessary. In other cases, the signs can only be detected in parts of the electromagnetic spectrum that are not visible to humans. A common approach in this case is the use of remote sensing techniques that explore multi and hyperspectral image captures. The methods that adopt this approach often employ digital image processing

tools to achieve their goals. However, due to their many peculiarities and to the extent of the literature on the subject, they will not be treated in this paper. A large amount of information on the subject can be found in the papers by Bock et al. (2010), Mahlein et al. (2012) and Sankaran et al. (2010).

Most diseases, however, generate some kind of manifestation in the visible spectrum. In the vast majority of the cases, the diagnosis, or at least a first guess about the disease, is performed visually by humans. Trained raters may be efficient in recognizing and quantifying diseases, however they have associated some disadvantages that may harm the efforts in many cases. Bock et al. (2010) list some of those disadvantages:

- Raters may tire and lose concentration, thus decreasing their accuracy.
- There can be substantial inter- and intra-rater variability (subjectivity).
- There is a need to develop standard area diagrams to aide assessment.



- Training may need to be repeated to maintain quality. Raters are expensive.
- Visual rating can be destructive if samples are collected in the field for assessment later in the laboratory.
- Raters are prone to various illusions (for example, lesion number/size and area infected).

Besides those disadvantages, it is important to consider that some crops may extend for extremely large areas, making monitoring a challenging task.

Depending on the application, many of those problems may be solved, or at least reduced, by the use of digital images combined with some kind of image processing and, in some cases, pattern recognition and automatic classification tools. Many systems have been proposed in the last three decades, and this paper tries to organize and present those in a meaningful and useful way, as will be seen in the next section. Some critical remarks about the directions taken by the researches on this subject are presented in the concluding section.

Vegetable pathologies may manifest in different parts of the plant. There are methods exploring visual cues present in almost all of those parts, like roots (Smith and Dickson 1991), kernels (Ahmad et al. 1999), fruits (Aleixos et al. 2002; Corkidi et al. 2005; López-García et al. 2010), stems and leaves. As commented before, this work concentrates in the latter two, particularly leaves.

This section is divided into three subsections according to the main purpose of the proposed methods. The subsections, in turn, are divided according to the main technical solution employed in the algorithm. A summarizing table containing information about the cultures considered and technical solutions adopted by each work is presented in the concluding section.

Some characteristics are shared by most methods presented in this section: the images are captured using consumer-level cameras in a controlled laboratory environment, and the format used for the images is RGB quantized with 8 bits. Therefore, unless stated otherwise, those are the conditions under which the described methods operate. Also, virtually all methods cited in this paper apply some kind of preprocessing to clean up the

images, thus this information will be omitted from now on, unless some peculiarity warrants more detailing.

## II. METHODS AND MATERIAL

The overall concept that is the framework for any vision related algorithm of image classification is almost the same. First, the digital images are acquired from the environment using a digital camera. Then image-processing techniques are applied to the acquired images to extract useful features that are necessary for further analysis. After that, several analytical discriminating techniques are used to classify the images according to the specific problem at hand. Figure 1 depicts the basic procedure of the proposed vision-based detection algorithm in this research.

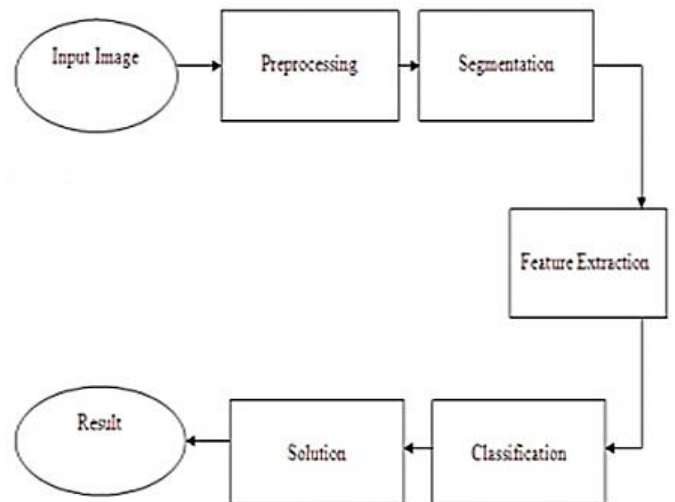


Figure 1. System Design

### Image Pre-processing

We convert the input RGB image into HSV(Hue Saturation Value) format using rgb2hsv command. After this transformation we consider only Hue component. We will not consider saturation and intensity component. Because it does not provide any useful information.

$$\text{Hue (H)} = \begin{cases} \vartheta & \text{if } B \leq G \\ 360 - \vartheta & \text{if } B > G \end{cases}$$

$$\vartheta = \cos^{-1} \left\{ \frac{1/2[(R - G) + (R - B)]}{\sqrt{[(R - G)^2 + (R - G)(G - B)]^2}} \right\}$$

Hue saturation Value:

HSV color space is preferred manipulation of Hue and saturation(to shift color or adjust amount of color). To convert RGB colormap to HSV colormap.

$$\begin{aligned} \text{Cmap} &= \text{rgb2hsv}(M) \\ \text{Hsv image} &= \text{rgb2hsv}(\text{rgb\_image}) \end{aligned}$$

convert an RGB colormap M to an HSV colormap Cmap. Both colormaps are m-by-3 matrix. The element of both colormap are in range 0 to 1. The columns of input matrix M represent intensities of red,green,blue respectively. The columns of output matrix Cmap represent Hue,saturation & Value respectively. Hsv image=rgb2hsv(rgb\_image) converts the RGB image to the equivalent HSV image. RGB is an m-by-n-by-3 image array whose three planes contain the red,green,blue components for the image. HSV is returned as an m-by-n-by- 3 image array whose three planes contain the Hue, saturation, value components for the image.

**K-means Clustering Technique**

There are two preprocessing steps that are needed in order to implement the K-means clustering algorithm: The phase starts first by creating device-independent color space transformation structure. In a device independent color space, the coordinates used to specify the color will produce the same color regardless of the device used to draw it. Thus, we created the color transformation structure that defines the color space conversion. Then, we applied the device-independent color space transformation, which converts the color values in the image to the color space specified in the color transformation structure. The color transformation structure specifies various parameters of the transformation. A *device dependent color space* is the one where the resultant color depends on the equipment used to produce it. For example the color produced using pixel with a given RGB values will be altered as the brightness and contrast on the display device used. Thus the RGB system is a color space that is dependent.

**Features Extraction**

In the proposed approach, the method adopted for extracting

**Features Identification**

The following features set were computed for the components H and S:

The angular moment ( E ) is used to measure the homogeneity of the image, and is defined as shown in Equation 8.

$$E = \sum_{i=0}^{N_g-1} \sum_{j=0}^{N_g-1} [p(i,j)]^2$$

The produc moment (cov) is analogous to the covariance of the intensity co-occurrence matrix and is defined as shown in Equation 9.

$$cov = \sum_{i=0}^{N_g-1} \sum_{j=0}^{N_g-1} (i - l_2)(j - l_2)P(i, j)$$

The sum and difference entropies (se and de) which are computed using Equations 10 and 11 respectively.

$$\begin{aligned} se &= \sum_{k=0}^{2(N_g-1)} P_{x+y}(k) \ln P_{x+y}(k) \\ de &= \sum_{k=0}^{N_g-1} P_{x-y}(k) \ln P_{x-y}(k) \end{aligned}$$

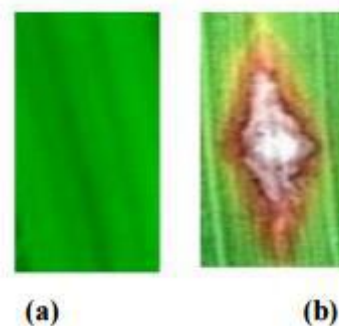
The entropy feature (e) is a measure of the amount of order in an image, and is computed as as defined in Equation 12.

$$\sum_{i=0}^{N_g-1} \sum_{j=0}^{N_g-1}$$

**III. RESULTS AND DISCUSSION**

In this section, the result of the stages involved in detection of the Leaf blast disease was shown:

Normal and Infected Image

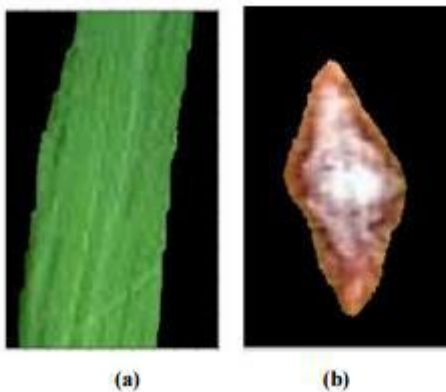


**Figure 2.** Input Image (a) Normal leaf (b) Infected leaf Image Preprocessing



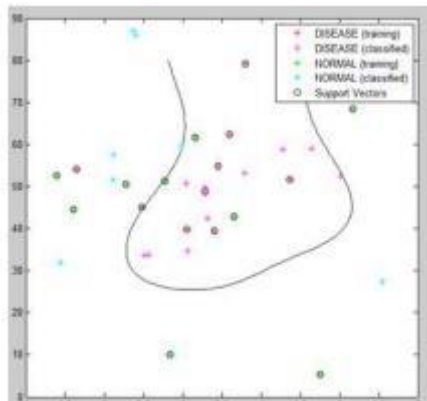
**Figure 3.** Contrast Enhancement

Segmentation Output



**Figure 4.** Segmented Image (a) Normal image (b) Infected image

Classification Output



**Figure 5.** SVM Output

#### IV. CONCLUSION

In this paper, respectively, the applications of K-means clustering and Support Vector Machine (SVMs) have been formulated for clustering and classification of diseases that affect on plant leaves. Recognizing the disease is mainly the purpose of the proposed approach. Thus, the proposed Algorithm was tested on four

diseases which influence on the plants; they are: Early scorch, Cottony mold, ashen mold, late scorch, tiny whiteness. The experimental results indicate that the proposed approach is a valuable approach, which can significantly support an accurate detection of leaf diseases in a little computational effort.

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# Evaluation of Instability Aspects of Cotton Productivity in India

Prof. P. S. Nerkar, B. D. Mehasare, S. V. Soitkar

Department of Mechanical Engineering, St. Vincent Pallotti College of Engineering & Technology, Nagpur, Maharashtra, India

## ABSTRACT

Policy decisions are often made based on the growth rates which depend on the nature and structure of the data and instability in farm production. The present paper analyzes the growth and instability in cotton area, production and productivity during the period 1951-52 to 2010-11. Growth and instability of cotton during pre-introduction (1993-94 to 2001-02) and post- introduction of Bt cotton periods (2002-03 to 2010-11) was also analyzed. For this purpose compound growth rates were estimated by studying the exponential function and coefficient of variation was worked out to find out instability associated. It was found that growth of cotton area and production was significant during 1950s, 1990s and 2001-10. Growth of cotton production was highest during the period 2001-10. Growth rate of productivity was also high during 2001-10. Instability analysis indicated that cotton area was more stable than production and productivity. Thus, policies should be made to reduce the risk in cotton production and to make it profitable so as to sustain the high growth rate experienced during the past few years.

**Keywords :** CAB, Bt Cotton, Farmer, Questionnaire , Cotton Supply , Crop

## I. INTRODUCTION

Cotton is an important commercial crop of India and plays a key role in the national economy. About 60 million people get employment either directly or indirectly in the agricultural and industrial sectors of cotton production, processing, textiles and related activities and by way exports, the foreign exchange earnings of cotton amounts Rs.3837.33 crores (CAB, 2008). With economic liberalization and globalization sweeping the world there is a scope for our country to play a leading role in the cotton production and export. It is encouraging to note that over the last few years the cotton production had shown a significant increase. In 2010-11 season, it touched a record production of 325 lakh bales with an average productivity of 496 kg/ha (Cotton Corporation of India, 2010). Majority of cotton produced in India is consumed domestically and hence, export of cotton from India is only 5.5 million bales. If this increasing production trend continues in years to come, India can become a major exporter of cotton.

Researchers have shown that with the adoption of new technologies on farmer's fields, it is possible to increase the average productivity beyond 600 kg lint per ha to meet the increasing cotton demand. Growth rates are the measures of past performance of economic variables. They are commonly used as summaries of trends in time series data. They are developed to describe the trends in a variable over time. Policy decisions are often made based on such growth rates which depend on the nature and structure of the data. Instability in farm production is causing serious shocks to supply and farm income and there is a growing concern about increased volatility in farm production, prices and farm income. Indian cotton production has undergone a metaphoric changes from 2002-03, after Bt cotton was introduced in the country, since then significant increase in area, production and yield was witnessed. Bt cotton now occupies 95% of the total cotton area in the country. These dynamic changes underline the importance of studying the growth performance and instability of cotton before and after Bt cotton introduction. Therefore the present study was

undertaken to analyze the growth and instability in cotton area, production and productivity during 1951-2010.

## 2. Growth of Area, Production And Productivity

Decadal growth rates of cotton area, production and productivity were worked out. Growth rate of cotton was negative during two decades only. But t-values indicated that this negative growth was statistically not significant. Growth rate was positive in other periods as well as overall period. Cotton area increased significantly during 1951-60, 1991-00 and 2001-10, the growth rates were 1.91, 2.21 and 3.43 percent respectively. During other periods, growth rate of cotton area was not significant. Growth rate of cotton area was positive and significant during overall period.

Cotton production during 1960-1970 witnessed significant negative growth rate whereas in 1951-60, 1991-00 and 2001-10 cotton production increased significantly. Growth of cotton production was highest during 2001-10. During overall period of analysis also cotton production increased significantly at an annual rate of 3.29 %. Cotton productivity also recorded positive growth during all the periods except during 1961-70 which has shown a negative growth rate. Among the decades showing positive growth rate all were statistically significant except the 1971-80 period. Productivity growth was highest during the last period i.e. 2001-10. During this period cotton productivity increased at a rate of 5.97% per annum, this may be due to introduction of Bt cotton. The growth rate for overall period was also positive and significant. The productivity increased at a rate of 2.94% per annum during the overall period.

## 3. Literature Review

As per Srinivasa Konduru, Fumiko Yamazaki and Mechel Paggi this paper gives the overview of the present condition of cotton harvesting and the also tell the us about the level of mechanization in cotton harvesting. In this paper the author has focused mainly on the cotton harvesting process and has given a complete comparison of the hand picking of cotton and the mechanized process of harvesting of cotton. The author has also discussed the prerequisites for application of mechanization in cotton harvesting. This

paper also deals with the implications of the mechanization process. In this paper the author and his team made discussion groups which included 7-8 farmers. The farmer were from small scale segment to large scale producers. The coordinator prepared a questionnaire and farmers are to answer them. Also there were discussions on varied topics related to cotton harvesting. They also discussed the problems faced by them in regarding to the application of mechanization techniques. Based on the data collected conclusions were made to analyze the condition of mechanized cotton harvesting and the problems faced to implement it and also the complication arising due to implementation of mechanized harvesting process.

As per Gusvinder Singh (Bayer), Asif Tanweer (Bayer), Deepak Kalbhor (John Deere). This paper gives a detailed insight into the collaborative mechanization project between the Bayer Cropscience limited, John Deere India Pvt Ltd and Bajaj Steel Industries Limited. It also tells us about the different requirements like seed requirements, distance between plants etc. to employ the mechanization in harvesting process. This paper also tells us the problems faced by the farmer in employment of mechanized process and gives the possible solution. Through this paper we also came to know about the economics related to the harvesting process. This paper also discussed the advantages of the mechanized cotton harvesting process.

As per Ambati Ravinder Raju Participatory ergonomic evaluation of cotton harvesting in rainfed and irrigated cotton of central India during 2012 found present contract manual harvesting is 30% more efficient than battery powered portable cotton picker. Higher load on contract labourer's heart was noticed with higher output of seed cotton regardless of methods of harvesting. Portable cotton pickers are high speed, precise and no need of defoliation but adequate training and willingness to adopt the machine is must. Adequately trained female and male pickers can pick 80 and 41% more seed cotton and 44% more cotton area was picked with Portable cotton picker. Portable cotton picker are more suitable for family labour of rainfed cotton harvesting with lower moisture percentage. Higher moisture content in irrigated cotton may be a hindrance for machine picking with frequent slippage. Trash content can be similar to hand harvesting (1- 2%). Present Portable cotton picker were frequently trouble shooting with improper cable

connections, entry of burs and leaves with obstruction of over grown braches.

As per S. S. Kohli, Manjeet Singh, Karun Sharma and Gayatri Kansal impact of mechanical harvesting of cotton on the profitability of Indian cotton farmers as well as its implications on cotton supply in the international markets. The results demonstrate that the net income of the cotton farmers represented from this study group will increase considerably with the mechanization of cotton harvesting. The results also show that the probability of earning a lower net income decreases, whereas, the probability of earning a higher net income increases when cotton pickers are used. The more usage of cotton pickers may lead to increase in yields and thereby increased cotton production in India, which may put a downward pressure on international cotton prices. But our observation of the conditions that are necessary for adoption of mechanical means of harvesting showed that it would take considerable period of time before Indian farmers adopt it. The findings of this study will be important for policy makers involved in improvement of Indian cotton sector as well as the livelihoods of farmers involved in cotton cultivation. Further research needs to be done to understand the efforts already put on by various public and private agencies to improve the pace of development and adoption of mechanical harvesting in India. Because when it happens, it is sure to create a major impact on international cotton markets.

As per Anuradha Narala and A.R. Reddy it is clear that during the last period and in the post- Bt period there was a significant increase in area, production and productivity and registered high growth rate. This may be due to introduction of Bt cotton in India. Instability was also high during this period indicating that cotton production increased over the periods. Although the cotton production and productivity is following an increasing trend, it is associated with many problems. Cost of production is escalating due to the rise in the prices of inputs. The prices of cotton are fluctuating from place to place and year to year making the production risky. Most of the cotton area is sown with Bt hybrids which have very high seed cost. The nutrient requirement is also high. Similarly the labor cost for cotton picking is also increasing exorbitantly. Since the Bt cotton matures early and because of synchronized bole bursting at one time the labour demand for cotton-

picking increases abruptly. Considering these facts policies should be made to Analysis of Growth and Instability of Cotton Production in India 453 reduce the risk in cotton production and to make it profitable. Programs and policies such as rehabilitation of irrigation systems, adoption of improved technologies, strengthening of extension, reducing risks in cotton production can play a vital role in achieving stability and to sustain the high growth rate experienced during the past few years.

As per Aniket S Deshmukh, Dr. Akash Mohanty Cotton Harvesters has proven to be a promising approach for cotton harvesting in India and developing countries. However challenges still remain in its implementation in India though considerable progress has been made in recent years. Developed countries have 100% mechanized cotton picking. With increasing labor charges and its unavailability, mechanization has gained pace in Indian agriculture sector. This review paper provides an overview of cotton harvesters and its various types. It also covers the anatomy of cotton plant, production, and its importance in Indian economy. Indian cropping pattern are studied in detail and various mechanism discussed and their pros and cons are evaluated in this paper.

#### **4. Cost of cotton farming**

Seed cost is the total money spent per farmer per acre in buying cotton seeds for the cotton field. Labour and machinery cost is the total money spent per farmer per acre in labour (including all events of cotton cultivation: soil preparation, sowing, spraying, manuring, weeding, picking, etc) and any machinery rental (tractor for soil preparation is the most common one). This includes only the external labour that the farmer needs to pay for. It does not include the non-financial labour supplied by the farmer and his or her family, as all farmers interviewed, and their families, supplied as much work as possible to their own farm. Family labour was not different between Bt and organic cotton farmers.

Pesticide cost is the total money spent per farmer per acre in buying chemical pesticides for cotton. Usually, Bt cotton farmers buy pesticides from the same shop where they buy Bt seeds and the shop vendors give them recommendations on what pesticides to spray.

Fertiliser cost is the total money spent per farmer per acre in buying nutrients for the cotton crop, both chemical and/or organic. Organic farmers do not use any chemical fertilisers. Organic fertilisers are applied in a variety of ways: farm yard manure, livestock temporal 'rental' in their farm, chicken manure from chicken industrial facilities and others.

Animal feed cost is the total money spent per farmer per acre in buying feed for animals. Most farmers keep some animals in their farm, both for farm work and manure supply and for milk production. In good years, farm products (e.g. straw from paddy) supply enough for feeding the animals. But in dry years, many farmers have to buy additional feed to keep their animals alive. As animals form an integral part of the cotton cultivation process, we have included this expense here.

Interest of loan cost is the total money spent per farmer per acre in paying interests from crop loans. In general, smallholding farmers are very cash limited and need to take a loan every year in order to buy farm inputs at the beginning of the season. Only some farmers are able to take bank loans at official rates. Many can only rely on moneylenders from their village, who normally charge interest up to 50% per year. Some farmers are associated with self-help groups and societies (sangam) that facilitate microcredits at much lower rates.

Total cost of cotton farming is the sum of all these expenses. Each variable was calculated for every farmer and then averaged across Bt and organic cotton farmers. All figures are given in Rupees (Rs) per acre (a). As we want to keep this study meaningful for farmers, we have kept the unit system used by farmers in India (i.e. acres instead of hectares and quintals instead of kilograms or tonnes)<sup>7</sup>. Conversions are given in the footnotes of the Results section.

## 5. Survey on Cotton Harvesting In Saoner

The purpose of this survey was to analyse the present level of mechanisation in cotton harvesting in the following region. The test was performed to get the present system of production, yield and harvesting techniques. Also the purpose was to analyse the actual cost required in this process of cotton harvesting. In this survey we tried to meet with as much farmers as we can and collect relevant data. A wide range of questions

were asked to understand the present scenarios. Also we came to know the reasons why the mechanisation in cotton harvesting india in at very low level.

Mechanization in the region surveyed was 0% i.e. No mechanization was present in the area for cotton harvesting. The reasons behind were firstly the cost of the machine which according to the farmer did not yield any increase in the output. The farmer argued that in one day a labour can pick around 30-50 kg of cotton on an average in a day i.e. in 7 hours, depending on their capacity so if they employ mechanized pickers then it should at least pick 100kg in a day then only it will be possible for them to employ it. They pay a labour 150-300 rupees per day (women are paid 150 rupees and men are paid 300 rupees a day) who pick 50kg of cotton each. If they employ machine for picking and if it picks around 50-60kg then there is no profit to them as they have to pay for machine and its maintenance and also the operator which will cost them more. And also while picking through machine there is trash content in the cotton which fetches them less money on sale. So until the efficiency of the machine is increased and the problem of trash content is solved it is not feasible for them to employ the mechanized processes.

Farmers also said that employment of machine is done when the area is very large. Small scale producers who have 10 -15 acre of land prefer hand picking but the large scale producers who have area of about 50-60 acre or above hand picking becomes cumbersome and also the advanced machine presently are available for the large areas which are very efficient and trash content is also very low.

According to the farmers the present portable pickers are not efficient and attract large amount of trash content which is a very huge problem. The farmers said that if a portable machine with good efficiency and which attracts very less trash content is available they will be ready to use it as it will profit them largely.

## II. CONCLUSION

Studies clearly show that non-Bt organic farmers, by engaging in economic and ecological farming, and by diversifying their cropping system and relying more on their community, achieved a better, more secure economic livelihood than Bt cotton farmers. Bt cotton



farmers, with very high cost of cultivation, high-chemical low-diversity farming, and high debt, are under high vulnerability and risk of household financial collapse. In an era of growing risk and uncertainty, the high variability in the performance of Bt cotton, even when looking at only two years, represents in itself a threat to the livelihood of these small-scale farmers. In an unfavourable year, Bt farmers made only a quarter of the income they could expect in a normal year, while organic farmers' income only decreased by half. This inherent variability resulting from the non-adaptable Bt technology, added to the background of high debt and unpredictable weather, clearly endangers the subsistence of the rain-fed smallholding cotton farmers in India. It seems clear that single technological interventions are a narrow, expensive and ineffective approach to solve any aspect of the profound problems that India and other developing countries are facing in the context of diverse and complex farming systems.

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## Automatic Water Dispenser Along With Mobile Charging

Prof. Amol Bhujade, Chitra Nandanwar, Deeksha Raut, Komal Mangrulkar, Lilangi Wanjari,  
Prachi Lokhande, Shivani Katare

Department of Electronics & Telecommunication Engineering, SRMCEW, Nagpur, Maharashtra, India

### ABSTRACT

This paper describes Liquid dispenser machine which is meant to be operated with IR coin module and mobile charging using RFID interfacing. The main part is control system which includes C programming in Arduino ATMEGA 328 microcontroller to control various components in system, a 28 pin microcontroller with LCD display. This project is very useful to people who are all using mobile phone without charging condition in public places so that they can re-activate a low battery or dead battery by simply plug in & charge it for one rupee. We are designing coin based dispenser machine which is going to dispense water according to the required amount and is turn off immediately, the major advantage here is there is no need for any mandatory person to take care about the system. This system can be placed at Hotels, Conference centers, Exhibition halls, service offices, Shopping malls, Airports, Train terminals, etc.

**Keywords :** ATMEGA 328 Microcontroller, LCD Display, RFID, Coin Box, Motor Driver.

### I. INTRODUCTION

With the advancement in the technology, devices and machines that are useful to the mankind. One of them is coin operated telephone. As we know the function of it and it's working. With the same concept we are going to design a project based on liquid (water, cold drinks). Coin Operated Water Dispensing System as the name indicates it is based on COIN operation. This system is based on micro controller. Coin detecting mechanism is used to detect the coin when inserted and sent a corresponding signal to signal conditioning unit that converts the incoming signal into square pulse and then given to microcontroller.

In the RFID based charger the user has to plug in the phone into one of the adapters and swap RFID card for charging at constant current for a definite time period. The microcontroller used is ATMEGA 328 which is a type of reprogrammable micro-controller programmed. Driver circuit consists relay, which acts as a switch to turn ON and OFF. The relay output is directly given to

the mobile charger pin. The different mobile charger requires different pin size. This project is divided into two major parts; hardware and software. Hardware part includes the electronic circuit the software part includes the programs written in the embedded C.

### BLOCK DIAGRAM

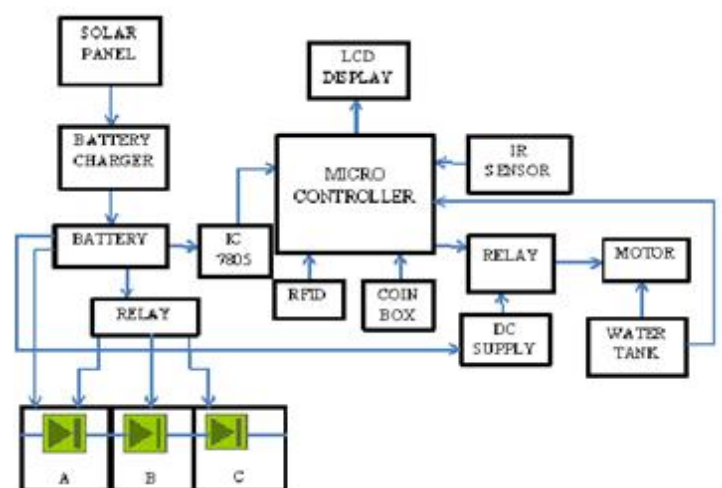


Figure 1. Block Diagram

Block diagram description-

Above block diagram shows the Coin Based Water dispenser and Mobile Charger using RFID.

POWER SUPPLY

SOLAR PANEL

To provide power supply regularly, we are using Solar Panel, DC Power Supply, and Battery. Solar Panel provide DC power supply to charge the rechargeable battery otherwise Grid supply provides DC 12V to charge the battery which means two standby power supplies are used here.

INPUT

When a coin is inserted in a coin box made up of one transmitter and receiver, the interruption occurs in the sensor mechanism then command signal will be send to the microcontroller.

Also when the card is swapped, it is detected by microcontroller and then the signal is sent to relay for mobile charging.

RFID is a radio frequency identification that uses electro-magnetic energy as a medium for communication purpose. The basic components reader and transponder are connected to microcontroller. Transponder receives a radio signal and automatically transmits different signal. When the transponder receives a signal from reader unit, it responds by transmitting its unique identification code.

CONTROLLER

Microcontroller works only when the command is received from RFID card or coin box. LCD displays the content given by microcontroller. Controller gives command signal to relay to switch ON or OFF.

OUTPUT

The supply from relay is given to the motor driver which sends signal to water tank. When the bottle is sensed by the IR sensor water starts flowing. Even if we insert coin

and the bottle is not placed we will not get any output (water).

The supply from relay is given to the mobile charger pin and the charger will be ON only when the RFID card is swapped. It gives 4.8V & 1500 mA power to the mobile battery.

FLOW CHART

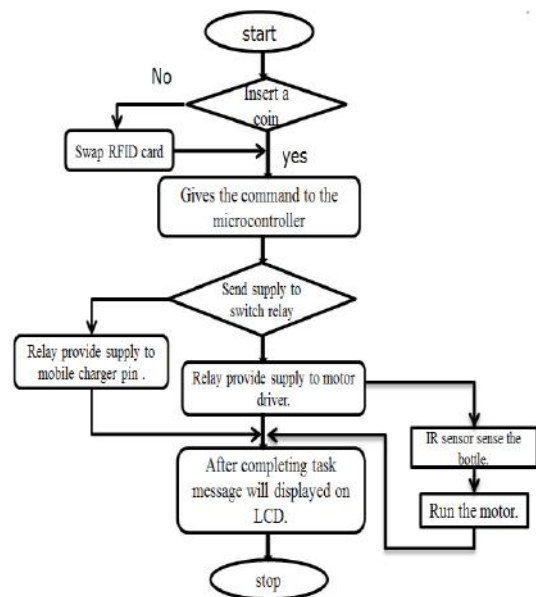


Figure 2. Flow Chart

COMPONENTS

ARDUINO ATMEGA 328

Arduino/Genuino Uno is a microcontroller board based on the ATMEGA 328P. It has digital input/output pins, 6 analog inputs a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.To support the microcontroller it contains everything needed, simply connecting it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. You can thinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.



**Figure 3.** Arduino ATMEGA 328 kit

**LCD DISPLAY**

The system uses 2-line, 16 character LCD display as shown in figure 4. It has 4 bit interface. It is relatively easy to use once you have it mapped into your processor’s memory mapped I/O. Then Characters need to send to display; they show it up on the screen.



**Figure 4.** LCD Display

**RELAY**

A relay as shown in figure 5 is an electrically operated switch. An electromagnet is used in relays to operate a switch mechanically, but also other operating principles such as solid state relays are used. Relays are used where it is necessary to control a circuit by a low-power signal. The first relays were used in long distance telegraph circuits as amplifiers; they repeated the signal coming from one circuit and re-transmitted on other circuit. Relays were used extensively in telephone exchanges and in early computers to perform logical operations.

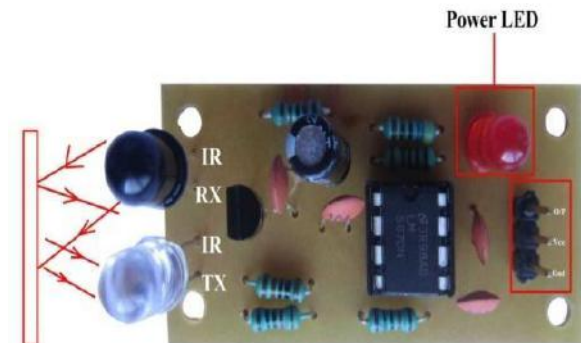


**Figure 5.** Relay

**IR SENSOR**

An Infrared sensor as shown in figure 6 is a sensor which is able to detect the presence of nearby objects without any physical contact.

An Infrared sensor emits an infrared signal or an electromagnetic radiation (infrared) and looks for a change in the field. The object being sensed is often referred to as the Infrared sensors target that demands different sensors. For example, a capacitive or photoelectric sensor are suitable for a plastic target; an inductive proximity sensor always requires a metal target. The maximum distance the sensor can detect is called as "nominal range". Some sensors have adjustments of the nominal range or means to report a graduated detection distance. With the absence of mechanical parts and lack of physical contact between sensor and the sensed object, infrared sensors may have high reliability and long functional life.



**Figure 6.** IR sensor

## II. RESULT

In this paper we represent mobile battery charging using solar power for rural & semi urban areas where the Grid power supply is not easily available. This paper is very useful in day to day life because nowadays every person wants to be in connection with each other. But every time we cannot carry charger with us or we may forget to carry mobile charger for long drive. Then this device is very useful.

Also one can get water easily through water dispenser available at public places such as Railway Stations, Bus Stands, Airports, etc.

## III. CONCLUSION

Thus we have worked on the project coin based water dispenser and RFID based mobile charging as per above algorithm and block diagram shown.

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## EHG Signal Classification for Term and Pre-Term Pregnancy Analysis

Uzma Fatima, Prof. Tirupati Goskula

Department of Electronics and Telecom, Anjuman College of Engg and Tech, Nagpur, Maharashtra, India

### ABSTRACT

Early prediction of premature pregnancy reduces neonatal death and helps in adoption of treatment well suited for the pre-term pregnancy state. There are scads of work done in the area of term and pre-term pregnancy analysis like artificial intelligence, regressive models, and higher order statistical models. This paper proposes a four-level decomposition of Electrohysterography (EHG) signals using Discrete Wavelet Transform (DWT) based on pyramid algorithm to obtain the final feature vector matrix. Classification is done using Support Vector Machines (SVM) by dividing the data into test and training sets. It is validated on a well-known benchmark database from Physionet Database. The proposed method can be used for real time implementation owing to low computational cost, high speed and its feasibility to be implemented on hardware. The encouraging experimental results show that the technique gives an accuracy of 97.8% and can be a promising tool for investigating the risk of preterm labor.

**Keywords :** Discrete wavelet transform, labor time detection, term and pre-term pregnancy, Support Vector Machines, EHG

### I. INTRODUCTION

Preterm birth, also known as premature birth or delivery, is described by the World Health Organisation (WHO) as the delivery of babies who are born, alive, before 37 weeks of gestation [1]. In contrast, term births are the live delivery of babies after 37 weeks, and before 42 weeks. According to the WHO, worldwide in 2010, preterm deliveries accounted for 1 in 10 births [1]. In 2009, in England and Wales, 7% of live births were also preterm (<http://ons.gov.uk>). Preterm birth has a significant adverse effect on the new born, including an increased risk of death and health defects. The severity of these effects increases the more premature the delivery is. Approximately, 50% of all perinatal deaths are caused by preterm delivery [2], with those surviving often suffering from afflictions, caused by the birth. These include impairments to hearing, vision, the lungs, the cardiovascular system and non-communicable diseases; up to, 40% of survivors of extreme preterm delivery can also develop chronic lung disease [3]. In other cases, survivors suffer with neuro-developmental or behavioural defects, including cerebral palsy, motor, learning and cognitive impairments. In addition, preterm

births also have a detrimental effect on families, the economy, and society. In 2009, the overall cost to the public sector, in England and Wales, was estimated to be nearly £2.95 billion [4]. However, developing a better understanding of preterm deliveries can help to create preventative strategies and thus positively mitigate, or even eradicate, the effects that preterm deliveries have on babies, families, and society and healthcare services. Preterm births can occur for three different reasons. According to [2], roughly one-third are medically indicated or induced; delivery is brought forward for the best interest of the mother or baby. Another third occurs because the membranes rupture, prior to labour, called Preterm Premature Rupture of Membranes (PPROM). Lastly, spontaneous contractions (termed preterm labour or PTL) can develop. However, there is still a great deal of uncertainty about the level of risk each factor presents, and whether they are causes or effects. Nevertheless, in [2] some of the causes of preterm labour, which may or may not end in preterm birth, have been discussed. These include infection, over-distension, burst blood vessels, surgical procedures, illnesses and congenital defects of the mother's uterus and cervical weakness. Further studies have also found other risk

factors for PTL/PPROM [5,6]. These include a previous preterm delivery (20%); last two births have been preterm (40%), and multiple births (twin pregnancy carries a 50% risk). Other health and lifestyle factors also include cervical and uterine abnormalities, recurrent antepartum haemorrhage, illnesses and infections, any invasive procedure or surgery, underweight or obese mothers, ethnicity, and social deprivation, long working hours/late nights, alcohol and drug use, and folic acid deficiency.

As well as investigating preterm deliveries, several studies have also explored preterm labour (the stage that directly precedes the delivery). However, in spite of these studies, there is no internationally agreed definition of preterm labour. Nonetheless, in practice, women who experience regular contractions, increased vaginal discharge, pelvic pressure and lower backache tend to show threatening preterm labour (TPL). While this is a good measure, Mangham et al., suggest that clinical methods for diagnosing preterm labour are insufficient [4]. Following a medical diagnosis of TPL, only 50% of all women with TPL actually deliver, within seven days [2]. In support of this, McPheeters et al., carried out a similar study that showed 144 out of 234 (61.5%) women diagnosed with preterm labour went on to deliver at term [7]. This can potentially add significant costs, and unnecessary interventions, to prenatal care. In contrast, false-negative results mean that patients requiring admittance are turned away, but actually go on to deliver prematurely [8].

Predicting preterm birth and diagnosing preterm labour clearly have important consequences, for both health and the economy. However, most efforts have concentrated on mitigating the effects of preterm birth. Nevertheless, since this approach remains costly [1], it has been suggested that prevention could yield better results [9]. Effective prediction of preterm births could contribute to improving prevention, through appropriate medical and lifestyle interventions. One promising method is the use of Electrohysterography (EHG). EHG measures electrical activity in the uterus, and is a specific form of electromyography (EMG), the measurement of such activity in muscular tissue. Several studies have shown that the EHG record may vary from woman to woman, depending on whether she is in true labour or false labour and whether she will deliver term or preterm.

EHG provides a strong basis for objective predication and diagnosis of preterm birth.

Many research studies have used EHG for prediction or detection of true labour. In contrast, this paper focuses on using EHG classification to determine whether delivery will be preterm or term. This is achieved by comparing various machine-learning classifiers against an open dataset, containing 300 records (38 preterm and 262 term) [10], using a signal filter and pre-selected features, which are suited to classifying term and preterm records. The results indicate that the selected classifiers outperform a number of approaches, used in many other studies.

In analysis of pregnancy for labor period detection the use of non – invasive techniques is highly encouraged. One such promising technique is the uterine Electrohysterography (EHG) signals. The EHG records correspond to the activity of the uterine muscles. The main events extracted from the uterine EHG are the contractions (CT). The electrical activity during preterm labor (labor prior to 37 weeks of completed gestation) is significantly different from the activity of term labor. These differences prove to be helpful in identifying the nature (term or preterm) of the delivery. Owing to its simple and non- invasive nature this technique finds huge acceptance in hospitals. The premature delivery can be a threat to the child if not detected timely, as it may lead to birth of handicapped child with mental, neurological or behavioral abnormalities. But, among 80% cases it causes neonatal death. Thus, knowing the time of labor can help in adoption of treatment well suited for the preterm pregnancy state.

Due to the complications involved it is an extremely difficult task to predict the labor time hence, it is necessary to rely only on a technique having very high accuracy of separating the term pregnancy from the preterm pregnancy.

## Review of Literature

A review of previous literature shows that immense work has been done in noninvasive techniques for determination of preterm delivery. Several model-based approaches [1], [5], [6], [7], [12], [13] have been proposed in this area. Jerzy et. al [1] classified the term

and pre-term data using the Lagrangian Support Vector Machines (SVM). In [5] Marwa Chendeb et. al used wavelet transform and then classified using artificial neural networks and SVM. Various linear and non-linear processing techniques were used by G. Fele et. al [6]. In [12] classical techniques of data analysis, such as Principal Component Analysis (PCA) and Discriminant Analysis (DA) have been used. In [7], [13] Artificial Neural Networks (ANN) has been used on the EHG signals quantified by finding the means and standard deviations of the power spectrum. But, still this area lacks an effective practical method to access whether the uterine signals have entered the phase of uterus activity-burst that may indicate labor time.

### **Electrohysterography**

Electrohysterography (EHG) is the term given for the recording of electrical activity of the uterus, in the time domain. In order to retrieve EHG signals, bipolar electrodes are adhered to the abdominal surface. These are spaced at a horizontal, or vertical, distance of 2.5 cm to 7 cm apart. Most studies, including [10], use four electrodes, although one study utilizes two [11]. In a series of other studies, sixteen electrodes were used [12–17], and a high-density grid of 64 small electrodes were used in [18]. The results show that EHG may vary from woman to woman. This is dependent on whether she is in true or false labour, and whether she will deliver at term, or prematurely.

A raw EHG signal results from the propagation of electrical activity, between cells in the myometrium (the muscular wall of the uterus). This signal measures the potential difference between the electrodes, in a time domain. The electrical signals are not propagated by nerve endings; however, the propagation mechanism is not clear [19]. Since the late 70s, one theory suggests that gap junctions are the mechanisms responsible. Nevertheless, more recently it has been suggested that interstitial cells, or stretch receptors may be the cause of propagation [20]. Gap junctions are groups of proteins that provide channels of low electrical resistance between cells. In most pregnancies, the connections between gap junctions are sparse, although gradually increasing, until the last few days before labour. A specific pacemaker site has not been conclusively identified, although, due to obvious physiological

reasons, there may be a generalised propagation direction, from the top to the bottom of the uterus [21].

The electrical signals, in the uterus, are ‘commands’ to contract. During labour, the position of the bursts, in an EHG signal, corresponds roughly with the bursts shown in a tocodynamometer or intrauterine pressure catheter (IUPC). Clinical practises use these devices to measure contractions. More surprisingly, distinct contraction-related, electrical uterine activity is present early on in pregnancy, even when a woman is not in true labour. Gondry et al. identified spontaneous contractions from EHG records as early as 19 weeks of gestation [22]. The level of activity is said to increase, as the time to deliver nears, but shoots up especially so, in the last three to four days, before delivery [23]. As the gestational period increases, the gradual increase in electrical activity is a manifestation of the body’s preparation for the final act of labour and parturition. In preparation for full contractions, which are needed to create the force and synchronicity required for a sustained period of true labour, the body gradually increases the number of electrical connections (gap junctions), between cells. In turn, this produces contractions in training.

Before analysis or classification occurs, EHG signals, in their raw form, need pre-processing. Pre-processing can include filtering, de-noising, wavelet shrinkage or transformation and automatic detection of bursts. Recently, studies have typically focused on filtering the EHG signals to allow a bandpass between 0.05 Hz and 16 Hz [24–28]. However, there are some that have filtered EHG recordings as high as 50 Hz [19]. Nevertheless, using EHG with such a wide range of frequencies is not the recommended method, since more interference affects the signal.

### **Feature Extraction from Elecrohysterography**

The collection of raw EHG signals is always temporal. However, for analysis and feature extraction purposes, translation, into other domains, is possible and often required. These include frequency representation, via Fourier Transform, [15], [28–30] and wavelet transform [24,27], [30–33]. The advantage of frequency-related parameters is that they are less susceptible to signal quality variations, due to electrode placement or the physical characteristics of the subjects [26]. In order to calculate these parameters, a transform from the time



domain is required, i.e., using a Fourier transform of the signal. In several of the studies reviewed, in order to obtain frequency parameters, Power Spectral Density (PSD) is used. Peak frequency is one of the features provided within the Term- Preterm ElectroHysteroGram (TPEHG) dataset, used within this paper. It describes the frequency of the highest peak in the PSD. Most studies focus on the peak frequency of the burst, in both human and animal studies, and is said to be one of the most useful parameters for predicting true labour [34]. On the other hand, the study by [10] found medium frequency to be more helpful in determining whether delivery was going to be term or preterm.

Several studies have shown that peak frequency increases, as the time to delivery decreases; generally, this occurs within 1–7 days of delivery [11,19,24,26,30,35]. In particular, the results in [28] show that there are, statistically, significant differences in the mean values of peak frequency and the standard deviations in EHG recordings taken during term labour (TL) and term non-labour (TN) and also between preterm labour (PTL) and preterm non-labour (PTN).

In comparison to peak frequency, the TPEHG study [10] found that median frequency displayed a more significant difference, between term and preterm records. When considering all 300 records, the statistical significance was  $p = 0.012$  and  $p = 0.013$ , for Channel 3, on the 0.3–3 Hz and 0.3–4 Hz filter, respectively. Furthermore, this significance ( $p = 0.03$ ) was also apparent when only considering early records (before 26 weeks of gestation), with the same 0.3–3 Hz filter, on Channel 3. The TPEHG study [10] concluded that this might have been due to the enlargement of the uterus, during pregnancy, which would affect the position of electrodes. The placement of the Channel 3 electrode was, approximately, always 3.5cm below the navel. However, as pregnancy progressed, this would mean that the electrode would move further away from the bottom of the uterus (cervico-isthmic section). If a generalised pacemaker area actually exists, and it is at the cervico-isthmic section, then, as pregnancy progresses, its position would move further and further away from the electrode, resulting in a diminished record of the signal. Whether this explanation is true or not, the results of [10] show that, the discriminating capability of median frequency is somehow diminished, after the 26th week.

Amplitude-related EMG parameters represent the uterine EMG signal power, or signal energy. However, a major limitation is that the differences in patients can easily affect these parameters. Patients may differ in the amount of fatty tissue they have, and the conductivity of the skin–electrode interface, which leads to differences in the attenuation of uterine signals [8,26,34]. Examples of amplitude-related parameters include root mean square, peak amplitude and median amplitude.

Using the Student's t-test, [10] found that root mean square might be useful in distinguishing between whether the information was recorded early (before 26 weeks of gestation) or late (after 26 weeks). The results obtained are in agreement with [19,30] and [36], who found that the amplitude of the power spectrum increased, just prior to delivery. This was despite only analysing the root mean square values, per burst, rather than the whole signal. On the other hand, other studies did not find that amplitude-related parameters displayed a significant relationship to gestational age or indicate a transition to delivery (within seven days) [23,25,28]. Some of these discrepancies may be due to the differences between the characteristics in the studies: [10] compared records before and after 26 weeks, whereas [25] only examined records after the 25th week; [29] and [35] studied rat pregnancy, in contrast to human pregnancy. The frequency band used in [30] and [19] was also a much broader band than in other studies (0.3–50 Hz; no bandwidth given for [36]), and the studies by [29] and [35] measured per burst, whilst [25] measured the whole signal.

Meanwhile, the TPEHG study [10] could not find any significant difference in root mean squares between preterm and term records. However, [25] did find that the root mean squares, in preterm contractions, were higher (17.5 mv 67.78), compared to term contractions (12.2 mV 66.25;  $p, 0.05$ ). The results, from [25], could not find a correlation between root mean squares and the weeks left to delivery. Nevertheless, they do suggest that a greater root mean square value was, for the most part, a static symptom that indicated a woman's dispensation to give birth prematurely. They also found that the root mean square values, within each pregnancy, did increase within a few days of birth.

Overall, the results suggest that there is no significant difference in the amplitude-related parameters between

term and preterm deliveries, when taken during labour, or close to it. However, there may be considerable differences earlier on in the pregnancy. This suggests that by the time of delivery, any differences have equalised themselves.

Sample entropy measures the irregularity of a time series, of finite lengths. This method was introduced by [37] to measure complexity in cardiovascular and biological signals. The more unpredictable the time series is, within a signal recording, the higher its sample entropy. The process is based on calculating the number of matches of a sequence, which lasts for  $m$  points, within a given margin  $r$ . The disadvantage of this technique is the requirement to select two parameters,  $m$  and  $r$ . However, sample entropy did show a statistical difference between term and preterm delivery information, recorded either before or after the 26th week of gestation, when using any of the filters, but only using the signal from Channel 3 [10].

### Term and Preterm Classification

Computer algorithms, and visualization techniques, are fundamental in supporting the analysis of datasets. More recently, the medical domain has been using such techniques, extensively.

Artificial Neural Networks (ANN) have been used in a large number of studies to classify term and preterm deliveries, [11,38]. They have also been useful for distinguishing between non-labour and labour events [11,38], irrespective of whether they were term or preterm. Moslem et al. [14] argue that they have been particularly useful in helping to identify important risk factors associated with preterm birth. The global accuracy of these studies varied from between 73% and 97%.

Baghamoradi et al. [39] used the TPEHG database [10] to compare sample entropy with thirty and three cepstral coefficients extracted from each signal recording through sequential forward selection and Fisher's discriminant. A multi-layer perceptron (MLP) neural network classified the feature vectors into term and preterm records. The results indicate that the three cepstral coefficients produced the best classification accuracy, with 72.73% (613.5), while using all thirty coefficients showed only 53.11% (610.5) accuracy.

Sample entropy performed the worst with an accuracy of 51.67% (614.6). The results indicate that the sequential forward selection and Fisher's discriminant had the most effect on the accuracy because the thirty coefficients set only presenting a small improvement, in classification accuracy. Support Vector Machines (SVM) have featured in several studies, which include [12,13,14]. Many of them classify contractions into labour or non-labour, using different locations on the abdomen. Majority voting (WMV) decision fusion rules, including a Gaussian radial basis function (RBF), form the basis for classification. The feature vectors include the power of the EMG signal, and the median frequency. The highest accuracy for a single SVM classifier, at one particular location on the abdomen, was 78.4% [12,13], whilst the overall classification accuracy, for the combined SVM, was 88.4% [14]. Finding the coefficients, for the decision boundary, occurs by solving a quadratic optimisation problem.

The k-NN algorithm has been used by Diab et al. [40] with an emphasis on Autoregressive (AR) modelling and wavelet transform pre-processing techniques. The study focused on classifying contractions into three types using data obtained from 16 women. Group 1 (G1), were women who had their contractions recorded at 29 weeks, and then delivered at 33 weeks; Group 2 (G2) were also recorded at 29 weeks, but delivered at 31 weeks, and Group 3 (G3) were recorded at 27 weeks and delivered at 31 weeks. Classification occurred against G1 and G2 and against G2 and G3 using, the k-NN algorithm combined with the pre-processing method of AR. As well as this, an Unsupervised Statistical Classification Method (USCM), combined with the pre-processing method of Wavelet Transform, was also used. The USCM adopted the Fisher Test and k-Means methods. The wavelet transform, combined with USCM, provided a classification error of 9.5%, when discerning G1 against G2, and 13.8% when classifying G2 against G3. Using AR, the k-NN provided a classification error of 2.4% for G1 against G2 and 8.3% for G2 against G3. In both classifications, the AR and k-NN methods performed better than the USCM. Furthermore, the classification accuracy for G1 and G2 was always lower than the equivalent G2 and G3 classifications. This suggests that it is easier to distinguish between pregnancies recorded at different stages of gestation than it is to distinguish between the time of delivery.

## Proposed System

The system used for automatic identification of the EHG signals is described using a block diagram shown in Figure 1.

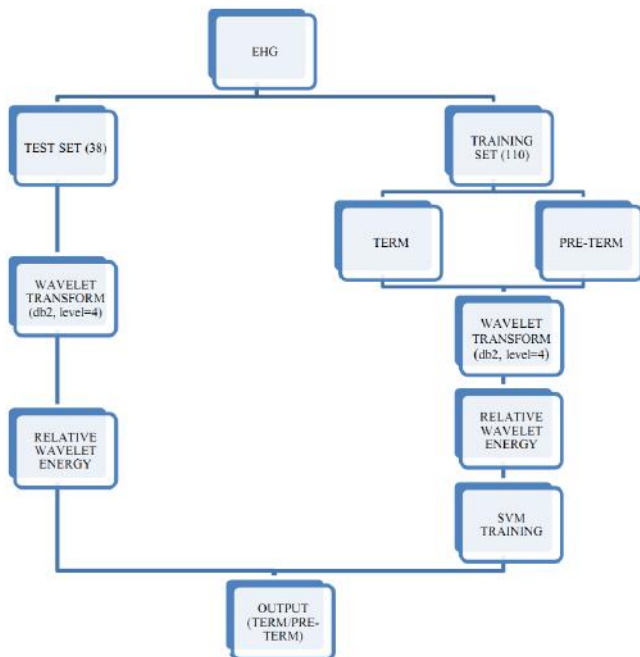


Figure 1. Block Diagram

## Signal Acquisition

The uterine EHG signals of a total of 146 pregnant women were downloaded from Physionet. One fourth of the data records were separated into test set (36) and the rest (110) as training set. The training set was grouped further into four groups according to the time of recording (before or after the 26th week of gestation) and according to the total length of gestation (term delivery records— pregnancy duration  $\geq 37$  weeks and pre-term delivery records— pregnancy duration  $< 37$  weeks).

## Feature Extraction

The dimension of the EHG signals is too high to be used directly for classification. Therefore it is important to apply feature extraction techniques in order to obtain informative features. Among all the feature extraction techniques used for signal processing, wavelet transform is found to be most successful. This is due to the reason that wavelet transform works in time and frequency

domains. Therefore Discrete Wavelet Transform (DWT) is used to extract the features.

## Feature Reduction

Further the features representing the burst of electrical activity are extracted by applying Relative Wavelet Energy (RWE) on the EHG signals. This feature reduction tools helps in further cutting down the feature vector matrix which is then sent for classification.

## Classification

The classification stage is used to discriminate between different classes, term and pre- term pregnancy state. A classifier plays a very important role and thus it should accurately separate the data into the two groups. For this work Support Vector Machines (SVM) is used for classification purposes. The classifier is first trained using the training set and then tested using the test set.

## II. METHODOLOGY

### Wavelet transform

A crucial part of the EHG processing consists of transforming the information acquired from the signals into a small number of components which represent the uterine activity. Traditional Fourier transform methods (Fast Fourier transform and Short time Fourier Transform) have proved to be extremely insightful over the years as a feature extraction technique. However, there are various limitations while applying these techniques like they are not suitable to extract features localized simultaneously in time and frequency domain. Due to this reason they cannot be used to analyze transient signals especially when it is required to generate features for detection and discrimination for critical applications. Over the past several years, the methods based on Wavelet Transform (WT) (Stationary WT, Discrete WT, Wavelet Packet) have received a great deal of attention for extracting information from the EHG signals. This can be accounted to the Multi resolution analysis (MRA) which makes WT the most suitable candidate for analysis of frequency content of non-stationary events which is a prerequisite for EHG signals.

WT decomposes a signal into small waves with energy concentrated in time called wavelets. Wavelets are the scaled and shifted copies of the main pattern, so-called

the mother wavelet. The mother wavelet function is defined by equation (1), where  $b$  is translation parameter and,  $a$  as scale parameter.

$$\Psi_{a,b} = \frac{1}{\sqrt{a}} \Psi \left( \frac{t-b}{a} \right)$$

DWT analyses the signal using MRA by decomposing the signal into approximation and detailing information by employing two functions: scaling and wavelet function as shown in equation 1. The approximation coefficient is subsequently divided into new approximation and detailed coefficients.

This process is shown in Fig. 2 which is carried out iteratively producing a set of approximation coefficients (CA) and detailed coefficients (CD) at four different levels of decomposition.

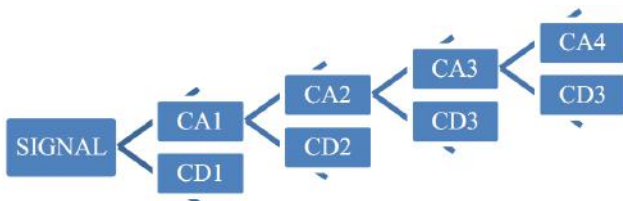


Figure 2. Decomposition

**Relative Wavelet Energy**

If the scaling functions and wavelets form an orthogonal basis, Parseval’s theorem relates the energy of the signal  $x(t)$  to the energy in each of the components and their wavelet coefficients. The energy  $E_j$  of the detailed signal at each resolution level  $j$  is given by

$$E_j = \sum_k |d_{j,k}|^2$$

Total energy is given by

$$E_{Total} = \sum_{j=1}^{N+1} E_j$$

The wavelet energy can be used to extract only the useful information from the signal about the process under study. For this work the concept of relative energy has been used. RWE gives information about relative energy with associated frequency bands and can detect the degree of similarity between segments of a signal. RWE is defined by the ratio of detail energy at the specific decomposition level to the total energy. Thus the relative energy is given by:

$$RWE = \frac{E_j}{E_{Total}}$$

RWE resolves the wavelet representation of the signal in one wavelet decomposition level corresponding to the representative signal frequency. Thus this method accurately detects and characterizes the specific phenomenon related to the different frequency bands of the EHG signal. RWE gains an advantage over DWT based feature extraction in terms of speed, computation efficiency and classification rate.

**Support Vector Machines**

The approach of SVM is to find an optimal hyper- plane in the multi-dimensional space of features, which would separate the classes being considered with the largest distance (margin) to the nearest training data points. The data (input vectors) that ensure this safety margin are called the support vectors. This optimal hyper plane is constructed in such a way that it maximizes the minimal distance between itself and the learning set.

$$g(y) = \text{sgn} \left( \sum_{i=1}^{ks} d_i \alpha_i K(y_i, y) + b \right)$$

Maximize

$$\sum_{i=1}^l \alpha_i - \frac{1}{2} \sum_{i,j=1}^l d_i d_j \alpha_i \alpha_j K(y_i, y_j)$$

Subject to

$$\sum_{i=1}^l \alpha_i d_i = 0 \quad 0 \leq \alpha_i \leq C \text{ for } i = 1, 2, \dots, l$$

$$K(u, v) = \exp \left( - \frac{\|u - v\|^2}{2\sigma^2} \right)$$

**III. CONCLUSION**

In this paper DWT based feature extraction is incorporated to classify the EHG signals using Support Vector Machines based classifier. The RWE of different EHG signals were obtained which provided a compact and accurate feature space to achieve better classification rate and reduced computational load. Due to its memory efficient capability this concept can generalize the EHG processing to much larger datasets. The SVM based classifier presented has a good performance in classifying the 2 stages of labor and can

be easily implemented on hardware for real time response. The most redeeming feature of proposed system is its capability to achieve excellent computational efficiency without any loss of information. This sets apart the system from the other automatic classifiers falling in the same levels of accuracy without any requirement of topnotch PCs. Owing to the suitably high accuracy achieved using the synergy of SVM and RWE technique, the methodology presented in this paper can be utilized for designing automatic EHG classifiers which can be used by the gynecologist for detecting premature birth risk.

#### IV. REFERENCES

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## Evaluation of Canny and Sobel Edge Detection Technique using Xilinx System Generator

Gagan Baraskar<sup>1</sup>, Pooja Thakre<sup>2</sup>

<sup>1</sup>Department of Electronics (Communication), RTMN University, Nagpur, Maharashtra, India

<sup>2</sup>Head of Department of Electronics (Communication), RTMN University, Nagpur, Maharashtra, India

### ABSTRACT

Edge detection is the first step in many computer vision applications. Edge detection of image significantly reduces the amount of data and filters out unwanted or insignificant information and gives the significant information in an image. This information is used in image processing to detect objects in which there are some problems like false edge detection, missing of low contrast boundaries, problems due to noise etc. The aim of this paper is to develop an edge detection which automatically detects edges of digital image. The complete design of sobel edge algorithm using sobel filter and canny edge detector algorithm followed by the Gaussian filtering and gradient filter is done on Xilinx System Generator (XSG). The complete design combines MATLAB, Simulink and XSG. The VHDL code is generated by using Xilinx system generator (XSG). Further the generated VHDL code is synthesized in Xilinx ISE Design Suit 13.1. The Edge Detection method has been verified successfully with no visually perceptual errors in the resulted images and also comparing the both filters with an individually performance is justified clearly with Practical and Theoretical

**Keywords :** XSG, Canny, Sobel, VHDL, Gaussian Filter

### I. INTRODUCTION

In lower level image processing edge detection plays very important role. Quality of detected edges has significant role in image segmentation, scene analysis, focused area Selection, object recognition. For accurate edge extraction, both changes in the colour and changes in the brightness between neighboring pixels should be demoralized. Many forceful and complex edge detection techniques have been presented in the previous literatures. These provide different outputs and particulars to the same input image. Here Sobel operator based edge detection technique is used and is extended for real-time applications. Due to the property of counteracting the noise sensitivity Sobel operator for edge detection over other gradient operators are chosen. The Sobel operator commonly known as Sobel filter is used for image processing and computer vision, which creates an image which focuses edges and transitions. It is discrete differentiation operator that calculates the gradient approximation of the image intensity function. The result of the Sobel operator is the corresponding

gradient vector at that particular point. The Sobel operator convolves the image with an integer valued filter in vertical and horizontal direction so it is thus relatively cheaper in terms of computations. The gradient estimation that it produces is relatively simple for high frequency variations in the image. A Xilinx tool, the System Generator for DSP offers an efficient and straight forward method for transitioning from a PC-based model in Simulink to a real-time FPGA based hardware implementation. The system model can be simulated in the Simulink environment. This higher abstraction level reduces the analysis and debugging time. For real hardware testing, Xilinx System Generator supports the possibility to perform hardware in-the-loop co-simulation [2]. This methodology provides easier hardware verification and implementation compared to HDL based approach. The Simulink simulation and hardware-in-the loop approach presents a far more cost efficient solution than other methodologies. The ability to quickly and directly realize control system design as a real-time embedded system greatly facilitates the design process. The goal of this project was to implement an

image processing algorithm applicable to Edge Detection system in a Xilinx FPGA using System Generator for DSP, with a focus on achieving overall high performance, low cost and short development time.

## II. LITRATURE SURVEY

Qian Xu, Chaitali Chakrabarti and Lina J. Karam, "A Distributed Canny edge detector and its implementation on FPGA". This paper describe the Canny edge detector and its implementation on FPGA. Edge detection is one of the key stages in image processing and object recognition. The Canny edge detector is one of the most widely-used edge detection algorithm due to its good performance. We present a distributed Canny edge detection algorithm that results in significantly reduced memory requirements, decreased latency . this results in a significant speed up without ssecrificing the edge detection performance. The computational cost of the proposed algorithm is very low compared to the original Canny edge detection algorithm.[1].

F. M. Alzahrani and T. Chen "A real-time edge detector algorithm and VLSI architecture, this paper present an absolute different mask (ADM) edge detection algorithm and its pipelined VLSI architecture for real time application .But the edge detector in offers a trade-off between precision cost and speed, and its capability to detect edges is not as good as the Canny algorithm. There is another set of work on Deriche filters that have been derived using Canny criteria. [2]

D. V. Rao and M. Venkatesan, "An efficient reconfigurable architecture and implementation of edge detection algorithm using Handle-C," the approach of this paper is to operates on two rows of pixel at a time ,this reduces the memory requirement at the expense of a decrease in the throughput. Furthermore it is known that the original Canny edge detection algorithm needs two adaptive image dependent high and low thresholds to remove false edges. However, the algorithm in just fixes high and low thresholds in order to overcome the dependency between the blocks which results in a decreased edge detection performance.[4]

S . Varadarajan , C. Chakrabarti, L. J. Karam, and J. M. Bauza, "A distributed psycho-visually motivated Canny edge detector ;" In this paper we proposed a new threshold selection algorithm based on the distributed of pixel gradients in a block of pixel to overcome the

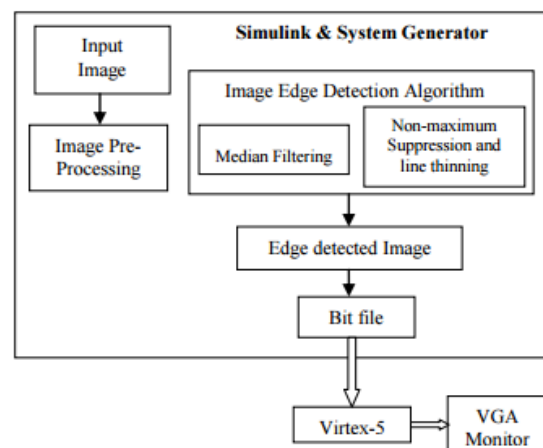
dependency between the blocks ,however in hysteresis thresholds calculation is based on a very finely and uniformly quantized 64 bit gradient magnitude histogram, Which is use in real time implementation.[5]

## III. SYSTEM DESIGN AND FUNCTION

### Architecture of Sobel and Canny Algorithm

The purpose of the design phase is to plan a solution of the problem specified by the requirement document. This phase is the first step-in moving from the problem domain to the solution domain. The design of the system is perhaps the most critical factor affecting the quality of the hardware implementation. Here we build the System Block Diagram that is helpful to understand the behavior of the system. In the proposed work entire system is divided into following:

1. Input image from image block MATLAB
2. Convert RGB to Gray block
3. Image Edge detection using Sobel & Canny Operator.
4. Conversion of image in MATLAB



**Figure 1.** System Block Diagram

The overall system consists of following blocks image input, image pre-processing, image edge detection algorithm, FPGA board, Output on VGA monitor. The Simulink models are generated for system using Simulink block sets, which are present in MATLAB/Simulink. Input image used is image stored in memory. Then the resizing and preprocessing is done using the median filtering on the image to reduce noise which is present in the input image. After preprocessing



the edge detection of the image is done and then the post processing is done using the non-maximum suppression and line thinning. The edge image is then detected with the help of Matlab/Simulink model. The Xilinx Platform Studio (XPS) is used to interface peripherals [4]. Then XPS along with xilinx ISE 14.1 generate a .bit file for the edge image and then downloaded to FPGA.

1) Input Image: Input image is a digital image which is of different formats such as .jpg, .bmp, .jpeg, .tiff, .gif, .png which are stored in memory. These images are color as well as black and white images. These images are converted from RGB to gray colour using the MATLAB code. These images are selected in the Simulink model using the 'image from file/workspace' block. The size of the stored image is resized to 512X512 in the MATLAB code.

2) Image edge detection Algorithm: Here Canny edge detection algorithm is implemented on FPGA board, which is implemented in following steps: pre-processing, gradient calculation, non-maximum suppression, double thresholding, hysteresis. These steps are explained in detailed in next section.

The Virtex-5 ML506 evaluation board is user friendly which is used to realize this system. For this system awfully fewer hardware is required such as RS232, JTAG cable and VGA monitor. The downloading process of Virtex-5 is easy to understand. This FPGA board gives especially rapid results.

A. Software Design In this paper, image edge detection algorithm is used for the detection of edges of object. The Fig. 2 shows the flow of the Canny edge detection algorithm.

1) Image pre-processing: Basically in many image processing applications input image is colour image. Here also input image is colour image. For edge detection purpose no any colour information is required so second step to minimize this unnecessary colour data. For this data reduction image is converted into grayscale image. This grayscale image containing some noise in it so filtering is applied. Median filter is preferred for this purpose.

2) Convolution with masks, Gradient and direction Calculation: Here, suppose  $G(x, y)$  is a 2D Gaussian mask and  $I(x, y)$  is the image, the first-order derivative

of Gaussian is  $g_x(x, y)$  and  $g_y(x, y)$ . Then the gradient of vertical direction  $E_x(x, y)$  and horizontal direction  $E_y(x, y)$  can be computed by the following equations:

$$G(x, y) = \frac{1}{2\pi\sigma^2} \{ e^{-\frac{x^2+y^2}{2\sigma^2}} \} \tag{1}$$

$$g_x(x, y) = \frac{\partial G}{\partial x} = \frac{1}{\pi\sigma^2} x \{ e^{-\frac{x^2+y^2}{2\sigma^2}} \} \tag{2}$$

$$g_y(x, y) = \frac{\partial G}{\partial y} = \frac{1}{\pi\sigma^2} y \{ e^{-\frac{x^2+y^2}{2\sigma^2}} \} \tag{3}$$

$$E_x(x, y) = g_x(x, y) * I(x, y) \tag{4}$$

$$E_y(x, y) = g_y(x, y) * I(x, y) \tag{5}$$

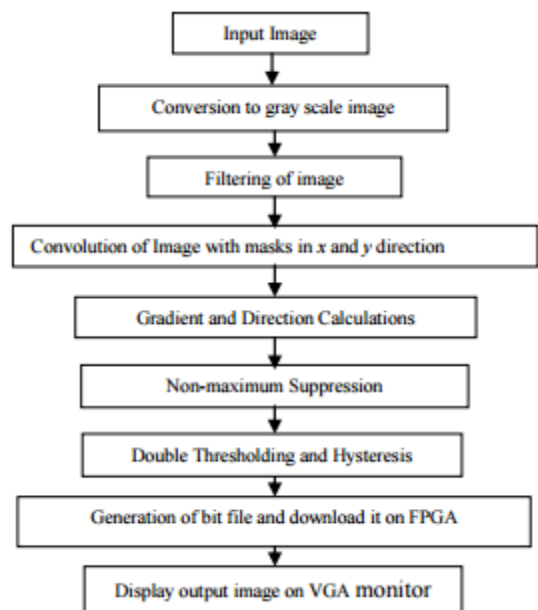
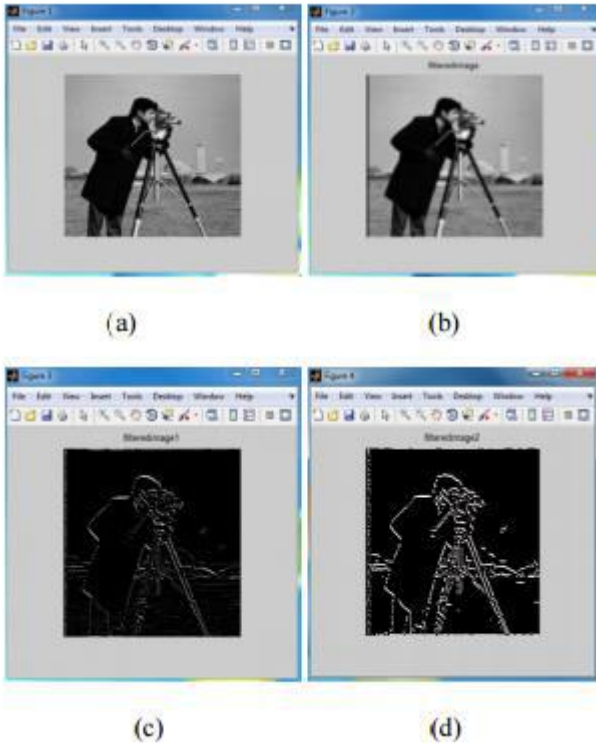


Figure. 2 Flow of Canny Edge Detection Algorithm

#### IV. RESULT

The proposed work is implemented by using MATLAB Simulink and XSG (Xilinx System Generator) with Xilinx blocksets. The method was tested on standard test image like „cameraman“. The output results show an image filtered from Gaussian filtering, another output is hysteresis thresholding output which removes streaking form an image. Final image is of Canny Edge Detected Syed Sameer Rashid et al VHDL Based Canny Edge Detection Algorithm 752 |International Journal of Current Engineering and Technology, Vol.4, No.2 (April 2014) image. The generated system is targeted for VIRTEX 5 starter kit. Further the VHDL code is generated by using System Generator token, this code is perfectly synthesized in ISE 13.1 Design Suit. After synthesis the device resource usage summary was produced for the targeted device.

## VI. REFERENCES



**Figure 3 :** (a) Original Image (c) Gaussian Filtering Result (c) Hysteresis Thresholding Result (d) Canny Edge Detection

Result The device utilization summary is estimated for the proposed design. Performance of this architecture implemented in Vertex5 (xc5vsx50t-1ff1136) as shown in Table. The proposed architecture provides lower complexity as well as improves efficiency in area. It also provides good choice in terms of low cost hardware

## V. CONCLUSION

This paper is present of Xilinx System. Generator development tools Edge Detection For Images Processing System .Comparing the results using matlab with two familiar edge detection methods Sobel and Canny . By observing the synthesis results we concluded that Canny edge detection method gives sharp edge image compare to sobel method.Future works include the use of the Xilinx System. Generator development tools for the implementation of other blocks used in computer vision like feature extraction and object detectionon Xilinx Programmable Gate Arrays (FPGA)

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## IOT Based E-Notification System

G. A. Solanke, A. A. Gavhane, M. R. Motghare, S. S. Jain, S.R.Dange, L. R. Nasre, V. V. Chakole

Department of Electronics Engineering, K.D.K.C.E. Nagpur, Maharashtra, India

### ABSTRACT

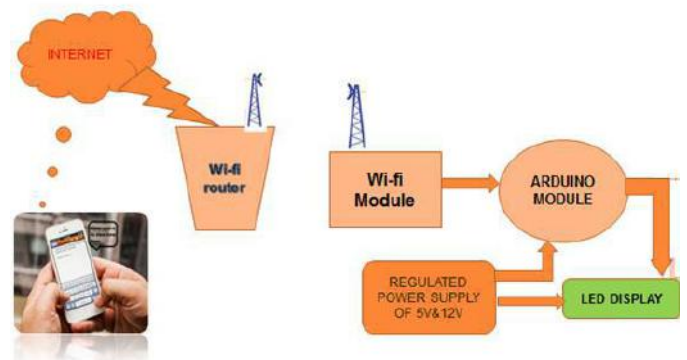
Notice Board is primary thing in any institution / organization or public utility places like a bus stations, railway stations and parks. But sticking various notices day-to-day is a difficult process. A separate person is required to take care of this notices display. In this paper we are proposing work using a arduino module interfaced with LED display designed to improving noticing process by android application. ESP8255 chip sense the opened wifi source and get connected to internet and process the notice which is send through mobile application. This project deal with an advanced hi-tech wireless notice board.

**Keywords :** 48\*8 LED Display, ESP8266 Wifimodule, Arduino Module, Mobile App.

### I. INTRODUCTION

The increasing demand of today's scenario for various academic institution is its automation. Every institution display number of notices on its notice board which require the manual works. A Notice Board is a very essential device in any institution / organization or public utility place like bus stations, railway stations and parks. The main aim of this project is to design a message driven automatic display which reduces the manual operation. The information can in turn be updated instantly at the location. The message to be displayed is sent through a android application which is first received at Arduino wi-fi module and message will be displayed on LED display through the controller AT mega 328. This smart notice board can be used in many applications including educational institutions, banks, public places like bus and railway stations, this kind of notice board reduces unauthorised access of notice and also attaching various notice papers to notice board will be overcome by this e-notification system so instead of that single scrolling display can display all kind of notices. The problems faced by wooden notice board could be well resolved by the implementation of our E-Notice Board application that brings an advanced means of passing notices around in the college in a much easier and efficient way. The following are the main functions of wireless notice board –

1. Using android based wireless notice board message can be sent to any distance located e-notice board
  2. By interfacing arduino module with mobile app we can sent text messages from any remote area.
- Arduino module, ESP8266, LED display and microcontroller atmega328 these are the main peripherals required for developing e-notice board. The block diagram of system is shown in figure given below-



**Figure 1.** block diagram Components for the system are as given below-

- 1.1 Power supply
- 1.2 LED display
- 1.3 Arduino module
- 1.4 Smart phone
- 1.5 ESP8266 module

Description for components mentioned above-

### 1.1 Arduino Module

Arduino is open source physical computing platform based on simple microcontroller board, and development environment for writing software for it. Can be used to develop interactive objects taking inputs from variety of switches or sensors, and controlling variety of physical output. Arduino is variety of arduino board based on ATmega328. It has 14 digital input/output pins, 6 analog inputs, 16MHz ceramic resonator, USB connection, power jack & reset button. Arduino programming language is implementation of wiring simple physical computing platform, which is based on processing multimedia.

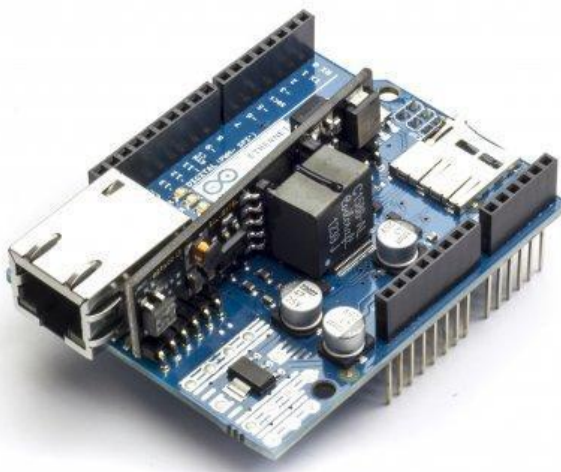


Figure 2. Arduino Module

### 1.2 ESP8266 Wi-Fi Module

The ESP8266 requires 3.3V power not more than that. Interfacing with an Arduino or any other microcontroller and using this board as a peripheral. Programming the module directly and use its GPIO pins to talk to your sensors, eliminating the need for a second controller. The cost of this module is around 199 rupees.

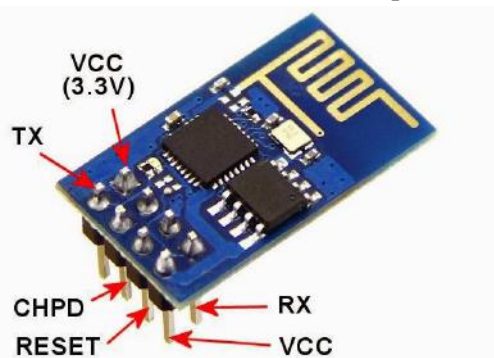


Figure 3. ESP8266 wifi module

### 1.3 LED Display

In this project we are using a matrix LED display. The cost of this display is around 2000rs. The display having ability to show 256 characters in a scrolling manner. The display having Serial USART Input, Easy to use for static and scrolling messages. Static display of characters without scrolling is also possible. It operates on 5v. It is connected to microcontroller via RS232 port.



Figure 4. LED Display

ATMEGA328 microcontroller -The Atmel 8-BIT AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 KB EPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages). The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz. As of 2013 the ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost microcontroller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models.

1.4 POWER SUPPLY- power supply is a basic electrical source which is required to give supply to various components. we need regulated supply and for this we have dc regulated supply with transformer, full wave bridge rectifier, IC7805

## II. AUTHENTICATION ALGORITHM



Figure 5. Flowchart For System

## III. RESULT

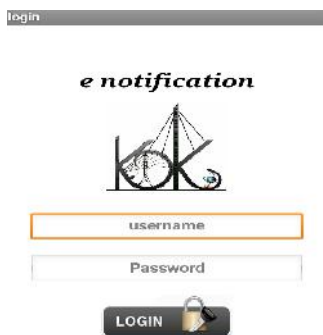


Figure 6. Authentication Required for login



Figure 7. Input from mobile application



Figure 8. Output on LED Display Board

## IV. CONCLUSION

The paper proposed the design and architecture of a new concept of Smart Electronic notice board. The advantage of the system lies in the fact that it can prove to be digitalization of old notice pattern which is user friendly and beneficial for the people .By introducing the concept of wireless technology in the Field of communication we can make our communication more efficient and faster, with greater efficiency we can display the messages and with less errors and maintenance. This system can be used in college, school, offices, railway station and commercial as well as personal use,By developing Android application in this proposed methodology we can enhance the security system and also make awareness of the emergency situations and avoid many dangers

## V. FUTURE SCOPE

We can add some value addition in the display system when notice board doesn't have any message to display, it can show room temperature data etc.we can also add text reader to speak the message out. The idea of many user authentication can also be applicable that means we can authenticate more than one user.

The proposed payment system combines the Iris recognition with the visual cryptography by which customer data privacy can be obtained and prevents theft through phishing attack [8]. This method provides best for legitimate user identification. This method can also be implemented in computers using external iris recognition devices.

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## Android Parental Control for Children

**Kakan Adwani, Shradha Lade, Simran Ukey, Yogini Tembhurne, S. P. Ratnaparkhi**

IT-CSE Department, J D College of Engineering and Management, Nagpur University, Nagpur, Maharashtra, India

### ABSTRACT

In today's life it is not easy for the parents to keep an eye on their children every now and then. The kidnapping of children, unnecessary browsing of internet and unwanted calls has increased. This paper presents a mobile based application solution to have a better parental control so that the parents can guard their children and protect them from bad communication and links. "Great things come in small packages", Smartphones are one of them and many children use smartphones. The application uses the GPS, call services, SMS services, browsing services and dropbox in Android mobiles. It allows the parents to track their child's location on G-MAP, browsing history, SMS history and call history. The main responsibility of parent's device is to fetch the files from dropbox. These files contain the data of the child's cell, whereas the responsibility of children is to install the app on his smartphone.

**Keywords :** Call Log, Message Log, Content of calls and message, browser, log, location(GPS).

### I. INTRODUCTION

Android is the most commonly used operating system developed by Google (American Company). It is mostly used in smartphones as well as tablets. Now-a-days a lot of misuse is done on smartphones operating android by recent generation. To control this misuse we are developing a parental security control apk which will be installed on child's smart phone by parents which will

- Create and maintain log of calls
- Create and maintain log of message
- Browser History
- Location
- Contact List
- Installed Apps

This entire detail is maintained and recorded by our .apk in background. This entire data will be sent onto cloud named as "DropBox". We will create an .apk for Parent which will be linked with DropBox where parent can read call logs, message logs and contents of message, browser log, location detail in files format. Parent App has the facility to call to child as well as message to child from our .apk

### II. RELATED WORK

In Al-Suwaidi and Zemerl work, the problem was solved by proposing an application "Locating Friends and Family Using Mobile Phones with Global Positioning System (GPS)". The architecture is based on client-server technology for this system. The client phone has to first register to login into the server. Then, the client periodically sends his latitude and longitude location updates to the server which stores it in a database. Thus, if any client wants to know the location of another client, then another client will also have to register and login to the server to request the location. This application was developed for help to locate family member and friends. The mobile application was developed using J2ME. It uses MySQL Database along with PHP to guarantee so that the server would not be hacked. This proposed solution makes each client have same control and privileges as the other which is not convenient for use in child tracking application where only the parent should have the control and command privileges. A demerit of this solution is that in order for the system to work there must be internet connectivity in both client and server sides[1].

Chandra, Jain and Qadeer used a simple web server approach along with SMS to solve the problem. It was implemented for JAVA enabled mobile devices equipped with GPS receptor. The control is on both side client as well as server. Some of the above discussed systems require internet connectivity on both sides[3].

### III. SYSTEM ARCHITECTURE

#### A. Existing System

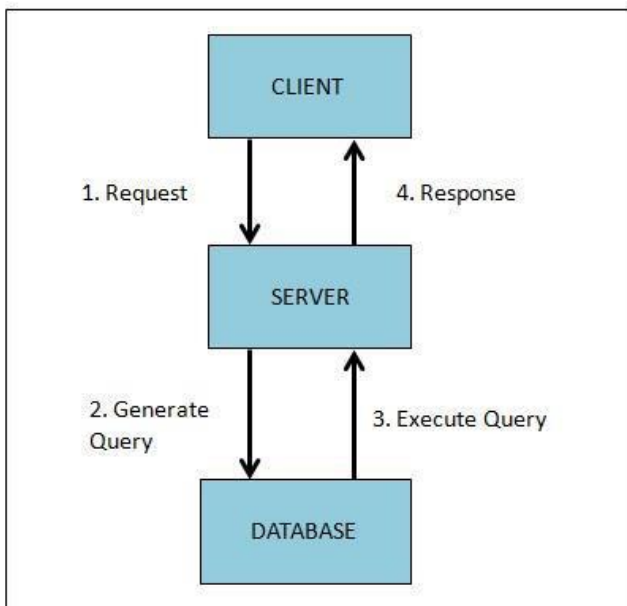
To fetch the user data and service request from smartphone to server and response from server back to user, medium used was internet.

Following elements constructs the system:

**Client :** Client is a person who send a service request to server through communication medium to fetch data about his/her family member or employee.

**Server :** Server is the most important element of the system. Server will fetch the data from database which must be appropriate to the request. It will give fetched data as a response to the client request.

**Database :** Database will maintain the information of the user. For this user must be registered. A list is maintained for every user that can store their respective family member's or employee's data.



**Figure 1.** Existing System Architecture

#### B. Proposed System

The “Android Parental Control For Their Children” system/paper is developed for parents and childrens. It may also be used by employers to keep eye on their employees. The one who wants to track their employee/children both should have android phones, as android phones support both as well as SMS facilities. This application/paper is used by parents to monitor their child’s activity which include the following :

- Call Log
- Message Log
- Browsing History
- Location
- Contact List
- Installed App List

According to the statistics, the market share by android operating system is 86.8% for the year 2016 which makes the highest market share of an android OS over other smartphones. This is the main reason to choose an android platform as more number of users are using android smartphones.

#### Call Log

This feature will give the information about the phone number of a person to/from the call is being made, type of call, time of call , date of call and call duration.

Phone number of a person to/from the call is being made

This will give the phone number of the person to whom the call is being made as well as from whom the call is being received.

#### Call Type

This will give the type of call i.e. incoming call, outgoing call or missed call.

#### Date and Time

This will give the system date and time (of the child) on which he made the call or received the call or got a missed call.



**Time Duaration**

This will give the time duration of the child to whom he spoke to.

**Message Log**

This feature will give the information about the phone number of a person to/from the message is sent/received respectively, type of message, date and time of message and the content of the message of the child's system.

Phone number of a person to/from the message is sent/received respectively

This will give the phone number of the person to whom the message is being sent as well as from whom the message is being received.

**Message Type**

This will give the type of message i.e. an inbox message(i.e. the child is the receiver) or outbox message(here the child is sender).

**Date and Time**

This will give the system date and time (of the child) at which he sent/received the message.

**Content of the Message**

This will give the content i.e. the body of the message that is being sent from the chid and received by the child.

**Browsing History**

This feature will give the history of the default browser. It will provide the link along with the date and time.

**Link**

It will provide the URL that is being browsed by the child on the default browser.

**Date and Time**

This will give the system date and time (of the child) on which he made the call or received the call or got a missed call.

**Location**

This feature will provide the location of the child i.e. where the child is, along with the accurate latitude as well as the longitude provided that the location of the child's phone must be on.

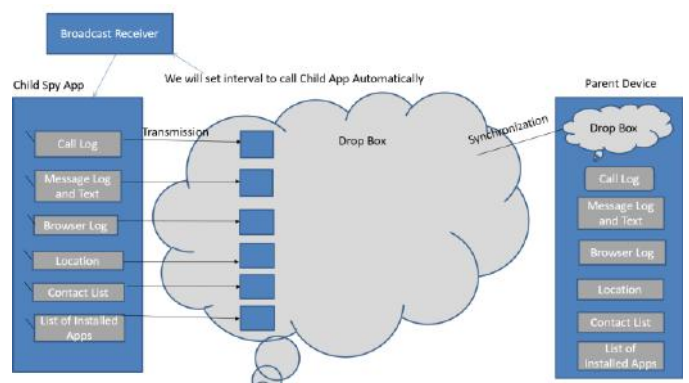
**Contact List**

This feature will give the information about the phone number of a person, name of that person, photo, email-id, address(if available) saved on the child's system.

Some apps need to save a contact to have a conversation. It might be impossible to know the conversations held in that app, but it is possible to know the person whose contact is saved in child's system.

**Installed Apps**

This feature will give information about the apps that are installed on the child's system.



**Figure 2.**Proposed System Architecture

**C. Architecture**

The architecture consists of three parts i.e :

- ✓ Child Spy App
- ✓ Drop Box
- ✓ Parent Device

This app will be installed in the child's cell (i.e. Child Spy App in the architecture) which will create and

maintain log of call that will provide the call type (i.e. whether it's a missed call, incoming call or an outgoing call). It will also provide the date and time of the call as well as the duration of the call.

This app will also create and maintain the log of message that will consist of the date and time of the message being sent/received by the child. It will also record the message text. As this app is an integrated system it also consists of the browser log (which will provide the links available in the default browser of the child's cell phone), location (it give the accurate location i.e. latitude as well as the longitude of the child), contact list(it will provide the contacts stored in the child's cell phone) and the installed apps(i.e. the list of installed apps on the child's cell phone).

Parent will be provided with the drop box id as well as the password and as soon as the parent will login (through the parent device as shown in the architecture) the parent will be able to fetch the files containing the call log, message log and text, browser log, location contact list and the list of installed apps in the child's cell phone (i.e. Child Spy App in the architecture).

Drop box is included in this app with the help of android sdk tool kit.

Broadcast receiver provides the background services (when an event occurs in the system). Every event occurs after a specific time period and after this time interval the events occurred in the child's cell phone will be transmitted to the drop box. Parent registered on the drop box will be able to login and fetch the events (i.e. the history of call log, message log and text(i.e. the content), browser log, location, contact list and the installed apps) stored in the drop box(cloud) in the form of files.

## V.CONCLUSION

"Android Parental Control" is an app which requires android version 5.3 and above. This paper results into an integration of many retrieval task in a single android application which were previously available separately. It provides user friendly environment .It will help the parents to monitor their children child's activity.

Kidnapping of children, unnecessary browsing of the internet and unwanted calls has increased .This presents a mobile based application solution to have a good parental control so that the parents can guard their

children and protect them from bad communication and links. As a lot of misuse on smartphones with android operating system is done by recent the generation. To control this misuse we are developing a parental security control apk which will be installed on child's smart phone which will create and maintain log of calls ,create and maintain log of message ,record message text, provide location, Browsing History, contact list, installed apps.

It also allows the parents to track their child's location (latitude, longitude) on GMAP, browsing history, SMS history and call history.

The main responsibility of the parent is to read the files fetched from the child's cell, these files contain data about the previous activities of the child performed on his phone whereas the responsibility of the child is to install the app on his smartphone. This will help the parents to monitor their child's activity on their smart phone while keeping an eye on them and guard them from bad communication and links.

## V. ACKNOWLEDGMENT

We take this opportunity to thank our project guide Prof. S. P. Ratnaparkhi for their most valuable guidance and for providing all the necessary knowledge, which was helpful in completion of this paper.

## IV. REFERENCES

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## Fault Detection Countermeasures using AES

Priyanka Dhok, Sneha Barwad, Kalyani Patil, Vikram Deshmukh

Electronics and Telecommunication, Smt. Rajashree Mulak Collage of Engineering for Womens, Affiliated to RTM University, Maharashtra India

### ABSTRACT

For security purpose, cryptography method is implemented through which communicated data is secured. Advanced Encryption Standard (AES) is the first choice for many critical applications. Federal Information Processing Standard (FIPS) consisting AES tool which is cryptographic algorithm used to secured electronic data. Implementations of the Advanced Encryption Standard (AES) has been used in various applications data-telecommunications, finance and networks that require low power consumptions, low cost design, less delay and specially it should be more secured. In this paper, the implementation details of the AES 128-bit Encryption and Decryption is presented. We will conduct a fault injection attack against the unprotected AES. Moreover we proposed a fault detection scheme for the AES. AES can be programmed in software or built with pure hardware. However Field Programmable Gate Arrays (FPGA) offer a quicker, more customizable solution. The protected AES has been implemented on Xilinx Nexus-3 FPGA. Its fault coverage, area overhead, frequency degradation, power and throughput have been compared. and it is shown that the proposed fault detection scheme allows maximum fault coverage and implemented design have low area, less hardware requirement and is more power efficient.

**Keywords:** AES, FIPS, FPGA, NIST, WiMAX, AES Encryption, SubByte Transformation, Inversion, GF Linear Mapping, Sbox Table, ShiftRows Transformation, AddRoundKey, AES Decryption, InvShiftRows Transformation

### I. INTRODUCTION

The National Institute of Standards and Technology (NIST) standardized the Advanced Encryption Standard. The AES is Federal Information Processing Standard which is cryptographic algorithm used to protect electronic data.

The algorithm described by AES is a symmetric key algorithm that can encrypt,(encipher), and decrypt, (decipher), data. Encryption converts data to an unintelligible form called cipher-text. The decrypt cipher-text converts the data back into its original form, which is called plaintext. The AES algorithm is capable of using cryptographic keys of 128, 192, and 256 bits to encrypt and decrypt data. Symmetric key cryptography uses a shared key in both sender and receiver ends during encryption and decryption for secure communications. [1]

For the drawbacks of the previous symmetric-key cryptographic standards such as the DES and the 3DES, they have been replaced by the Advanced Encryption Standard (AES). In particular, the AES has overcome the drawbacks of the previous standards has overcome by AES in terms of vulnerability to brute symmetric-key cryptographic standards such as the DES and the 3DES, they have been replaced by the Advanced Encryption Standard (AES). [2]

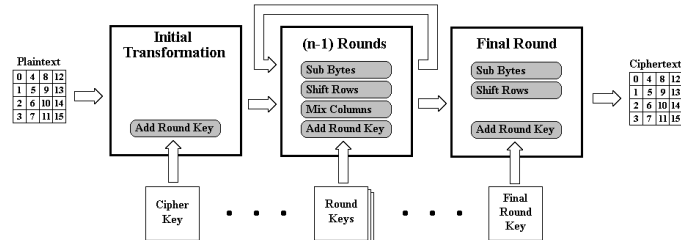
The AES was accepted in 2001 by the National Institute of Standards and Technology (NIST) and since its acceptance, it has been utilized in a variety of security-constrained applications. For instance, it has been included in wireless standards of Wi-Fi as well as WiMAX and many more other applications, ranging from the security of smart cards to the bit stream security mechanisms in FPGAs. Various hardware implementation architectures of AES algorithm have been proposed and their performances are evaluated.[3,4]

In this paper, Encryption and Decryption process of AES algorithm is implemented a fault attack is conducted and fault detection scheme is applied. Maximum fault coverage is achieved through this detection scheme and then different parameters like Area, Hardware requirement is to be compared. Power analysis is to be performed to show that proposed design is more power efficient.[5,6]

The rest of the paper is organized as follows: The basic structure of AES is given in section II. The Encryption process of AES is explained in section III. The Decryption process of AES is explained in section IV. The experimental synthesis results as well as the performances report of the AES encryption and decryption are discussed in section V. Section VI concludes the paper.

## II. AES ALGORITHM

In AES algorithm, Data is encrypted or decrypted in blocks of 16 bytes. The state is manipulated internally during a variable number of rounds. There are 10,12, or 14 rounds needed for cipher keys of length 128, 192, or 256 bits respectively.



### 1. AES Encryption

AES encrypt information by repeatedly using four kinds of data transformations: SubBytes, ShiftRows, MixColumns and AddRoundKey while the final round does not have the MixColumns transformation. Each round contain four transformations (linear and non linear) called Layers. Each round has round key derived from original key. Round transformation and its steps generate intermediate data called States. State considered as rectangular array of bytes with four rows and no. of columns that depend on size of key length.

- Key length: 128 bit
- Key arranged in 4\*4 matrix
- Each element is byte.

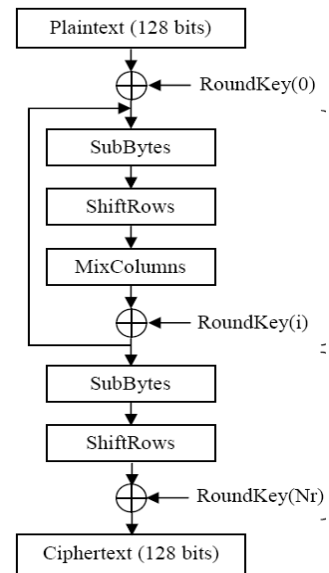
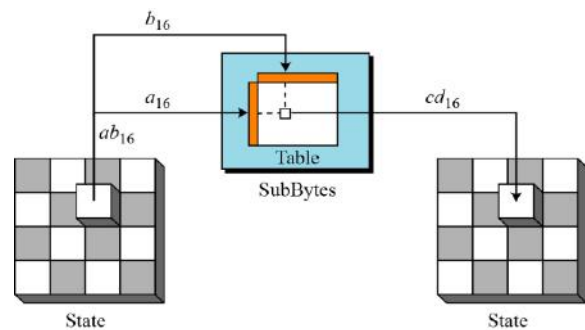


Figure 1. AES Encryption Structure

### A. SubByte Transformation

This is the only non linear part of algorithm assures resistance to differential and linear cryptanalysis attacks this transformation consist of S-box which is applied to each byte element of state ( 16 byte block) independently and has 3 different steps:

1. Inversion
2. A Galois field linear mapping
3. S-box constant



### B. Inversion

In this operation of s-box, inverse is computed in 8bit Galois field,  $GF(2^8)$ .the byte 00000000 has no inverse and 00000000 is used in place of its inverse.

Assume  $x_7x_6x_5x_4x_3x_2x_1x_0$  byte which comes up from inversion  $y_7y_6y_5y_4y_3y_2y_1y_0$  represent 8 element column vector with rightmost binary bit  $y_0$  in top position this operation provides resistance against linear and differential cryptanalysis attack.

## 2. GF Linear Mapping

At this pt. y vector is multiplied by constant matrix and column vector (0,1,1,0,0,1,1) is added yielding vector  $Z_7Z_6Z_5Z_4Z_3Z_2Z_1Z_0$ .

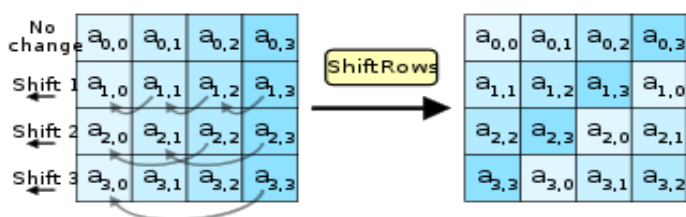
## 3. Sbox Table

It is basic component of symmetric key algorithms. It performs substitution S box often implemented as lookup table. Each of 256 possible byte values is transformed to another byte value with the sub bytes transformation, which is full permutation meaning that every element gets changed and all 256 possible elements are represented a result of change so that no two different bytes are changed to same byte. The sub byte transformation carried out by s-box is most time consuming procedure in AES. The strength of cryptographic algorithms is determined by non linear s boxes.

		y															
		0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0	63	7c	77	7b	f2	6b	6f	c5	30	01	67	2b	fe	d7	ab	76	
1	ca	82	c9	7d	fa	59	47	f0	ad	d4	a2	af	9c	a4	72	c0	
2	b7	fd	93	26	36	3f	e7	cc	34	a5	e5	f1	71	d8	31	15	
3	04	c7	23	c3	18	96	05	9a	07	12	80	e2	eb	27	b2	75	
4	09	83	2c	1a	1b	6e	5a	a0	52	3b	d6	b3	29	e3	2f	84	
5	53	d1	00	ed	20	fc	b1	5b	6a	cb	be	39	4a	4c	58	cf	
6	d0	ef	aa	fb	43	4d	33	85	45	f9	02	7f	50	3c	9f	a8	
7	51	a3	40	8f	92	9d	38	f5	bc	b6	da	21	10	ff	f3	d2	
8	cd	0c	13	ec	5f	97	44	17	c4	a7	7e	3d	64	5d	19	73	
9	60	81	4f	dc	22	2a	90	88	46	ee	b8	14	de	5e	0b	db	
a	e0	32	3a	0a	49	06	24	5c	c2	d3	ac	62	91	95	e4	79	
b	e7	c8	37	6d	8d	d5	4e	a9	6c	56	f4	ea	65	7a	ae	08	
c	ba	78	25	2e	1c	a6	b4	c6	e8	dd	74	1f	4b	bd	8b	8a	
d	70	3e	b5	66	48	03	e6	0e	61	35	57	b9	86	c1	1d	9e	
e	e1	f8	98	11	69	d9	8e	94	9b	1e	87	e9	ce	55	28	df	
f	8c	a1	89	0d	bf	e6	42	68	41	99	2d	0f	b0	54	bb	16	

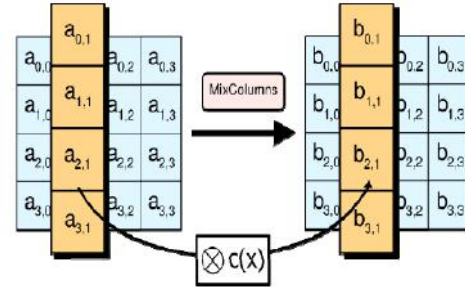
## A. ShiftRows Transformation

It is linear transformation. This provides resistance against truncated differential and saturation attacks. The ShiftRows transformation is a circular shifting operation on the rows of the state with various numbers of bytes. The first row of the state is kept as it is, while the second, third and fourth rows cyclically shifted by one byte, two bytes and three bytes to the left respectively.



## B. MixColumn Transformation

This transformation operates on each 4 byte column separately and is omitted in last round. Columns of state are considered as polynomials over  $GF(2^8)$  which are multiplied by fixed polynomial  $c(x)$  modulo  $(x^4+1)$ .



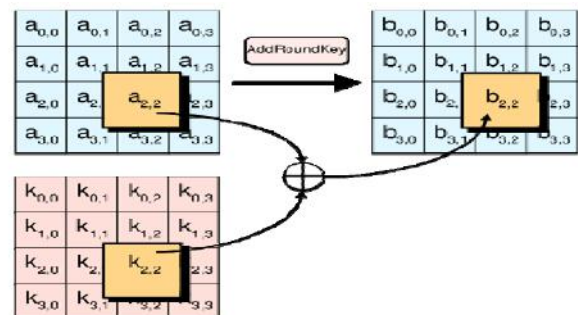
Fixed polynomial  $c(x)$  is given by  $c(x) = \{03\}x^3 + \{01\}x^2 + \{01\}x + \{02\}$

In matrix form, the MixColumns transformation can be expressed as:

$$\begin{bmatrix} b_0 \\ b_1 \\ b_2 \\ b_3 \end{bmatrix} = \begin{bmatrix} 02 & 03 & 01 & 01 \\ 01 & 02 & 03 & 01 \\ 01 & 01 & 02 & 03 \\ 03 & 01 & 01 & 02 \end{bmatrix} \times \begin{bmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \end{bmatrix}$$

## C. AddRoundKey

The add round Key is a XOR operation that adds a round key to the state in each iteration, where the round keys are generated during the key expansion phase. Key consisting of 128 bits which are arranged in  $4 \times 4$  byte matrix is added to output of mix column transformation. A different round key is added to state at end of each round.



## 4. AES Decryption

The transformations in the decryption process perform the inverse of the corresponding transformations in the

encryption process. In the AES decryption rounds, four transformations are used : InvShiftRows, InvSubBytes, AddRoundKey and InvMixColumns.

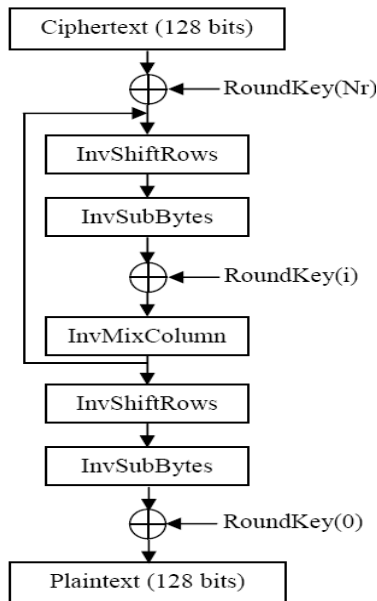


Figure 2. AES decryption Structure

**A. InvByteSub Transformation**

It consist of inverse S-box. The inverse transformation of equation that was made in ByteSub transformation is performed. For linear mapping:

$$\begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{bmatrix} \times \begin{bmatrix} a_7 \\ a_6 \\ a_5 \\ a_4 \\ a_3 \\ a_2 \\ a_1 \\ a_0 \end{bmatrix} \oplus \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} b_7 \\ b_6 \\ b_5 \\ b_4 \\ b_3 \\ b_2 \\ b_1 \\ b_0 \end{bmatrix}$$

Following is the inverse S-box used in the decryption process:

		y															
		0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0	52	09	6a	d5	30	36	a5	38	bf	40	a3	9e	81	f3	d7	fb	
1	7c	e3	39	82	9b	2f	ff	87	34	8e	43	44	c4	de	e9	cb	
2	54	7b	94	32	a6	c2	23	3d	ee	4c	95	0b	42	fa	c3	4e	
3	08	2e	a1	66	28	d9	24	b2	76	5b	a2	49	6d	8b	d1	25	
4	72	f8	f6	64	86	68	98	16	d4	a4	5c	cc	5d	65	b6	92	
5	6c	70	48	50	fd	ed	b9	da	5e	15	46	57	a7	8d	9d	84	
6	90	d8	ab	00	8c	bc	d3	0a	f7	e4	58	05	b8	b3	45	06	
7	d0	2c	1e	8f	ca	3f	0f	02	c1	af	bd	03	01	13	8a	6b	
8	3a	91	11	41	4f	67	dc	ea	97	f2	cf	ce	f0	b4	e6	73	
9	96	ac	74	22	e7	ad	35	85	e2	f9	37	e8	1c	75	df	6e	
a	47	f1	1a	71	1d	29	c5	89	6f	b7	62	0e	aa	18	be	1b	
b	fc	56	3e	4b	c6	d2	79	20	9a	db	c0	2e	78	ed	5a	f4	
c	1f	dd	a8	33	88	07	c7	31	b1	12	10	59	27	80	ec	5f	
d	60	51	7f	a9	19	b5	4a	0d	2d	e5	7a	9f	93	c9	9c	ef	
e	a0	e0	3b	4d	ae	2a	f5	b0	c8	eb	bb	3c	83	53	99	61	
f	17	2b	04	7e	ba	77	d6	26	e1	69	14	63	55	21	0c	7d	

**B. InvShiftRows Transformation**

In this transformation opposite shifting operation applied. Therefore rows are shifted to right instead to left, which takes place at shiftrows transformation.

**C. InvMixColumn Transformation**

In this transformation, every column is multiplied by inverse polynomial of  $c(x)(\text{mod } x^4+1)$  which is

$$d(x) = \{0B\}.x^3 + \{0D\}.x^2 + \{09\}.x + \{0E\}$$

The inverse matrix multiplication of equation which was used in mixcolumn transformation:

$$\begin{bmatrix} b_0 \\ b_1 \\ b_2 \\ b_3 \end{bmatrix} = \begin{bmatrix} 0E & 0B & 0D & 09 \\ 09 & 0E & 0B & 0D \\ 0D & 09 & 0E & 0B \\ 0B & 0D & 09 & 0E \end{bmatrix} \times \begin{bmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \end{bmatrix}$$

This transformation is omitted in last round.

**D. InvAddRoundKey Transformation**

This transformation applies keys that were used in encryption process in reverse order. The AddRoundKey is the same for both encryption and decryption.

Block diagram of AES encryption and decryption is shown in Fig.1 and Fig.2 respectively.

In this paper, we consider the implementation of 128bit key system only, as this is the most commonly implemented form of AES.

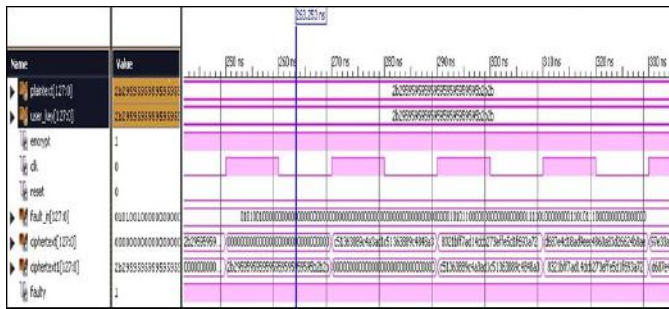
**5. AES Implementation: Results and Conclusion**

The AES Encryption and decryption have been described using VHDL and simulated using Model Sim and synthesized using Xilinx ISE13.1.

As seen in the table, the number of occupied slices, frequency, the throughput, efficiency and the power required for AES encryption and decryption are presented.

AES Design	Area	Frequency	Throughput	Efficiency	Power
Conventional Encryption	250	3.356ns	3.806W	297.97MHZ	3814.06Mbps
Proposed Encryption	270	3.343ns	3.3809W	299.155MHZ	3829.12Mbps

### III. RESULT



### IV. CONCLUSION

In this paper, in order to improve the security of the AES. AES algorithm in encryption and decryption is implemented. And the parameters like Area, Frequency, Throughput, Efficiency and power analysis is performed. From the above paper we see that after injecting and detecting the fault in any signal, the throughput of the signal decreases.

AES Design	Area(Slice)	Frequency	Throughput
Encryption without countermeasure	270	299.15MHz	3829.12Mbps
Encryption with countermeasure	430	218.98MHz	2802.944Mbps

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## Animatronic Hand Using Arduino

Jagruti P. Gour, Jayswini K. Shende, Karishma K. Kubde, Samiksha K. Kothekar, Prof. Pankaj S. Taklikar

S. B. Jain Institute of Technology Management and Research, Nagpur, Maharashtra, India

### ABSTRACT

For some time we have been interested in making some sort of robot based on the Arduino. The idea is to change a perception of remote controls for actuating manually operated robotic arm. The robotic hand is very useful for paralysis and handicap person as well as in various medical field so , this paper discuss the design of an electronic product known as animatronic hand based on wireless technology using XBee S2 , Arduino UNO board ,servo motor, flex sensor. As the whole body of the robot would have been of much cost, we will only develop a hand which will act as shadow hand.

**Keywords :** Animatronic, Arduino-UNO, Flex Sensor, XBee -S2, Servo Motor.

### I. INTRODUCTION

Animatronic hand is basically a robotic hand which is designed by using a latest wireless technology. The history of animatronics begins with clock makers. Thus hand replica of human hand which is called animatronic hand. This project intends to implement an affordable electronic product known as animatronic hand based on wireless technology based on XBee-S2 as well as Arduino - UNO board. There are two main parts of animatronic hand first one is electrical components and second is mechanical structure that allows motion. Many times in our day to day life we face a problem with paralysis patients as well as handicap people as they are unable to do their work by their own hence in case of these people an extra person should be there for them who help them to do their work hence this animatronic hand is very helpful for such people. This hand can make them independent somehow, In industries many chemicals are used now a days especially in pharmaceutical companies every day they have to deal with many chemicals in which some are soft but some chemicals are hazardous to human being for their skin like methyl isocyanate and many more , so to deal with these kinds of chemicals animatronic hand is very useful. The main aim of designing this hand is to reduce human efforts and do the same task with less time using

arduino-UNO and XBee technology. There are two main parts of this project i.e. transmitter (Control glove) and receiver (mechanical-electronic robotic hand). Control glove consists of flex sensors. There are total five flex sensors placed separately on each finger on the glove. Human hand will control another robotic hand; so that it is called as a control glove.

### II. LITERATURE SURVEY

This paper discuss the robotic arm develop by using MEMS-ACCERLOMETER technology. MEMS (Microelectromechanical System) motion sensor were used to sense the movements. These gesture arm were controlled by preloaded code i.e, (automatic) or via joystick .six motor were used, out of this two for shoulder motion and wrist motion and one motor for elbow motion and gripping motion. [1]

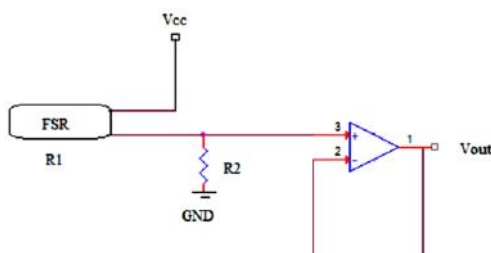
This paper discusses the robotic hand which records the gesture using the MATLAB. The hand was implemented using 3 steps, first step was hand segmentation the next step was to track the position & orientation of the hand to prevent error in the segmentation phase and the last step they use the estimated hand state  $V_{out} = V_{cc} \frac{R2}{R1+R2}$



to extract several hard features to define the deterministic process of gesture. This paper deals with the design & development of a four fingered robotic hand (FFRH) using 8-bit microcontroller sensors and wireless feedback. The robot system has 14 commands for all the four fingers open and & closed, wrist up& down, base clockwise & counter clockwise, peak & place & home position to move the fingers. The main object of this paper is to design & implementation of FFRH for providing a simple reflexive grasp that be utilized for a wide variety of object .The while structure of the hand consist of the digits, sensor and wires for the other unit of the hand.[3] This paper is highlight the use of wireless communication & its application by developing animatronic hand which can be used in many field like medical, defence, chemical industries. Here, instead of using actual human hand , they can replace it by this wireless robotic hand . This animatronic hand can be mounted on moving platform along with a camera to dfuse the bomb from a safer distance without any harm to human life. This hand can help paralysis patients who can not move their hand by providing a electronic hand which can work on voice command of the bearer .basically there are two main parts of this project i.e. transmitter (control glove) & receiver (mechanical electronic robotic hand).[4] This paper presents the mechatronic design of a robotic hand for prosthetic applications. The main characteristic of the robotic hand is its biologically-inspired parallel actuation system, which was based on the behaviour/strength space of the Flexor Digitorum Profundus (FDP) and the Flexor Digitorum Superficial (FDS) muscles. The direct relation between signal and actuation system lends itself well to interpreting the EMG signal from FDP and FDS. There have been may different approaches taken in the development of an effective prosthetic hand. [5]

### III. METHODOLOGY

#### 1) Comparator Circuit



$$V_{out} = V_{cc} (R2/R1+R2)$$

Figure. 1 : Comparator Circuit

#### 1. Block Diagram

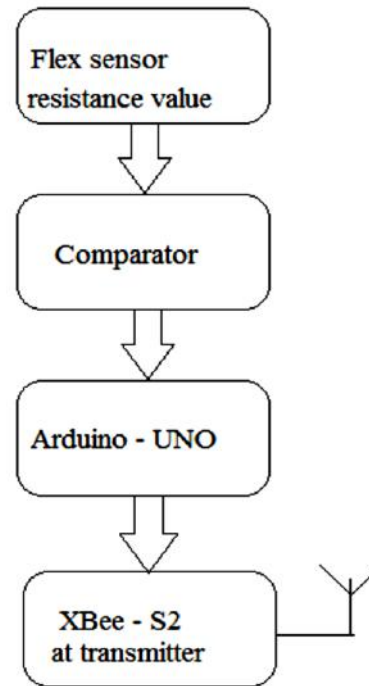
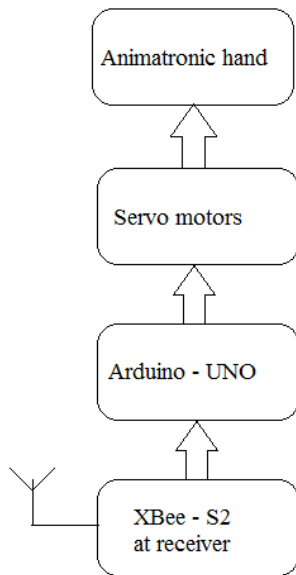


Figure 2. Transmitter circuit

2) Flex sensor: Flex sensor is a variable resistor that gives variable resistance value after bending. Flex sensor is also called as potentiometer. When flex sensor will be connected with analog pins of Arduino-UNO resistance of flex sensor can be measured. Value of resistance increases with bending angles. Bending radius is inversely proportional to resistance value. By applying particular amount of voltage, resistance generated by flex sensor is then compared by comparator circuit and output voltage value calculated.

3) Arduino-UNO: Arduino-UNO is ATMEGA-328 based microcontroller board. It has 14 digital input/output pins in which 6 are analog pins , clock cycle of 16 MHz quartz crystal, a USB cable or power with AC to DC adapter. The ATmega328 AVR microcontroller has 32 KB flash memory (with 0.5 KB occupied by the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM. The board can operate on an external supply from 6 to 20 volts. The microcontroller can be programmed using Arduino-UNO specialized software.



**Figure 3.** Receiver Circuit

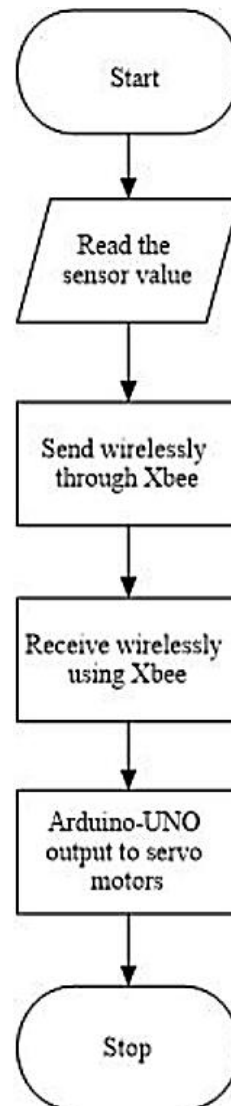
**V. WORKING**

The whole working of project is divided into two parts i.e., transmitter and receiver. As far as transmitter is concerned, there are four main stages which are flex sensor, comparator circuit, arduino-UNO and XBee shield. Initially flex sensor is mounted on cotton or woollen gloves, as finger bends to a certain angle flex sensor also get bent at the same angel. As per the property of flex sensor it gives different value of resistance with different angles. This resistance value is then gives to comparator circuit where output voltage value is calculated by the voltage divider formula. As resistance changes at different angles the value of voltage is also changes. This value is then given to arduino-UNO board at its input pins.

4) Servo motor: Servo motor is electrical motor with great precision that rotates in different degrees. Servo motor can turn 90 degree and 45 degree in either direction for total 180 degree movement. Servo motor expects to see a pulse in every 20 ms. How far motor turns is depends on length of pulse. The input to its control is a signal, either analog or digital, representing the position commanded for the output shaft. Servo motor requires sophisticated controller, often dedicated module design specifically to the motor suitable for the use in the control system. XBEE is a wireless communication module that Digital built to the 802.15.4/Zigbee standards. The XBee shield simplifies the task of interfacing XBee with an Arduino. It has 20 input/output pins. It has operating voltage of 5V DC. XBee Shield has Status LEDs, Prototyping Area, Arduino reset button ,Serial select switch , XBee socket.

**IV. ALGORITHM**

1. Start
2. Get the analog output from flex sensors.
3. Convert into digital form and send it to XBee serially.
4. Send data wirelessly through XBee on transmitter side.
5. Receive the data wirelessly via XBee on receiver side.
6. Give the output to the servomotors accordingly.
7. Stop.



**Figure 2.** Flowchart

As XBee-S2 shield provides interfacing to arduino-UNO board. This voltage value is then sent to XBee-S2 transmitter pin and the data is sent wirelessly to another XBee-S2 which is at receiver side. This data is received by another XBee-S2 at receiver side at its input pins. The output voltage value is sent to another arduino-UNO board through output pins of XBee-S2 to input pins of arduino-UNO at receiver. Servo motors were connected to arduino-UNO at receiver side hence by various voltage values servo motors start rotating at various directions and finally an animatronic hand starts working.

## VI. RESULT

A wireless animatronic hand was first tested with a single finger. It was observed that after bending the single flex sensor at the transmitter side, the corresponding robotic finger moved in the same direction and same angle. Servo motor causes the movement of a robotic finger. With reference to this, all five servo motors moved by five flex sensors on a cotton or woollen glove. In this way, a wireless communication has been achieved successfully. So, now it is possible that a man can control a robotic hand from a distance wirelessly.

## VII. CONCLUSION

This paper presents a wireless animatronic hand which is implemented by using a latest wireless technology. It can be widely used where there are harmful things to a human hand. It is basically a futuristic project which will be used to make Human hand. Future efforts will be made to make this hand movable from one place to another, more flexible and more precise if possible be implemented in computers using external iris recognition devices.

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## Evaluation of Transmission Charges by Relative Electrical Distance Concept

K. Dadhe, S. Kalambe, A. Lavaniya, V. Gourkhede, S. Kotangale, V. Warudkar

Department of Electrical Engineering, RTMNU University/DBACER, Nagpur, Maharashtra, India

### ABSTRACT

The electrical power industry has over the years been ruling by large utilities that had an overall authority over all actions in generation, transmission, distribution of power within its field of operation. Such system is also referred to as vertically integrated utilities. The first stage in the unbundling process of power industry has been the detachment of the transmission activities from the electricity generation activities. By the development of deregulated power system has been evolved many problems such as capacity storage, crowding of lines, allotment of transmission charges. In an open access electricity market, crowding occurs when the transmission network is impotent to accommodate all the needed transactions due to a violation of system working limits. In this restructured environment it is also very difficult to assign transmission charges. In this paper Relative electrical distance concept is use to check the transmission charges and used to improve rescheduling of generators to reduce congestion in lines. Relative electrical distance method gives relative position of load junction with respect to generator junction. This method gives the relative electrical distance between two points. In this paper a simple 4 bus network is taken to show the evaluation of transmission charges by this method.

**Keywords :** - Vertically Integrated Utility, Restructured Environment, Deregulated Power, Crowding of Lines, Relative Electrical Distance, Unbundled Operation

### I. INTRODUCTION

The power plant is undergo a total change in its trade where the vertically integrated utility are being break or unlatch for competition with private and individual participants. In the deregulated power system, transmission charges have become a prime duty because it necessary to grow a well-planned, practical and dependable charging scheme that can evolve the useful economic signals to network users. In recent years, because of restructuring, the Electric Supply Industries (ESIs) had to face crucial reforms in its firm and operation. Deregulations have introduced functional independence and flexibility but in other hand it has also introduced complications in operational and economic decision building. The pricing of the transmission system comprise the charges of designing, working and maintenance of the transmission corridor. It is the duty

of the transmission users (generators and loads) to pay the transmission utilization cost. In an open access market, it is very difficult to find an authentic and efficient method for assign the utilization and cost of the transmission system to its users. In [1] author discussed about Transmission charge allotment which is one of the key issue in transmission open access. In this paper [1] author introduces a novel process of transmission charge distribution base on relative electrical distance (RED) concept. Transmission prices are assigning based on the relative electrical distance and the power agreements. This suggested procedure allot better transmission charges for maintaining network stability margins, least transmission losses and alleviate crowding on lines. In [2] author presents a process for transmission loss charge allotment in deregulated power system based on Relative Electrical Distance (RED) method. This paper [2] presents the drawbacks of pro-rata method; ITL

method and the proportional sharing method are overcome as this process takes into account the network configuration which is independent of the location of swing bus. In this paper [3] the author is examine both the outcomes of power factor and loss cost constituents in the traditional MW-Mile method for giving superior profitable signal to the consumer. In [4] author presents an approach for alleviation of system in restructured environment. The offering of every generator for a specific over loaded line is first recognize, then based on RED method the required amount of generations for the required overload alleviate is obtained, so that the network will have least transmission losses and greater stability margins with respect to Voltage profiles, bus angles and preferable transmission tariff. In [5] author talks about liberalisation of electricity market. In this paper [5] relative electrical distance (RED) method is used to calculate reactive power offering from different sources such as generators, switchable volt-amperes reactive (VAR) sources and line charging susceptances that are spread in overall system, to encounter the network demands. The transmission line charge susceptances allowance to the network reactive flows and its aid enlarge in minimizing the reactive generation at the generator buses are examine in this paper. In this paper [6] the basis on which the mutual contract are to be made so that the arrangement is together best possible and economical is discussed. If the bilateral agreement are prepared using the conceptualization of Relative Electrical Distance (RED), such an agreement will confirm enhanced network safety such as a good voltage profile and will also diminish the losses occupied in the mutual contract. In this paper the prices attain in meeting loads like generation charge, transmission prices and prices due to losses are estimate [6].

## II. NETWORK EQUATION

To finding out  $[FLG]$  matrix we have to consider a network in which  $n$  is the overall unit of buses with 1, 2,  $g$ ,  $g$  is unit of generator buses, and  $g + 1, n$ , remaining  $(n - g)$  buses. For a given network we can write,

$$\begin{bmatrix} I_G \\ I_L \end{bmatrix} = \begin{bmatrix} Y_{GG} & Y_{GL} \\ Y_{LG} & Y_{LL} \end{bmatrix} \begin{bmatrix} V_G \\ V_L \end{bmatrix}$$

Where  $I_G, I_L$  and  $V_G, V_L$  illustrate complex current and voltage vectors at the generator and load junction.

$[Y_{GG}], [Y_{GL}], [Y_{LL}]$  and  $[Y_{LG}]$  are relative partitioned portions of system  $Y$ -bus matrix:

$$[I_G] = [Y_{GG}][V_G] + [Y_{GL}][V_L] \quad (2)$$

$$[I_L] = [Y_{LG}][V_G] + [Y_{LL}][V_L] \quad (3)$$

From eq (3);

$$\begin{aligned} [Y_{LL}]^{-1}[I_L] &= [Y_{LL}]^{-1}[Y_{LG}][V_G] + [V_L], \\ [V_L] &= [Y_{LL}]^{-1}[I_L] - [Y_{LL}]^{-1}[Y_{LG}][V_G] \end{aligned} \quad (4)$$

Substituting  $[V_L]$  in eq. (2), we get,

$$\begin{aligned} [I_G] &= [Y_{GG}][V_G] + [Y_{GL}]\{[Y_{LL}]^{-1}[I_L] \\ &\quad - [Y_{LL}]^{-1}[Y_{LG}][V_G]\} \end{aligned}$$

Representing eq (4) and (5) in matrix form we get,

$$\begin{bmatrix} V_L \\ I_G \end{bmatrix} = \begin{bmatrix} Z_{LL} & F_{LG} \\ K_{GL} & Y_{GG} \end{bmatrix} \begin{bmatrix} I_L \\ V_G \end{bmatrix}$$

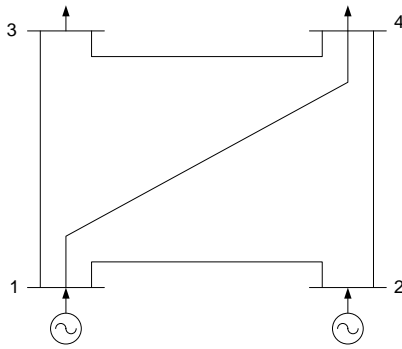
Where,

$$[F_{LG}] = -[Y_{LL}]^{-1}[Y_{LG}].$$

The components of  $[FLG]$  matrix are complex and its columns relative to the generator bus numbers and rows relative to the load bus numbers. This matrix provides the relationship between load bus voltages and source bus voltages. It also provides information about the location of load junction with respect to generator junction that is designate as relative electrical distance between load nodes and generator nodes.

## III. SAMPLE SYSTEM

The sample bus system is shown below



The line specifications (in ohms) of sample four bus system:-

From bus	To bus	Line resistance	Line reactance
1	2	12.75	97
1	3	6	69.5
1	4	11.7	96
2	4	3.5	30.8
3	4	5.75	5.8

1. Calculations of [FLG], [RLG], and [DLG]:-

The [FLG] matrix which gives the association between load bus voltages and source bus voltages and also gives the statistics about the position of load junction with respect to the generator junction. Its columns relative to the generator bus numbers and rows relative to the load bus numbers. The elements of the [FLG] matrix are complex in nature and the matrix relative to the load/generator buses for the above system is given by;

$$[F_{LG}] = \begin{bmatrix} 0.6500 + 0.0000i & 0.3500 + 0.0000i \\ 0.3600 + 0.0000i & 0.6400 + 0.0000i \end{bmatrix}$$

The sample system shown above has two generators and two sinks at bus 1,2 and 3, 4 respectively. The components of [FLG] matrix are complex and its rows represent the load bus number 3 and 4 and the column represents the generator bus number 1 and 2. The [RLG] matrix which gives the relative electrical distances, i.e., the relative locations of load Junction with respect to the generator junction is obtained from the [FLG] matrix and is given by;

$$[R_{LG}] = 1 - \text{abs}\{[F_{LG}]\}$$

The solution of [RLG] matrix is given by;

$$[R_{LG}] = \begin{bmatrix} 0.35 & 0.65 \\ 0.64 & 0.36 \end{bmatrix}$$

The desired quantity of generation for the required load sharing/generation arrangement is also acquiring from the [FLG] matrix and is given by;

$$[D_{LG}] = \text{abs}\{[F_{LG}]\}$$

The solution for the desired quantity of generation, for the required load sharing/generation scheduling is given by;

$$[D_{LG}] = \begin{bmatrix} 0.65 & 0.35 \\ 0.36 & 0.64 \end{bmatrix}$$

For example, if the load at bus 3 is 60 mw then it compute  $0.65 \times 60 = 39$  mw from above matrix of load from generator 1 and partial remaining load  $0.35 \times 60 = 21$  mw from generator 2. Likewise the load at other buses also has to obtain according to the corresponding components of the [DLG] matrix. If the load sharing/generation arrangement is according to the [DLG] matrix, then the network will have smallest amount of transmission losses and greater stability margins with respect to voltage profile, bus angles and L-indices.

Required load sharing/generation arrangement in mw

Load bus no.	Power taken from generator		load at the bus
	G1	G2	
3	195	105	300
4	72	128	200
SUM	267	233	500

The contract matrix used in this paper is basically the transaction matrix. In this paper, it is supposed that there is no action by the dealing utility. All the transaction is therefore restricted to consumers and the suppliers.

Ignoring transmission losses, the transaction matrix is given by;

**A. Calculation of [PLG]:-**

$$[P_{LG}] = \begin{bmatrix} P_{g+1,1} & \dots & P_{g+1,g} \\ \vdots & \dots & \vdots \\ P_{n,1} & \dots & P_{n,g} \end{bmatrix}$$

Where 1, g are generator buses, g + 1, n are load buses. Each constituent of [PLG] presents a transaction between consumer and a supplier. Additionally, the sum of row represents the overall power consumed at load and the sum of column represents the entire power given by a generator.

**2. Evaluation of Basic Charges**

The required power contracts/transactions the contract/transaction matrix is;

$$[P_{LG}] = \begin{bmatrix} 195 & 105 \\ 72 & 128 \end{bmatrix}$$

**3. Calculation of [CLG] matrix:-**

$$[C_{LG}] = \{1000 + ([R_{LG}]500)\} = \begin{bmatrix} 1175 & 1325 \\ 1320 & 1180 \end{bmatrix}$$

For the study of transmission charges, it is assumed that the transmission charge (in Indian Rupees) for 1MW of power transaction from load at bus 3 to generator 1 is Rs. 1175 and to generator 2 are Rs. 1325. Likewise, the rate for 1MW of power contract from load at bus 4 to generator 1 is Rs. 1320 and to generator 2 is 1180 Rs. It means that the transmission charges are comparable to the relative electrical distances and they are restricted to maximum of Rs. 1000 for very long way situated users and minimum of Rs. 500 for very closely situated consumer. If the relative electrical distance of a load bus is fewer then the transmission charge is low and if the electrical distance is highest then the transmission charge is more. The transmission charges are estimate by multiplying each component of the transmission cost matrix [CLG] by the corresponding elements of the contract/transaction matrix [PLG]. The entire transmission basic charge (in Indian Rupees) for the above power contracts is;

$$(195 \times 1175) + (105 \times 1325) + (72 \times 1320) + (128 \times 1180) = 6,14,330 \text{ RS}$$

It is supposed that the transmission power charge to be enhanced for a transmission line is equal to the line resistance of the line. Then the total charge to be recuperated for a given network is equal to the sum of resistances of all the lines. The sum of the resistances of all the lines for the four-bus system is 39.7. A multiplication factor (w) is used to obtain the related transmission charges in Indian Rupees for each line and is given by;

$$w = \frac{6,14,330}{39.7} = \text{Rs. } 15474.307/\text{ohm}$$

**4. Calculation of Transmission supplementary charges:-**

The benefit of the suggest method is that knowing the electrical distance matrix of a network the transmission charges can be assess for another possible associations of power contracts with small calculations. If any contract changes from the desired contract supplementary transmission charges will be allocate for the deviated power contract. If the sum of real generation at a generating bus is greater than the expected generation, the power contracts, which are larger than the expected, are allocate supplementary charges. Likewise, if the entire generation at a generating bus is small than the desired generation, the power contracts, which are small than the expected, are allocate supplementary charges. Consider a real power contract/transaction matrix:

$$\text{Actual } [P_{LG}] = \begin{bmatrix} 190 & 110 \\ 140 & 60 \end{bmatrix}$$

From the above contracts matrix it is seen that the total generation at bus 1 is 190 + 140 = 330MW which is more than the desired generation of 267MW and the total generation at Generator bus 2 is 110 + 60 = 170MW that is less than the desired generation of 233MW. That means for the above contract matrix the new generation values are deviating from the desired generation scheduling. To calculate the transmission supplementary charges, first which contract is causing to deviate from the desired generation scheduling and the

amount of MW deviations are identified. The amounts of power contract (MW) deviations are

$$\begin{bmatrix} -5 & +5 \\ +68 & -68 \end{bmatrix}$$

And the deviations of generation values (MW) are given by;

$$[ +63 \quad -63 ]$$

Since the total generation at bus 1 is more than the desired generation by (+63 MW), the deviated power contract (+68 MW), which is more than the desired, is allocated supplementary charges. Similarly, the total real generation at the generating bus 2 is less than the desired generation by (-63 MW), the deviated power contract (-68 MW), which is less than the desired, is assigned supplementary charges. The load sharing scheduling (mw) and deviation of power contract and supplementary charges are shown in below tables.

**5. Load contribution scheduling (MW):**

Case no.	Load bus no.	Power taken from generator		Total load	Total generation	
		1	2		1	2
1	3	195	105	300	267	233
	4	72	128	200		
2	3	190	110	300	330	170
	4	140	60	200		
3	3	240	60	300	400	100
	4	160	40	200		

**6. Variation of power transactions and supplementary charges**

Case no.	Load bus no.	Deviation of				Transmission Supply. Charges of load
		Power contracts		Generations		
		G1	G2	G1	G2	
1	3	0	0	0	0	0
	4	0	0			0
2	3	-5	+5	+63	-63	0
	4	+68	-68			17000
3	3	+45	-	+133	-	11250

			45		133	
	4	+88	-88			22000

**IV. CONCLUSION**

A new approach, called relative electrical distance, is used for evaluation of transmission prices. The suggest method assign the transmission charges based on the relative location of load junction with respect to the generator junction. The suggest method gives a preferable transmission tariff for verify system stability and reduce crowding on trnsmission lines. To have an effective operation in deregulated power network, it is mandatory to understand the possible ways of congestion and its comfort. In this paper a method of generation rearranging for congestion management has been suggest under restructured environment. The presented concepts are better adapt for finding the utilization of resource generation/load and system by various utilities involved in the day-to-day working of the system under regular and contingency situations. This will support in finding the contribution by various players involved in the congestion management and the deviations can be used for proper tariff purposes. This process is authentic and fast to determine congested lines. The main benefit of this process lies in its applicability to examine various contracts/transactions together.

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## Single and Multi-Plane Balancing of Rotor in Static and Dynamic Condition – A Review

Konal I. Singh , Saket Kolhe , Amit R. Bhende

Mechanical Engineering, St. Vincent Pallotti College of Engineering & Technology, Nagpur, Maharashtra, India

### ABSTRACT

Static and dynamic balancing of a rotor plays an important role in deciding the life of any turbo-machinery. Vibrations generated due to unbalance rotor is considered as one of the major factors that can lead to accelerating degradation of machine components or even catastrophic failure especially at high speed where reliability is important consideration. Rotor unbalance may result due to error in manufacturing process, wear and tear of rotating component, thermal deformations, deposition of material on rotor surface etc. There are various static and dynamic balancing methods depending upon type of rotor. Different methods of rotor balancing requires different trial runs (number of times the machine has to stop) so as to place trial weights and measure vibration amplitude. This paper studies the number of trial runs required in various rotor balancing methods in static and dynamic condition. Any method which balances the rotor in less number of trials is considered to be the efficient one because stopping machine results in more energy consumption and reduction in machine life. It is normal human psychology to find and search for a method that solves the problem in least possible time and the work can be started again. The paper also includes the derivation of two balancing methods that has reduced the number of trial runs to a considerable number and also reviews the literature concerning the origin of various balancing techniques including the ones that use influence coefficient method, cradle balancing method, modal balancing method.

**Keywords:** Balancing, Rotor, Vibration, Phase Angle, Influence Coefficient Method

### I. INTRODUCTION

Static and dynamic balancing of a rotor plays an important role in deciding the life of any turbo-machinery. A rotor is said to be unbalanced when axis of inertia of rotor axis of rotation of shaft are different. Balancing any rotor means coinciding (or try to coincide), the axis of inertial of the rotor and axis of rotation of the shaft. Theoretically, the inertia axis of the rotor coincides with axis of shaft, but in actual practice, this does not happen due to error in manufacturing process, wear and tear of rotating component, thermal deformations, deposition of material on rotor surface etc. Rotor unbalances results in centrifugal couple and unbalance centrifugal forces that are being generated and transmitted to the shaft support bearings. These centrifugal couple and unbalance centrifugal forces further increases the value of centrifugal force, which

further increases the distance of center of gravity from axis of rotation. This effect is cumulative and ultimately the shaft fails. The bending of shaft not only depends upon the value of eccentricity but also depends upon the speed at which the shaft rotates. The speed, at which the shaft runs so that the additional deflection of the shaft from the axis of rotation becomes infinite, is known as critical speed. [1] The forces generate vibrations in the machinery and this is why unbalance rotor is considered as one of the major factors that can lead to accelerating degradation of machine components or even catastrophic failure especially at high speed where reliability is important consideration.

There are various static and dynamic balancing methods depending upon the type of rotor. The fundamental aspect of balancing process is to determine the amount and angular location of the mass concentration so as to either add an equal amount of mass to the opposite side

of the mass concentration or remove mass at the mass concentration. Vibration amplitude is directly proportional to the amount of unbalance. Hence balancing process is accomplished by closely monitoring the vibration amplitudes and phase angle to determine the location of the unbalance.

A rotor can generate vibrations due to various reasons apart from unbalance such as faults in the bearing, misalignment of shaft, lose foundation bolts, transfer of vibrations from neighbouring machine etc. Now to diagnose the unbalance vibration signals, frequency analysis of vibration signal is carried out. If the vibration signals are due to unbalance of rotor, then prominent peaks can be seen at the rotational frequency in the frequency spectrum. Frequency analysis is carried out before and after balancing process to see the reduction in the vibration level due to balancing [6].

In this paper, various methods of static and dynamic balancing of rotor are reviewed and compared to various methods on their merits and demerits. For dynamic balancing, rotors are classified in two major categories, e.g., the rigid and flexible rotors. In fact, the same shaft of a rotor can be considered as rigid if it is operating much below its first critical speed and the flexible when it is operating near or above the first critical speed. That is why sometime it is also called the slow and high speed rotor balancing. [2]

The rotor balancing methods can be classified as off-line balancing methods and real-time active balancing methods. The off-line rigid rotor balancing method is very common in industrial applications. In this method, the rotor is modeled as a rigid shaft, which cannot have elastic deformation during operation. Theoretically, any imbalance distribution in a rigid rotor can be balanced in two different planes. Methods for rigid rotors are easy to be implemented, but they can only be applied to low speed rotors, where the rigid rotor assumption is valid. A simple thumb rule is that rotors operating under 5,000 rpm can be considered rigid rotors. It is well known that rigid rotor balancing methods cannot be applied to flexible rotor balancing. Therefore, researchers developed modal balancing and influence coefficient methods to off-line balance flexible rotors. Modal balancing procedures are characterized by the use of the modal nature of the rotor response. In this method, each mode is balanced with a set of masses specifically

selected so as not to disturb previously balanced, lower modes. There are two important assumptions:

- i. The damping of the rotor system is so small that it can be neglected; and
- ii. The mode shapes are planar and orthogonal. [3]

The real-time balancing methods can be classified into passive balancing methods and active balancing methods, according to what kinds of balancing devices are used. Automatic Balancing uses Passive Devices. Very little research has been done on passive auto balancing devices. The selection of balancing method will depend on several factors such as unbalance configuration, length-to-diameter ratio, balance speed compared to operating speed, rotor flexibility and amount of cross-effect.

Different methods of rotor balancing requires different trial runs (number of times the machine has to stop) so as to place trial weights and measure vibration amplitude. Any method which balances the rotor in less number of trials is considered to be the efficient one because stopping machine results in more energy consumption and reduction in machine life. This paper reviews the various methods of static and dynamic balancing of rotor and effect of rotor speed on its balancing.

## II. ROTOR BALANCING METHODS

This section of the paper gives an overview of previously published literature surveys on balancing of rotating machineries. These reviews are limited in scope, focusing on methods related to static and dynamic rotor type, and do not directly discuss application to rotor dynamic systems. The methods are reviewed in the order of their number of trial runs required to accomplish balancing process.

### A. Single plane balancing:

In the actual practice location (radial as well as angular) of centre of gravity G point is unknown in the single plane rotors. The orientations of the point G can be obtained by keeping the rotor on frictionless supports and gently allow it to rotate freely without any external drive. The rotor becomes stationary after some time with heavy spot (G) acting vertically downwards. To confirm the orientation of the residual unbalance it can be



$$\cos \phi = \frac{a_0^2 + \overline{AB}^2 - a_1^2}{2a_0\overline{AB}} \text{----- (1)}$$

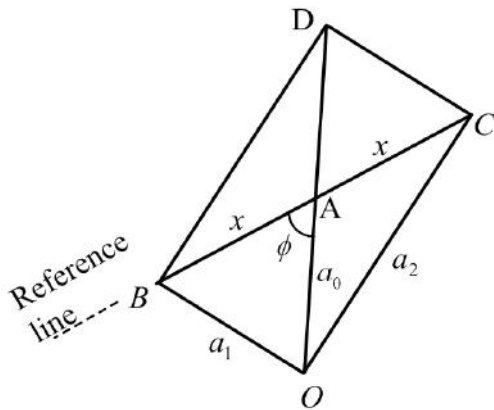


Figure 2: Geometrical constructions for determination

$$\cos(\pi - \phi) = \frac{a_0^2 + \overline{AC}^2 - a_2^2}{2a_0\overline{AC}} \text{----- (2)}$$

$$\overline{AB} = \overline{AC} = x \text{----- (3)}$$

Equating equation (1),(2),(3)

$$2a_0\overline{OB}\cos\phi = a_0^2 + \overline{AB}^2 - a_1^2 = a_0^2 + \overline{AC}^2 - a_2^2$$

when simplified further

$$x = \pm \sqrt{\frac{1}{2}(a_2^2 + a_1^2) - a_0^2}$$

and

$$\cos \phi = \frac{a_2^2 - a_1^2}{4a_0x}$$

**C. Dual Plane Balancing**

E. L. Thearleenet. al. (1934) [4], describes the various means of dealing with the various components of vibration occurring at running speed frequency. The author have also discusses about the different portable instrument used for balancing the rotating machineries. The author have used the technique for a two plane semi-graphical balancing procedure based on a linear rotor system to conduct experimental trial (using test rig shown in fig 3). The similar techniques named as Influence Coefficient Technique was originally proposed by Goodman (1964) [7], refined by Lund and

Tonneson (1972) [8], and verified by Tessarzik and others (1972) [9]. This technique comprised what we would now call a dual plane balancing; the balance computation included one speed and two vibration sensors (Generator & Contactor).

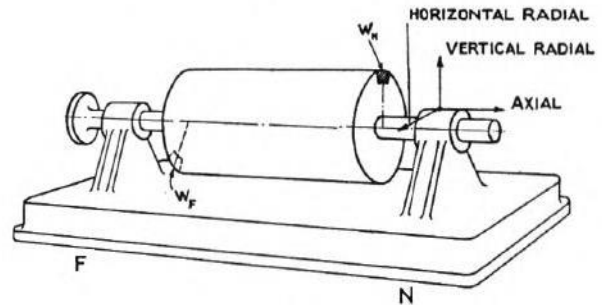


Figure 3: Test rig for dual plane balancing

The values of the correction mass and angle can be determined by plotting vector diagram as shown in Fig. 4. Vector diagram is plotted by taking the vibration amplitude and phase angle at no corrective weight being added, at reasonable amount of corrective weight  $W'_n$  is mounted on near end of rotor plane and corrective weight  $W'_f$  is mounted on far end of rotor plane. Fig. 4 shows the vector plot in dual plane balancing method.

The trial weights  $W'_n$  and  $W'_f$  and the final wrights  $W_n$  and  $W_f$  require a statement of both magnitude and position(direction) to specify each of them. Each final weight may be derived from its corresponding trial weight by a shift in angle and a

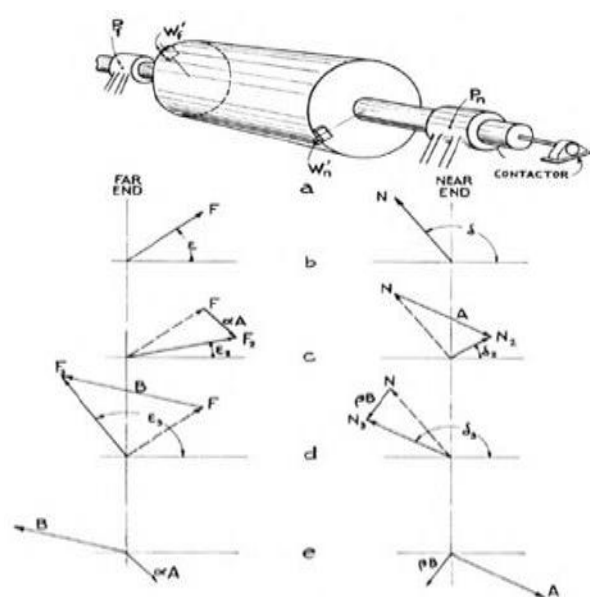


Figure 4: Vector plot in dual plane balancing method

multiplication. Thus two new vector operator  $\theta$  and  $\emptyset$  may be introduced such that

$$W_n = \theta W'_n \text{ ----- (4)}$$

$$W_f = \emptyset W'_f \text{ ----- (5)}$$

The angles  $\theta$  &  $\emptyset$  are the angle through which the near and far end trial masses should be shifted in counter clockwise direction. The values of correcting masses and their positions can also be calculated by plotting the vectors on a polar plot and the equations given below. Fig. 5 shows polar plot and balance data calculations.

The operators  $\theta$  and  $\emptyset$  can also be calculated as

$$\theta A + \emptyset B = -N \text{ ----- (6)}$$

$$\emptyset B + \theta \alpha A = -F \text{ ----- (7)}$$

On solving equation (6) & (7)

$$\theta = \frac{\beta F - N}{(1 - \alpha B)A}$$

$$\emptyset = \frac{\beta N - F}{(1 - \alpha B)B}$$

Rearranged the above equation of  $\theta$  and  $\emptyset$  as

$$\theta A = \frac{\beta F - N}{(1 - \alpha B)}$$

$$\emptyset B = \frac{\beta N - F}{(1 - \alpha B)}$$

The value of  $\theta$  can be calculated as  $\theta A = -N$  & similarly the value of  $\emptyset = \emptyset B = -B$  and the corrective weight to be mounted at  $\theta$  &  $\emptyset$  can be found from equation 4 & 5.

**D. Modal Balancing**

This is an off-line method in which rotor is to be mounted on a balancing machine. First run the rotor near first critical speed and measure vibration amplitudes. Select a suitable trial mass and mount it near to the hub of the rotor. Vibration amplitudes are measured at the same speed. Single plane balancing method can be applied to determine the correct mass and its location using the above two vibration measurements. After mounting the corrective mass, it can be observed that the vibration amplitudes are reduced considerably. Next, the rotor is run approximately at second critical speed. Vibration amplitudes are measured at this speed. Trial mass is mounted at  $180^\circ$  a part [10]. It has been observed that if rotor is balanced at first critical speed then it will not affect the balancing at other critical speeds [11]. Similarly correction mass is determined at second critical speed. Similarly rotor can be balanced up to higher modes [12] [13]. Kellenburger [14] suggested that the rotor should be corrected in  $N+2$  planes, so as not to disturb the rigid body balancing.

**III. CONCLUSION**

Rotor balancing is very critical and time consuming process in industry. In off-line method, the rotor has to take out from the machine and put it on balancing machine or on some specially designed fixtures for the balancing. Whereas in on-line balancing, machine has to stop for several time to put the trial mass on the rotor and take the various vibration measurements. These stoppages to the machine lead to loss of energy, production loss, reduction in component life etc. Hence any method which accomplishes in less number of trial runs is considered to be the efficient one. In this paper, various balancing methods have been reviewed. Out of these methods, the dual plane balancing method is found to be the efficient and accomplished in only three numbers of trial runs for first time balancing of a rotor. Any subsequent rebalancing process of the rotor requires only a single run provided there is no change in the machine such as speed, means of support.

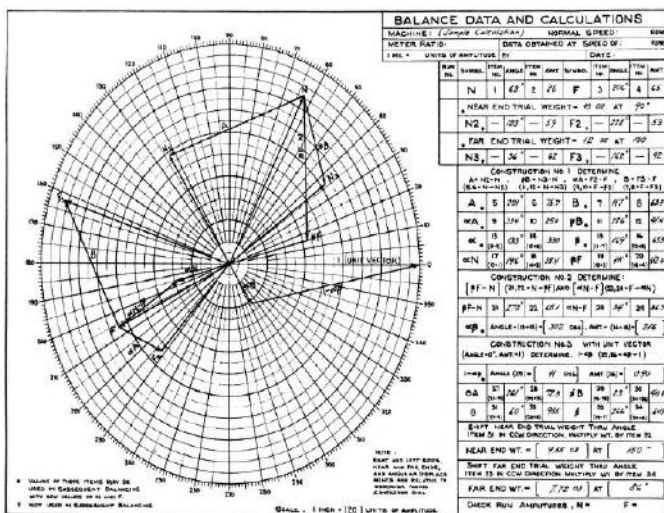


Figure 5: Vector Representation on polar plot

All the methods explained in this paper are accomplished at constant speed. But in actual practice, machines are operated at various speeds. A rotor is balanced at one speed may get unbalanced at other speed. The design of rotor under various study are taken as uniform cross-section but in actual practice some rotor may have non uniform in cross section. The example of such type of rotor is conical rotor. Effectiveness of two plane balancing method is need to be studied the disadvantages of field balancing are production loss, component life, skilled manpower require. Frequent stoppages of machine for trial runs etc. These drawbacks can be reduced by using various numerical techniques such as finite element method. Hence this study is to be extended further to analyse the effect of rotor speed on its balancing.

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# Multilevel Inverters : Comparison of Various Topologies and its Simulation

Mithilesh Shivankar, Komal Deshmukh, Akshay Sahu, Abhijit Dutta

Department of Electrical, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

## ABSTRACT

The multilevel inverters have drawn a tremendous interest in power industry now a day for high power and medium voltage energy control applications. Multilevel inverter is used to reduce the harmonic content in output waveform without decreasing the inverter power output. This paper presents the basic but important topologies diode-clamped inverter (N- point clamped), Capacitor clamped (flying capacitor) and Cascaded h-bridge with separated dc sources. This paper also includes advantages and disadvantages of multilevel inverters over conventional inverters along with its working principle and constructional features. The switching sequence of 3 level and 5 level for single leg of above mentioned topologies has been presented in this paper with their waveforms. The designs have been simulated in MATLAB/SIMULINK and the total harmonic distortion (THD) for voltage output has been carried out and comparison of DCMLI, FCMLI and CHB MLI is also done. Emerging topologies like asymmetric hybrid cells and modified cascade h-bridge multilevel inverters with reduced number of switches are also discussed.

**Keywords :** Multilevel Inverters (MLI), Diode Clamped Inverter (DCMLI), Flying Capacitor Multilevel Inverter (FCMLI), Cascade H-Bridge Inverter, hybrid multilevel inverter, modified cascade h-bridge multilevel inverter, THD

## I. INTRODUCTION

The device which converts dc input voltage to ac output voltage with desired magnitude and frequency, is known as inverter. It is a power electronics device. In practice, inverter gives square wave output voltage waveform while output voltage waveform of the ideal inverter should be sinusoidal. To get better waveform with low harmonic distortion, multilevel inverter are used. Multilevel inverter are starts with a level of three. The concept of multilevel inverter (MLI) has been introduced since 1975[1].

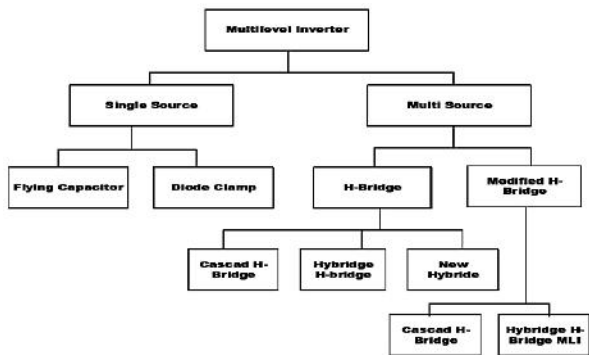
There are several advantage to multilevel approach as compared to conventional two level approach. The smaller voltage steps lead to the production of higher power quality waveforms and also reduce voltage (dv/dt) stress on the load and the electromagnetic compatibility concerns which ultimately results in output with reduced harmonics

Another important feature of multilevel converters is that the semiconductors are wired in a series-type connection, which allows operation at higher voltages. However, the series connection is typically made with clamping diodes, which eliminates overvoltage concerns. Furthermore, since the switches are not truly series connected, their switching can be staggered, which reduces the switching frequency and thus the switching losses. One clear disadvantage of multilevel power conversion is the higher number of semiconductor switches required. It should be pointed out that lower voltage rated switches can be used in multilevel converter and, therefore, the active semiconductor cost is not appreciably increased when compared with the two level cases. However, each active semiconductor added requires associated gate drive circuits and adds further complexity to the converter mechanical layout.

Another disadvantage of multilevel power converters is that the small voltage steps are typically produced by isolated voltage sources or a bank of series capacitors.

Isolated voltage sources may not always be readily available, and series capacitors require voltage balancing [2].

## II. METHODS AND MATERIAL



Voltage Source Multilevel Inverters has been broadly classified in to two parts depending upon the number of voltage sources as shown below:

### A. INVERTER TOPOLOGIES

The basic and most important three topologies of a voltage source multilevel inverters are as follows:

1) Diode Clamped Inverter: Diode Clamped Inverter is also termed as Neutral Point Clamped inverter. In Diode clamped inverter diode is used as a clamping device to clamp the dc bus voltage so as to achieve steps in output voltage. Thus the main concept of this inverters is to use diodes to limit the power devices voltage stress.

A three level single leg diode clamped inverter is shown in figure 1(a) in which dc bus voltage consists of two series connected bulk capacitors C1 & C2, along with four IGBT. The middle point of two capacitor 'n' can be termed as neutral point. The output is taken across phase (a) and neutral point (n) as shown in fig below.

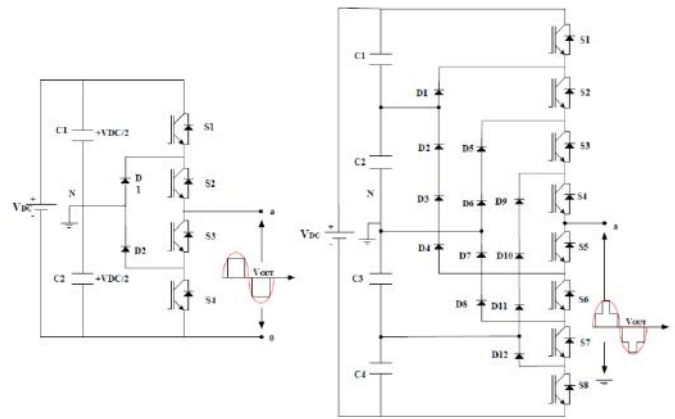


Figure 1. One phase leg of DCMLI (a) 3 level; (b) 5 level

For voltage level  $V_{an} = V_{dc}/2$  turn on the switches S1 and S2, for voltage level  $V_{an} = 0$  turn on the switches S2 and S3, and for voltage level  $V_{an} = -V_{dc}/2$  turn on switch S3 and S4.

Similarly a five level single leg diode clamped inverter can be achieved as shown in fig.1 (b). In which the dc bus consists of four capacitors C1, C2, C3 and C4 along with eight IGBT. The output is taken across phase (a) and neutral (n).

To synthesize 5-level output phase voltage, switching sequence as given in table below:

Table 1: Switching table for 5 level DCMLI

VOLTAGE	SWITCHING STATE							
	S1	S2	S3	S4	S5	S6	S7	S8
$+V_{DC}$	1	1	1	1	0	0	0	0
$+1/2 V_{DC}$	0	1	1	1	1	0	0	0
0	0	0	1	1	1	1	0	0
$-1/2 V_{DC}$	0	0	0	1	1	1	1	0
$-V_{DC}$	0	0	0	0	1	1	1	1

An n-level inverter needs (n-1) voltage sources, 2(n-1) switching devices and (n-1) (n-2) clamping diodes. But n becomes sufficiently large then the no. of diodes make the system impractical to implement, which in fact limits the possible no. of levels with such configuration.

2) Flying Capacitor Inverter: The structure of this inverter is similar to that of the diode clamped inverter except that instead of using clamping diodes, the inverter uses capacitor in their place. The flying



capacitor involves series connection of capacitor clamped switching cells, this topology has a ladder structure of dc side capacitors where the voltage on each capacitor differs from that of the next capacitor. The voltage increment between two adjacent capacitor leg gives the size of the voltage steps in the output waveform.

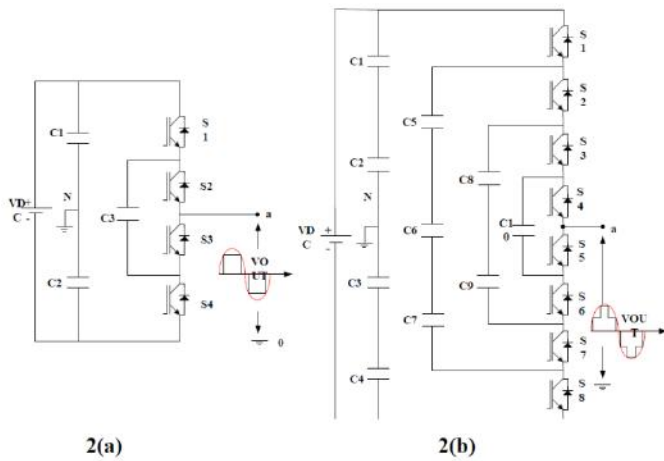


Figure 3. One phase leg of CHB (a) 3 level; (b) 5 level

Fig 3(a) below shows a single-phase full-bridge inverter which is considered as a single cell. A single cell gives waveform of three output levels i.e. +Vdc/2, 0 and -Vdc/2. For voltage +Vdc/2 switch S1 and S4 to be turned on while for voltage -Vdc/2 switch S2 and S3 to be turned on. For 0 voltage, either pair (S1, S3) or (S2, S4) needs to be turned on.

Thus a 5 level CHB can be designed by connecting two h-bridge in cascade as shown in fig 3(b) above. In this one h-bridge generates either polarity i.e. positive and negative and other bridge generates no. of output levels. The resulting output ac voltage swings from to +Vdc to -Vdc with different levels, and the stair case waveform is nearly sinusoidal, even without filtering.

The switching table for 5 level CHB inverter is given below:

**Table 3:** Switching sequence for 5 level CHB MLI

VOLTAGE	SWITCHING STATE							
$V_{an}$	S1	S2	S3	S4	S5	S6	S7	S8
+V <sub>DC</sub>	1	1	0	0	1	1	0	0
+1/2 V <sub>DC</sub>	1	0	0	1	0	1	0	1
0	0	1	0	1	1	0	1	0
-1/2 V <sub>DC</sub>	0	1	0	1	1	0	0	1
-V <sub>DC</sub>	0	0	1	1	0	0	1	1

The relation between number of H-bridges and the associated number of output levels can be given as follows:

$$\begin{aligned} \text{No. of switches} &= (N_{\text{level}} - 1) * 2 \\ \text{No. of H-Bridge} &= (N_{\text{level}} - 1) / 2 \end{aligned}$$

### III. RESULTS AND DISCUSSION

The model for single leg 5 level multilevel inverter has been simulated in MATLAB/ SIMULINK for resistive load (RL = 10 ohms).

#### A. Simulation Results

The MATLAB Simulink model for Diode clamped 5 level inverter, Flying Capacitor and Cascade h-bridge inverter has been simulated and is as follows. The 5 level voltage output and current output for R load is as follows:

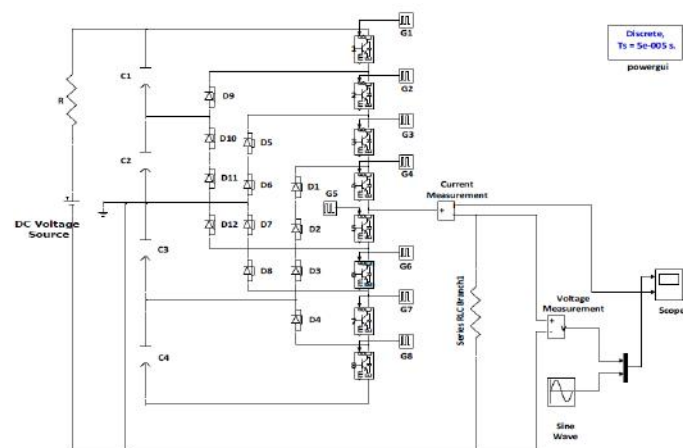
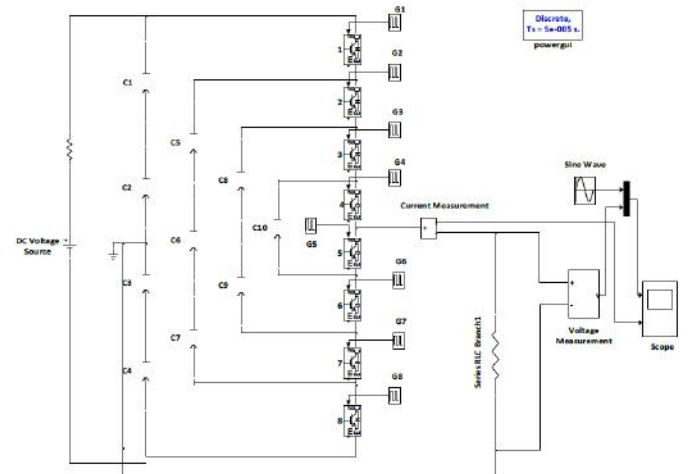
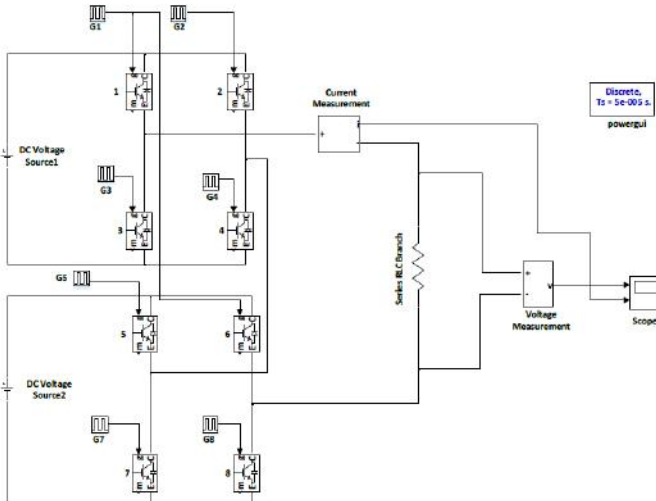


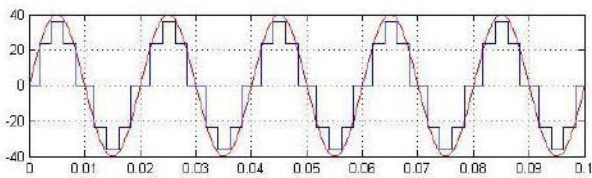
Figure 4. MATLAB Simulink model for single leg 5 level DCMLI



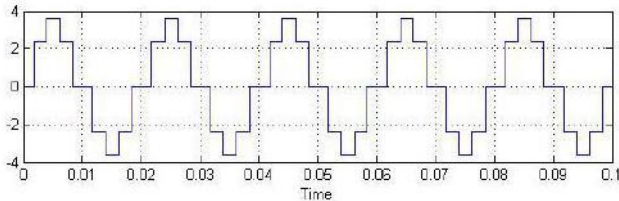
**Figure 5.** MATLAB Simulink model for single leg 5 level FCMLI



**Figure 6.** MATLAB Simulink model for single leg 5 level CHBMLI



**Figure 7.** 5 level Voltage Output for R load



**Figure 8.** 5 level Current Output for R load

The voltage and current output for all three inverters are almost same and consists of 5 levels (i.e. +Vdc, +1/2 Vdc, 0, -1/2Vdc, -Vdc). Hence only voltage output and current output of only Cascade H-Bridge inverter is shown in this paper.

**B. Results of FFT Analysis**

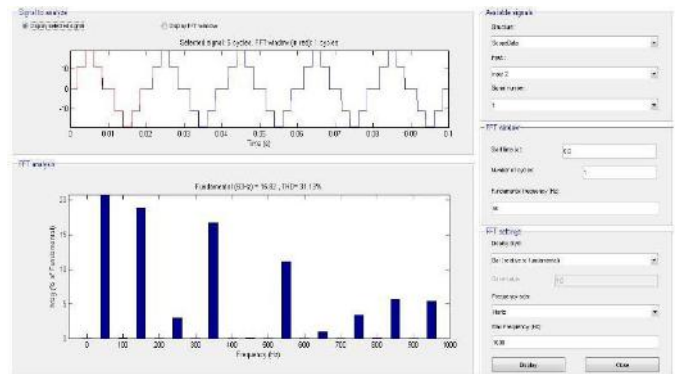
Fast Fourier Transformation (FFT) technique is used for analysis of harmonic content present in the output of multilevel inverter. In this paper FFT analysis is done with resistive load for 3 levels and 5 levels DCMLI, FCMLI and CHBMLI respectively.

FFT analysis gives magnitude of output voltage and Total Harmonic Distortion (%).

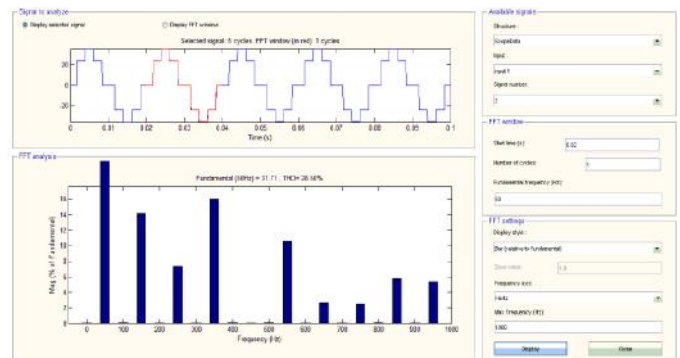
THD is calculated as follows:

$$THD = \frac{\sqrt{V_2^2 + V_3^2 + V_4^2 + \dots + V_n^2}}{V_1}$$

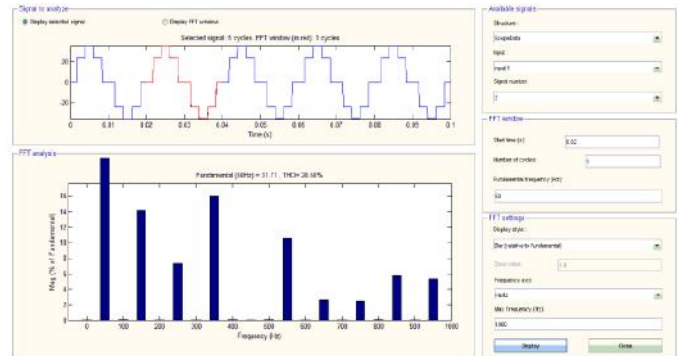
THD analysis of above mentioned three topologies have been done and are as follows:



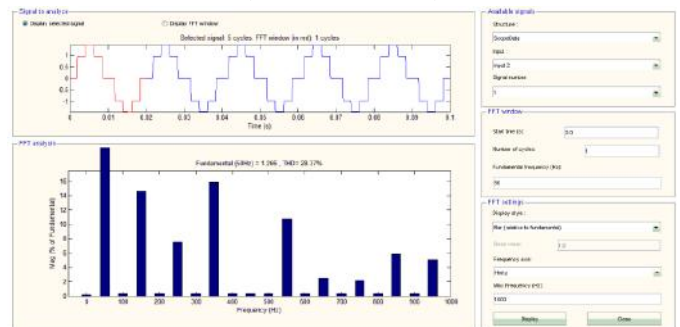
**Figure 9.** THD analysis of 5 level DCMLI with R load (THD = 31.13%)



**Figure 5(a)** THD analysis of 5 level DCMLI with R load (THD = 31.13%)



**Figure 5(b)** THD analysis of 5 level FCMLI with R load (THD = 28.50%)



**Figure 5(c)** THD analysis of 5 level CHB MLI with R load (THD = 28.37%)

Thus it can be seen that cascade H-Bridge THD is least of all i.e. 28.37.

**C. Comparison of Power components Requirement**

The comparison of power component requirements per phase leg among three multilevel inverters is shown below in table 4.

**Table 4:** Comparison of power component

Type of Inverter	DCMLI	FCMLI	CHBMLI
Voltage Source	1	1	2
IGBT	8	8	8
Clamping Diodes	8	8	0
Power diodes	12	0	0
Capacitors	4	10	0

The THD analysis and comparison of above three topologies has been compared for 5 level output which is shown in TABLE 5 below:

**Table 5:** Comparison of THD analysis

No. of output levels	THD (%)		
	DCMLI	FCMLI	CHBMLI
5 Level	31.13%	28.50%	28.37%

**IV. CONCLUSION**

This paper provides a brief summary of multilevel inverter and its basic three circuit topologies (i.e. Diode Clamped, Flying Capacitor and Cascade H-bridge). Although this paper cannot cover all the detailed work, but the basic principle of different multilevel inverters has been covered. Comparison of topologies is also done in this paper in which cascade H-Bridge multilevel inverter is found to be better than other inverters in such a way that the number of levels can be increased easily by increasing the number of H-Bridge. Also according to constructional point of view Cascade H-bridge Multilevel Inverter (CHBMLI) is very simple. There is no requirement of voltage clamping diodes and voltage balancing diodes which make circuit bulky and increase the cost.

Further inverter circuits can be modified reducing the number of switches and using a single source for more number of output levels (i.e Modified H-Bridge and Hybrid Multilevel Inverter with different gate control strategies for reducing the harmonic contents.

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## EMG Signal Acquisition and Classification System

Mujib Khan , Nemkumar Meshram , Gaurav Kohad , Pathan Gazi Khan

Department of Electronic and Telecommunication Engineering, RTMNU, Nagpur, Maharashtra, India

### ABSTRACT

Measuring muscle activation via electric potential, referred to as electromyography (EMG). EMG has traditionally been used for medical research and diagnosis of neuromuscular disorders. However, with the advent of ever shrinking yet more powerful microcontrollers and integrated circuits, EMG circuits and sensors have found their way into prosthetics, robotics and other control systems. Electromyography (EMG) is the non-invasive recording of electrical muscle activity that is used to diagnose neuromuscular disorders, among other applications. Muscle fibers are activated by motor neurons and the resulting electrical signals produced by the muscle fibers can be detected by electrodes placed on the surface of the skin. Electromyography (EMG) measures the electrical impulses of muscles at rest and during contraction. As with other electrophysiological signals, an EMG signal is small and needs to be amplified with an amplifier that is specifically designed to measure physiological signals. When EMG is measured from electrodes, the electrical signal is composed of all the action potentials occurring in the muscles underlying the electrode. This signal could either be of positive or negative voltage since it is generated before muscle force is produced and occurs at random intervals. A method of pattern recognition of EMG signals of hand gesture using spectral estimation and neural network. The work proposed in this project is motivated by the need for stronger classifiers that would help to implement the human-machine interface. The electrical activity of skeletal muscle finds useful applications in many fields, such as biomechanics, rehabilitation medicine, neurology, gait analysis, exercise physiology, pain management, orthotics, incontinence control, prosthetic device control, even unvoiced speech recognition and man-machine interfaces.

**Keywords:** Electromyography (EMG), A/D Converter, PC, Neuromuscular

### I. INTRODUCTION

Design of EMG signal acquisition and classification system project is use to get muscles signal and plot it on PC. Muscles signal are pick up from body with the help electrodes which are connect on hand or any other muscles of body and amplified. Frequently more than one amplification stages are needed, since before the signal could be displayed or recorded, it must be processed to eliminate low or high frequency noise, or any other factors that may affect the outcome of the data. The point of interest of the signal is the amplitude, which can range between 0 to 10 mill volts (peak-to-peak) or 0 to 1.5 mill volts (rms). The frequency of an EMG signal is between 0 to 500 Hz. However, the

usable energy of EMG signal is dominant between 50-150 Hz. There are two reasons to amplify the signal. First, amplification increases the level of signal enough to protect an electrical interference during transmission. Second, the signal is amplified so that it could be stored in a storage device, or displayed by a measurement device like oscilloscope.

This signals wirelessly transmit to PC to analyse. The signals are modulated and transmit it to receiver. Receiver demodulate signal and convert it into digital form and fed to PC through microcontroller 8051. On PC software is used to analyse the EMG signal. It is helps to analyses moment of muscles. This project also use in measuring signals like oscilloscope. One signal

can be possible to receive by more than one receiver. It has two channels to analyse signal on PC therefore at a time we can able to observe two signals and compare it.

This project can then be used to design a new electromyography signal conditioning circuit that would have good performance characteristics, will be reduced in size and power and be possible to manufacture and maintain in an academic setting.

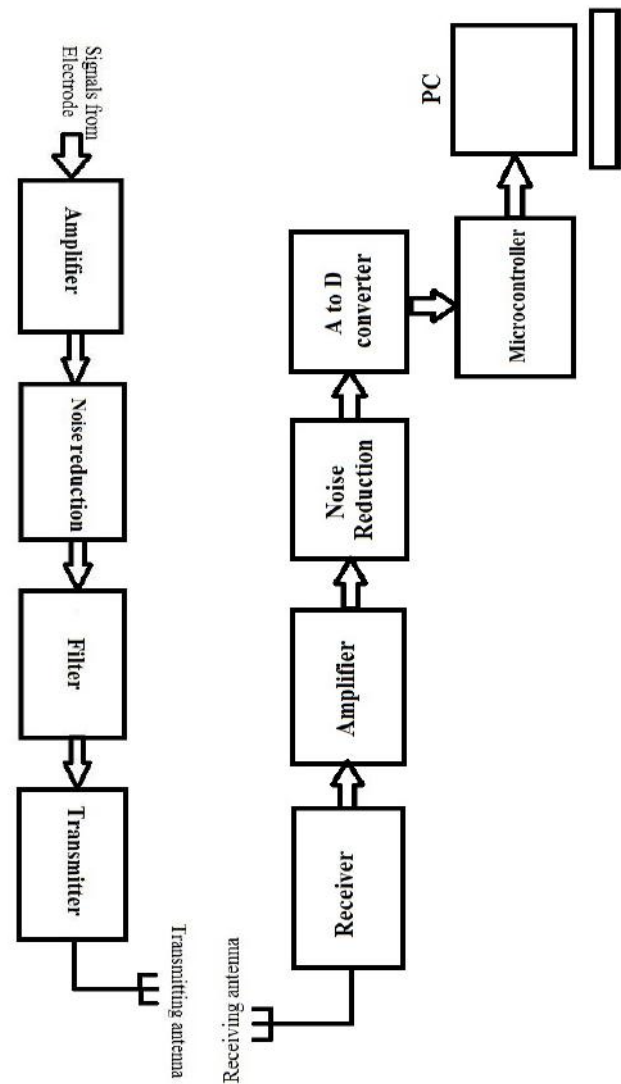
## II. METHODOLOGY

Electrodes are connected to muscles. There is more than one electrode connected to analyse signal. It converts muscles vibration into electrical signal. Electrodes pick up the signal which is in analog signal and fed to amplifier.

Amplifier is voltage amplifier which increases the voltage of signal. It special amplifier which amplify signal of uV to desired level of modulation. Noise reduction process helps to remove noise signal from desired signal and filter allow only low frequency signal.

Amplified output signal is modulated to transmit it to receiver. Modulation is use to transmit signal to a large distance and to communicate with minimum noise. The signals are wirelessly transmit through antenna. (using zigbee technology) In transmitter part their battery power supply to all circuits. If this circuit is portable or place on body then battery should be light weighted required. It is rechargeable battery. There is possible that more than one receiver. It receives the signal through receiving antenna and demodulates it. After demodulation signal is in' original form.

Amplifier is voltage amplifier which increases the voltage of signal. It amplify signal to desired level of A to D converter. Noise reduction process helps to remove noise signal from desired signal and A to D converter convert analog signal into digital form. Microcontroller is interface with PC through USB port. Hence incoming data from A/D converter is converted into serial form and fed PC. Microcontroller is responsible for serial communication with PC.



On PC there is oscilloscope software which plot EMG signal according to received data. This signal helps to analyse EMG signal. It is two channel software hence there is possible to analyse two signal at a time. Also software have additional feature to presses on signal.

## III. APPLICATIONS

1. Robotics:- This system will use to control robot by using human gesture.
2. Medical:- Biomechanics, orthotics, prosthetic device control, etc.
3. Athletes Strength Training:- It is use to monitor the muscles of Athletes when muscle fatigue.
4. Videogames:- It possible to give command for handling games.

#### IV. CONCLUSION

In this paper we proposed the emg signal acquisition and classification system using wireless technology that is zigbee. Using this wireless technology we can acquire the emg signal through the body at a time of motion. Due to this there is a flexibility in acquiring the emg signal for analysis from the body of a sportsperson. As the zigbee is a advance wireless communication technology there is very less error in the transmission of the signal from the transmitter to the receiver.

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## Solar AC Generator

**Prof. Akil Ahmed<sup>1</sup>, Afreen Khan<sup>2</sup>, Gunwanti Shende<sup>3</sup>, Nighar Sheikh<sup>4</sup>, Murtuza Johar<sup>5</sup>, Ritisha Jaiswal<sup>6</sup>, Shubham Sawarkar<sup>7</sup>, Tabish Khan<sup>8</sup>**

\*<sup>1</sup>Assistant Professor, Electrical Department, Anjuman College of Engineering and Technology, Nagpur, Maharashtra, India  
\*<sup>2,3,4,5,6,7,8</sup>Student Electrical Department, Anjuman College of Engineering and Technology, Nagpur, Maharashtra, India

### ABSTRACT

Conventional energy sources have been depleting at a very alarming rate and they are limited and the consumption has been increasing with every passing day. Solar energy has moved out fast to have a major role to play as a renewable energy resource. Solar panels have been used to harness the solar power and this power is required to be stored in the battery. This dc power is then required to be converted to ac power to be used in homes and industry. This method turns out to be expensive and suffers from losses. In this work we present a new scheme wherein we are able to generate ac power without using the inverter. This technique also avoids the battery resulting in cost reduction. By adopting this technique, we can remove power losses due to an inverter. Another very good aspect of this technique is that we get a very pure sine wave of better efficiency than that of an AC inverter. We can generate the sine wave of any frequency by just controlling the speed of motor used in this technique. So it is a very simple technique with great effects.

**Keywords:** Research Solar, Inverter, Alternating Current, Renewable Energy

### I. INTRODUCTION

Solar energy can be harnessed in many ways. One way is to convert it by using solar cells or with concentrated solar power (CSP), in which we the sunlight is allowed to fall on the water so as to boil it and this boiled water is then used to produce electricity.

In this work we present the use of solar cells in such a way that they can directly produce alternating current. This eliminates the use of inverter and battery and the alternating current can be directly used. It is also possible to control the frequency of the sine wave by controlling the system and this system is able to produce a satisfactory sine wave.

### A. Problem Statement

Existing solar harnessing systems first store the dc voltage in the battery and then using the inverter the dc voltage is converted to ac voltage to be used for various application. They turn out to be expensive and are prone to energy losses. The AC Solar Generator can achieve the same result at a lower price and lower energy loss. The prototype device which is used to exhibit this process has an array of solar cells that are arranged in a circle, a base and a disk on top of them which has holes that are used to control each cell's exposure to sun light and darkness. This alternating current is achieved by controlling the disk and ultimately controlling the shaded and exposed areas of the solar cells [3]. Hence we have name it a Smart Solar AC Generator without inverter.

**B. Purpose**

The energy requirement has been escalating with every passing day and the conventional fuels are depleting fast. More so the conventional energy sources have contributed to various type of pollution. The hydroelectric power is a good source to generate power but requires huge amount of water. The nuclear energy is a good option but is very costly and requires a high maintenance. The solar energy comes as good ecofriendly option. The solar energy can be easily converted to electricity using solar cells or panels A photovoltaic cell is made up of a semiconductor material like silicon. It absorbs the sunlight and produces electricity. Electron can only flow in a one direction through a solar cell because the terminals (positive and negative) of the solar cell are static. That’s why solar cell can only produce direct current (DC). Now direct current has its own issues as it is difficult to send out in large distance, so it has limited uses [4]. So we use alternating current. Furthermore, the majority electrical devices can only use alternating current (AC).

**C. Benefits**

The proposed system comes as a practical, cheap, and environmental friendly unit for commercial as well as domestic use. It can be efficiently put to use for commercial as well as domestic usage and has the capacity to replace the existing power plants and can be placed at almost any place like a playground, school or in any residential or in any urban surroundings [4]. Large scale solar AC electricity generator arrays can easily be placed in any remote place.

**II. TECHNIQUE TO BE EMPLOYED**

The system has been divided in to two parts

- a) Generation of AC
- b) Solar tracking

**Generation of AC**

It contains the components to generate the alternating current

The major components used are

- Lasani Wood Sheet
- Solar cell

- Variable Power supply
- DC motor

**A. Lasani Wood sheet**

We used Lasani wood sheet for the base and upper rotating disk in the project. Lasani wood sheet has been selected due to following reasons such as

✓ Safety

This wood sheet is impact-resistant [10]and does not shatter in case of impact.

✓ Weight

This would turn out to be a bit heavy then other material but has high stability.

✓ Rigidity

Lasani wood sheet used is a very rigid material [10]. So we don’t expect much elasticity in it.

✓ Surface Hardness

The surface hardness is very even.

**B. Electrical Properties**

This wood is a good insulator with a high surface resistivity and suffers from very negligible effect due to its exposure to sunlight.

Small Solar Panel mono-crystalline 12pcs Solar cell pairs are connected in anti-parallel to make alternating current [11].

**Table 1.** Specification of small Solar Panel monocrystalline

Material	Mono-crystalline
	Silicon
Max. Power	3W
Shape	Rectangular
Max. Power	36watt-72watt
Max. Power	12V-24V
Max Output Current	2 Amp

**C. Variable Power Supply**

A variable power supply is used to power the DC motor which rotates the disk. [11]

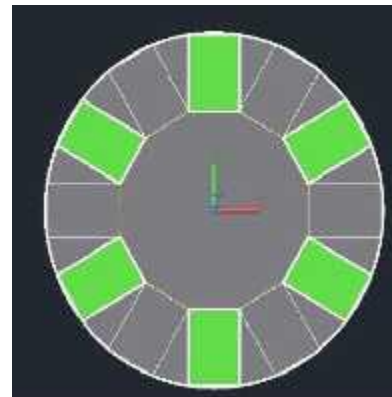


**Table 2.** Specification of variable power supply DC gear motor

Max. Power	36watt-72watt
Max. Power	12V-24V
Max Output Current	2 Amp

**D. DC Gear Motor**

The motor houses a gear assembly where the small gear is coupled with a large gear in such a way that when small gear rotates the large gear also rotates, eventually rotating the disk.

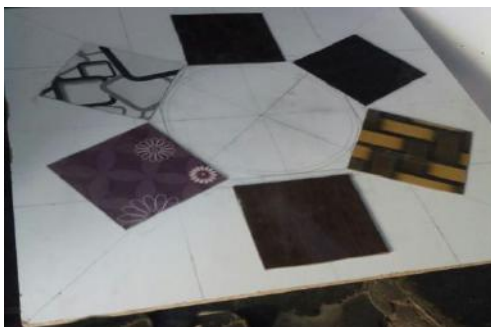


**Figure: 2** Auto Cad design of the rotating disc

**III. METHODS AND MATERIAL**

**A. Solar Cells Arrangement**

The arrangement has been done such that the solar cells have been placed in a circular form such that each pair of anti-parallel connected photovoltaic cells of each photovoltaic cell pair progressively and alternately get exposed and shaded producing the amplitude and polarity so as to generate alternating current.



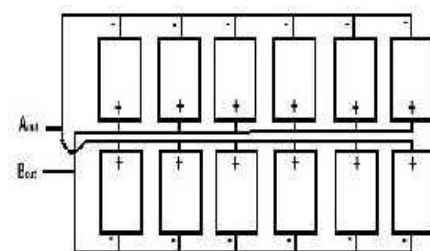
**Figure: 1** Arrangement of Solar cells

**B. Designing**

To arrange solar cells in a circular array perfectly we designed its drawing on AutoCAD. As the total numbers of solar cells are 12 so they must be kept at an angle of 30° from each other. So we made an evenly spaced circular array.

**C. Connections**

To generate an AC output, wave the solar cell pair is connected in anti-parallel. The negative terminal of the photovoltaic cell A is connected with positive terminal of the photovoltaic cell B, whereas the negative terminal of the solar cell B is connected to the positive terminal of the photovoltaic cell A. The solar cell pair should be connected as shown in the figure [4]. The AC output terminals are Aout and Bout. In the figure below, an array of solar cells is connected for AC sine wave. The solar cells on the upper side are represented by solar cells. A1, A2, A3, A4 and A5 are coupled to form the single AC output terminal Aout, while the remaining solar cells represented by solar cells B1, B2, B3, B4 and B5 are coupled so that they can form the single AC output terminal Bout hence forming a "photovoltaic cell pair". To increase the current and maintain the constant voltage, the solar cells shown are connected in parallel. In order to increase voltage and to maintain constant current, solar cells would be connected in series. Each solar cell pair of them has the first and second AC output (which can be seen in Fig. 4.4) is connected in anti-parallel to form a single AC output. So one output terminal would provide the single phase AC electricity.



**Figure: 4** Array of solar cells connected in anti-parallel

**D. Method For Directly Generating AC**

The process of generating alternating current at an AC output of the photovoltaic cell pairs mechanically exposes and shades solar cell pairs that are connected in anti-parallel. We expose and shade the solar cells alternately and gradually of all solar cell pairs that are connected in anti-parallel to vary the amplitude and polarity to form AC.

**E. Area With Respect To Angle**

We calculated the area of uncovered solar cells with respect to angel of rotation of the disk in order to check out what are we giving as input to the solar cell.

**Table 3.** Angle v/s area in tabular form

Angle(degree)	Area(inch square)
0	30.3
5	29.7
10	26.8
15	20.4
20	13.6
25	6.9
30	0
35	6.9
40	13.6
45	20.4
50	26.8
55	29.7
60	30.3

So we are giving a half rectified sine wave as an input to each cell and connecting them in anti-parallel form to a get AC unlike the other techniques in which they give a constant value as an input to the solar cell to get constant DC.

**1) Base**

We used wood sheet as base which is a non-conducting material. The solar cells are arranged in a circle on the surface of the base [4]. And the motor is at the center of base which is rotating the spinning disk. To support the upper disk some rollers are also fixed on the base.



**Figure: 11** Smart Solar AC generator

**2) Rotating Disc**

A non-elastic disk having same or more diameters then the solar cell array which covers the whole solar cell array and it can expose and block the sun light. The disc should be of a lightweight material with no elasticity so it can easily rotate [4]. The disc has 6 holes. The size and shape of the holes is same as that of the photovoltaic cell array to control exposure of photovoltaic cell to the sunlight when the holes are placed over the solar cell. Rest of the sheet is used to completely cover a solar cell when the hole is not over the solar cell. The holes are located at about 60° from each other. The number of holes is 6 so that the number of coverings is half the number of photovoltaic cells. So, when the disc is placed on the frame above the photovoltaic cell array, half of the solar cell array area is exposed and half of the solar cell array area is covered [4]. When the disc rotates over the array of solar cells, it will slowly and constantly covers and exposes the array of photovoltaic cells by the cutouts and coverings.



**Figure: 12** Rotating disc with arrangements of solar cell

**3) DC Gear Motor**

A DC motor that is supported by the base rotates the disc above the base consisted of solar cell array. Rotation can be in any direction clockwise or Counter

clockwise. Rotation of the disc causes the cut outs to alternately cover and expose the neighboring photovoltaic cells. The frequency of the signal depends on the speed of the rotating disk. Faster the photovoltaic cells are covered and exposed, the higher the frequency of AC electricity produced and vice versa [4]. Variable power supply to drive motor. The variable power supply is used to supply the DC voltages to the DC motor which will then rotate the disk to produce AC waveform

**IV.RESULT AND DISCUSSION**

**A. Getting A Sine Wave**

Mechanically exposing and covering the photovoltaic cell pairs gradually, alternating expose and cover the two anti-parallel solar cells. It results in a sinusoidal AC wave form. The resulting sine wave is periodic. The rate at which the exposing and shading is done determines the frequency of the sine wave.

**B. Measurements of Output**

We get the following output from a single ac solar generator. The resulting Sinusoidal wave form has peak voltage and frequency given in table shown below.

**Table 4.** Measurement of Solar AC generator

AC Voltage	30 volts
DC Voltage	14 Volts

**V. CONCLUSION**

Solar energy has emerged as a very popular alternate source of energy which is eco-friendly. The issue with the generation of electricity through solar cells is that they produce DC electricity thus requiring the need of an inverter to get the desired AC supply. This leads to escalation in the cost and leads to reduction in overall efficiency of the system. To counter this problem, we have been able to develop a mechanical setup which directly generates AC from the solar cells cell array which at a much lesser cost and with comparable efficiency.

But this system has its own limitations like the size of the solar cells and the sheet to be used and the spinning disk to be employed. The system efficiency can be

improved greatly by employing the tracking system. Reducing the weight and overcoming the frictional losses would also help in improving the efficiency. Similarly, by using some lighter sheets as compared to Lasani sheath the overall results can be improved.

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## An Android Messenger Application for Dumb and Deaf People

Nidhi Kawale, Divya Hiranwar, Mayuri Bomewar

Computer Technology Department, RTMNU, Nagpur, Maharashtra, India

### ABSTRACT

An evolution of Information and Communication Technology has influenced every part of human life. It has modified the way we do the job, occupation, travel, acknowledge and convey. For the Deaf people group, the utilization of ICT has enhanced their personal satisfaction by creating frameworks that can help them discuss better with whatever remains of the world and among themselves. Gesture based communication is the essential method for correspondence in the almost totally impaired group. The issue emerges when hard of hearing individuals attempt to convey what needs to be to other individuals with the assistance of these gesture based communication language structures and bad habit a versa. The application gives hard of hearing individuals a method for getting more shut to cutting edge innovation by utilizing discourse to picture interpretation. This deaf individual to learn new advances by looking toward pictures which are being changed over to pictures by utilizing discourse acknowledgment framework.

**Keywords :** Sign Language, Deaf and Dumb, Android Application.

### I. INTRODUCTION

Almost nine billion humans on the earth are impaired of hearing and not able to speak. How regularly we run over these individuals speaking with the ordinary world? The correspondence between a hard of hearing and unable to speak individual's stances to be a major issue contrasted with correspondence amongst visually impaired and ordinary visual individuals. This makes an almost no space for them with correspondence being a principal part of human life.

In our everyday life the majority of the errand we complete includes talking and hearing. The hard of hearing and unable to speak individuals experience issues in speaking with other people who can't comprehend communication via gestures and miss-mediators. Henceforth correspondences between hard of hearing quiet and an ordinary individual have dependably been a testing undertaking.

The quantity of almost totally senseless on the planet constantly expanding and they are thoughtful shut society. In this way, Deaf-Dumb individuals don't have typical open doors for learning. Uneducated Deaf-Dumb individuals confront difficult issue in correspondence with ordinary individuals in their general public. It is outstanding, be that as it may, that most accessible application concentrate just on learning or acknowledgment of gesture based communication. The venture means to help tragically challenged particularly uneducated hard of hearing and unable to speak by giving them an appealing correspondence and as a learning instrument.

Likewise with different types of manual correspondence, Sign dialect relies on upon finger spelling. The least complex visual type of finger spelling is reenacting the state of letters noticeable all around, or tangibly, following letters on the hand.

Finger spelling can utilize one hand, for example, in American Sign Language, French Sign Language and

Irish Sign Dialect, or can utilize two hands, for example, in British Sign Language [3]. Uneducated Deaf-Dumb individuals can speak with other individuals (ordinary or

impediment) with gesture based communication just, so they confront significant issues in their day by day life. For instance: eateries, transportation, doctor's facilities, government offices...etc. In this manner, they require a compelling apparatus to decipher their words from gesture based communication to English dialect straightforwardly. This device can offices their correspondence with ordinary individuals and urge them to learn both dialects. Additionally, Deaf-Dumb children need to learn sign and English dialects in a fascinating way.

Uneducated Deaf-Dumb individuals can speak with other individuals (ordinary or debilitation) with communication via gestures just, so they confront significant issues in their day by day life. For instance: eateries, transportation, healing facilities, government offices...etc. Along these lines, they require a compelling device to decipher their words from gesture based communication to English dialect straightforwardly. This instrument can offices their correspondence with ordinary individuals and urge them to learn english dialects. Likewise, Deaf-Dumb children needs to learn sign and English dialects in a fascinating way.

This project introduces a coordinated android application with mix uneducated Deaf-Dumb individuals inside society, and help them to speak with ordinary individuals. This work presents an Android Mobile application that empowers correspondence between uneducated Deaf-Dumb and ordinary individuals in our general public. It additionally builds up a guide device for not too sharp in many fields like eateries, healing facilities and transportation. In addition, this application presents a simple interpreter from gesture based communication to English and the other way around.

## II. RELATED WORK

The problem appears when impaired of hearing individuals attempt to convey what needs be to other individuals with the help of these communication through signing linguistic uses. This is on account of usual people are normally ignored of these sentence structures. Thus, it has been observed that coherence of

an imbecilic people are just uneasy inside his/her family or the impaired of hearing group. At this generation of modernization, there is the importance for a computer based framework for such group. Intriguing advances are being created for discourse acceptance however no certain work item for sign acceptance is really there in the present market.

The Stephen Cox, Michael Lincoln and Judy Tryggvason in 'TESSA, a framework to help correspondence with hard of hearing individuals', 2002 proposed the discourse to sign coversion calculation is being utilized as a part of this paper to perceive the discourse and change over it into a pictures. The S.M. Halawani and Zaitun A.B. proposed 'An Avatar Based Translation System from Arabic Speech to Arabic Sign Language for Deaf People', in 2008 which portray the significance of web to inquiry sight and sound substance, for example, picture or video which is characterized into two classes, for example, content based pursuit and substance based hunt. D. Molla and J.L Vicedo talked about that the 'Confined area QA', in 2007 augmentation of content based QA (Question Answer) to inquire about based interactive media QA to deal with the scope of tidbit. H. Cui, M.Y. Kan suggested that the 'Definitional QA', in 2008 Queries is arranged into two classes in particular related inquiry or non-related question. R. C. Wang, W. W. Cohen, E.Nyberg recommends that the paper 'List QA' in 2008 to gather picture and video information we have to produce inquiries through motor.

There are couple of versatile applications for Deaf and idiotic like Deaf and Dumb through 3G applications [4]. These procedures just empower correspondence amongst hard of hearing and unable to speak through gesture based communication utilizing cell phones.

The various application which suggested in [5] makes acceptance of gesture based communication. Portable based Deaf what's more, Dumb Interaction System extend in [6] proposed portable application that empowers the requirements of 'hard of hearing and idiotic building up a voice-actuated versatile which would change over their gesture based communication into messages that might be perused by different clients, this message can likewise change over to a voice.

Almost totally senseless is a term means a man who couldn't either hear or both hear and talk. The quantity of hard of hearing and unable to speak on the planet persistently expanding and they are contemplative shut

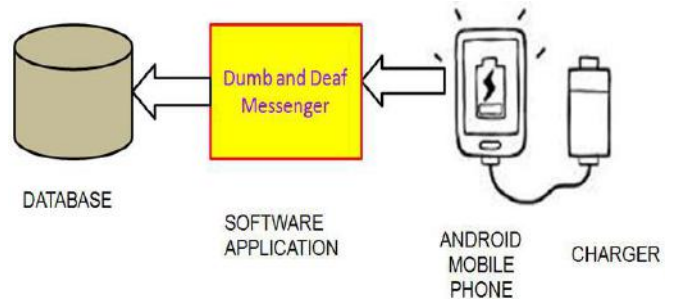
society. The instruction of the hard of hearing is just around exceptionally old [2]. Since sign is the most punctual method for correspondence on the planet when there is no fitting dialect, so the communication via gestures is favoured among the hard of hearing stupid individuals for instruction. Similarly as with different types of manual correspondence, Sign dialect relies on upon finger spelling. The least complex visual type of finger spelling is reproducing the state of letters noticeable all around, or tangibly, following letters on the hand.

Finger spelling can utilize one hand, for example, in American Sign Language, French Sign Language and Irish Sign Language, or can utilize two hands, for example, in British Sign Language [3]. Uneducated Deaf-Dumb individuals can speak with other individuals (typical or handicaps) with gesture based communication just, so they confront difficult issues in their day by day life. For instance: eateries, transportation, healing centers, government offices...etc. Along these lines, they require a powerful apparatus to decipher their words from gesture based communication to Arabic or English dialect straightforwardly. This instrument can offices their correspondence with typical individuals and urge them to learn both Arabic and dialects. Likewise, Deaf-Dumb children needs to learn sign, Arabic and English dialects in an intriguing way. For the above reasons, the inspiration of our application is to offer a support of the general public as a rule and to Deaf-Dumb individuals specifically. This work is an incorporated framework that can without much of a stretch take care of a large portion of their issues in one application.

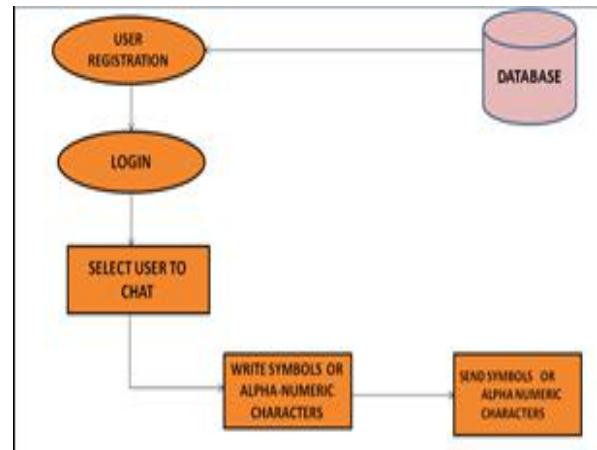
Along these lines, the proposed work means to:

- ✓ Help almost totally senseless to cooperate more with typical individuals
- ✓ Offer an extraordinary instrument for guardians to instruct their not too sharp children
- ✓ Introduce Sign dialect console.
- ✓ Introduce tests and recreations for preparing hard of hearing and unable to speak to recognize English words.

A. System Architecture:



B. Flow Chart



1. User Registration

Here User will register into application using sign Language Keypad.

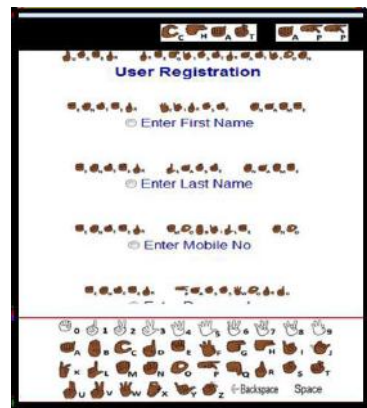


Figure 1. User Registration

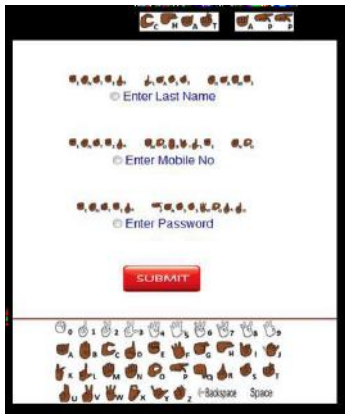


Figure 2. User Registration

2. Chat Module

User can chat with the other available user. Here the message communication will be performed using sign language.



Figure 3. Sender



Figure 4. Reciever

3. File Upload

Text File is uploaded and then it will be converted into Sign



I. CONCLUSION

We display a useful application for Deaf-Dumb messenger application. This messenger means to help and to sharp by furnishing them with an appealing correspondence and learning device. This work present a Mobile android application that empower correspondence between Deaf-Dumb and typical human in our general public .It additionally build up a guide apparatus for impaired hearing and unable to speak in many fields like eateries, Hospitals and transportation. Besides, this application presents a simple interpreter from communication via sign language to English and the other way around. All the methods explained in this paper are accomplished at constant speed. But in actual practice, machines are operated at various speeds. A rotor is balanced at one speed may get unbalanced at other speed. The design of rotor under various study are taken as uniform cross-section but in actual practice some rotor may have non uniform in cross section. The example of such type of rotor is conical rotor. Effectiveness of two plane balancing method is need to be studied the disadvantages of field balancing are production loss, component life, skilled manpower require. Frequent stoppages of machine for trial runs etc. These drawbacks can be reduced by using various numerical techniques such as finite element method. Hence this study is to be extended further to analyse the effect of rotor speed on its balancing.

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# Performance Improvement of Power System Using Static Synchronous Compensator (STATCOM)

Priya Naikwad, Mayuri Kalmegh, Poonam Bhonge

Department of Electrical Engineering, RTMNU University, Maharashtra, Nagpur, India

## ABSTRACT

STATCOM is a Static synchronous compensator which operates as a shunt connected static var compensator whose both capacitive as well as inductive output current can be controlled by the ac system voltage. STATCOM is one of the key FACTS Controllers. STATCOM is a reactive power source. It gives the voltage support by generating or absorbing capacitors. It normalize the voltage at its terminals by compensating the quantity of reactive power in or out from the power system Reactive power compensation is an important issue in the control of electrical power system. Reactive power increases the transmission system losses and reduces the power transmission capability of the transmission line. Moreover, reactive power flow through the transmission line can cause large amplitude variation in the receiving end voltage. In this paper study the shunt operation of Flexible AC Transmission System (FACT) controller, the Static Synchronous Compensator (STATCOM), & how it helps in the better utilization of a network operating under normal condition. Effect of STATCOM in power system on reactive power control by proper modelling of simple power system and voltage source converter (VSC) based STATCOM using Simulink and simpower toolboxes in MATLAB. It is shown that with suitable control of STATCOM can inject a voltage of required magnitude in shunt with the transmission line. This helps in providing shunt compensation and improving the power flow of transmission line.

**Keywords** :- STATCOM, FACTS, Power Flow Control, Power System, Modelling of STATCOM.

## I. INTRODUCTION

Modern power systems are highly complex and are expected to fulfill growing demands of power wherever required, with acceptable quality and costs. But in the present scenario control of voltage and reactive power is the major issue in the electrical power transfer. This is because of the topological differences between transmission and distribution system. Reactive power can cause harmful effect on various electrical appliances and motorised applications. This results in reduction of stability margins. This problem can be effectively tackled by the FACTS technology which controls the interrelated parameters of transmission systems including series impedances, shunt impedances, voltage, phase angle, current and damping of oscillations at frequency below the rated frequency.

The flexible AC transmission system (FACTS) are recognised as a variable solution for controlling power flow, transmission voltage and dynamic response. The Static Synchronous Compensator (STATCOM) is a member of FACTS family which is connected in shunt with the transmission line. The STATCOM was originally called as advanced SVC and then labelled as STATCON (static condenser) and now days commonly known as static synchronous compensator. Since 1980 when the first STATCOM (rated at 20 Mvar) using force commutated thyristor inverters was put into operation in Japan, The main purpose of shunt connected devices is to support bus voltage by injecting (or absorbing) reactive power. This shunt connected static compensator was developed as an advanced static VAR compensator where a voltage source convertor (VSC) is used in-stead of the controllable reactors and switched capacitors.

Although VSCs require self-commutated power semiconductor devices such as GTO, IGBT, IGCT, MCT, etc (with higher costs and losses) unlike in the case of variable impedance type SVC which use thyristor devices, there are many technical advantages of a STATCOM over a SVC such as a) Faster response b) Requires less space as bulky passive components (such as reactors) are eliminated c) Inherently modular and relocatable. Various computing and simulation of these devices, have found its application to modelling and simulating these devices.

N. G. Hingorani and L. Gyugyi gives The information about all shunt type facts controller design and the basic definition, which define that how the shunt facts controller are differ from the series controller for the compensation of reactive power. Mathur R. Mohan and Rajiv K. Varma in described STATCOM advantages, modes of operation, controller, Analysis of STATCOM, capability characteristics, harmonic performance, losses and modelling of STATCOM.

## II. Static Synchronous Compensator (STATCOM)

A STATCOM is a static synchronous generator operated as a shunt connected static var Compensator whose capacitive or inductive output current can be controlled independent of the ac system voltage. A STATCOM is a solid state switching converter capable of generating or absorbing independently controllable real and reactive power at its output terminals, when it is fed from an energy source or an energy storage device of appropriate rating. A STATCOM incorporate a voltage source inverter (VSI) that produces a set of three phase ac output voltages, each of which is in phase with, and coupled to the corresponding ac system voltage via a relatively small reactance. This small reactance is usually provided by the per phase leakage reactance of the coupling transformer. The VSI is driven by a dc storage capacitor. By regulating the magnitude of the output voltage produced, the reactive power exchange between STATCOM and the ac system can be controlled. The Static Synchronous Compensator (STATCOM) is a power electronic-based Synchronous Voltage Generator (SVG) that generates a three-phase voltage from a dc capacitor in synchronism with the transmission line voltage and is connected to it by a coupling transformer as shown in Fig.1. By controlling the magnitude of the

STATCOM voltage  $V_s$  the reactive power exchange between the STATCOM and the transmission line and hence the amount of shunt compensation can be controlled.

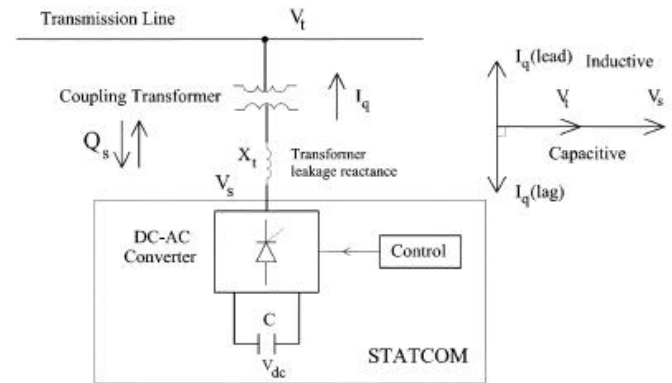


Figure 1. The structure of Static synchronous compensator (STATCOM)

Figure 2 terminal characteristic of STATCOM, respectively. From Fig. 8, STATCOM is a shunt-connected device, which controls the voltage at the connected bus to the reference value by adjusting voltage and angle of internal voltage source. STATCOM exhibits constant current characteristics when the voltage is low/hig under/over the limit. This allows STATCOM to delivers constant reactive power at the limits compared to SVC.

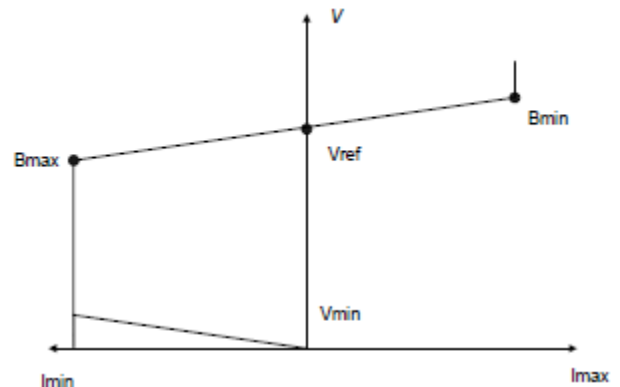


Figure 2. Terminal characteristic of STATCOM

The following mode of operation of STATCOM given as:

### 1. Over excited mode of operation ( $V_o \geq V_{bus}$ )

That is, if the amplitude of the output voltage is increased above that of the ac system voltage, then the current flows through the reactance from the

STATCOM to the ac system and the STATCOM generates reactive (capacitive) power for the ac system.

## 2. Under excited mode of operation ( $V_o \leq V_{bus}$ ):

On the other hand, if the amplitude of the output voltage is decreased below that of the ac system, then the reactive current flows from the ac system to STATCOM, and the STATCOM absorbs the reactive (inductive) power.

## 3. Normal (floating) excited mode of operation ( $V_o = V_{bus}$ ):

If the output voltage is equal to the ac system voltage, the reactive power exchange is zero. In STATCOM, the resonance phenomenon has been removed. So STATCOM is having more superior performance as compare to SVC.

$$I_o = \frac{V_o - V_{bus}}{jX}$$

Where,

$V_{bus}$  = System voltage

$V_o$  = STATCOM voltage

$I_o$  = Compensating current

Here while compensating of reactive power the phase angle of bus voltage and STATCOM voltage should be same.

### 2.1 Multi Control Function of STATCOM

In the practical application of a STATCOM, it may be used for controlling one of the following Parameters.

- ✓ Voltage magnitude of the local bus to which the STATCOM is connected.
- ✓ Reactive power injection to the local bus, to which the STATCOM is connected.
- ✓ Impedance of the STATCOM.
- ✓ . Voltage Injection.
- ✓ Voltage magnitude at a remote bus.
- ✓ Power flow.
- ✓ Apparent power or current control of a local or remote transmission line.

Among these control options, control of the voltage of the local bus which the STATCOM is connected to, is

the most recognized control function. The other control possibilities have not fully been investigated in power flow analysis

## III. NEED OF REACTIVE POWER COMPENSATION

Voltage control and reactive-power management are two aspects of a single activity that both supports reliability and facilitates commercial transactions across transmission networks. On an alternating-current (AC) power system, voltage is controlled by managing production and absorption of reactive power. Voltage control is complicated by two additional factors. First, the transmission system itself is a non-linear consumer of reactive power, depending upon system loading. At very light loading the system generates reactive power that must be absorbed while at heavy loading the system consumes large amount of reactive power that must be replaced. The systems reactive power requirements also depends on generation and transmission configuration. Consequently, system reactive requirements vary in time as load levels and load and generation patterns change. The bulk-power system is composed of many pieces of equipment, any one of which can fail at any time. Therefore, the system is designed to withstand the loss of any single piece of equipment and to continue operating without impacting any customers. That is, the system is designed to withstand a single contingency. Taken together, these two factors result in a dynamic reactive-power requirement. The loss of a generator or a major transmission line can have the compounding effect of reducing the reactive supply and, at the same time, re configuring flows such that the system is consuming additional reactive power. The need for adjustable reactive power compensation can be divided into three basic classes:

i) The need to maintain the stability of synchronous machines. We shall see that voltage control by reactive power compensation can have a positive stabilizing influence on the system during disturbances cause the rotor angles of synchronous machines to change rapidly. Both the transient stability and the dynamic stability of a system can enhance. It is even possible with controlled compensators to drive voltages deliberately out of their normal steady-state bounds for several seconds following a fault or other major disturbance to enhance the stabilizing influence still further

ii) The need to control voltage within acceptable bounds about the desired steady-state value to provide quality service to consumer loads. Following certain abrupt changes in the load, or in the network configuration as a result of switching actions, it may be necessary to make a voltage correction in as short a time as a few cycles of the power frequency. For other voltage disturbances, a correction within a few seconds will suffice. Uncorrected voltage deviations, even if temporary, may lead to an outage or damage to utility or consumer-owned equipment. Even small variations, particularly those that cause flicker, are often objectionable. Reactive power compensation using STATCOM.

iii) The need to regulate voltage profiles in the network to prevent unnecessary flows of reactive power on transmission lines. To this end, reactive power compensation can be used to maintain transmission losses to a practical minimum. While the reactive compensation must be adjusted or changed periodically to maintain minimum losses, the adjustments can be made quite infrequently with several minutes to effect the desired change.

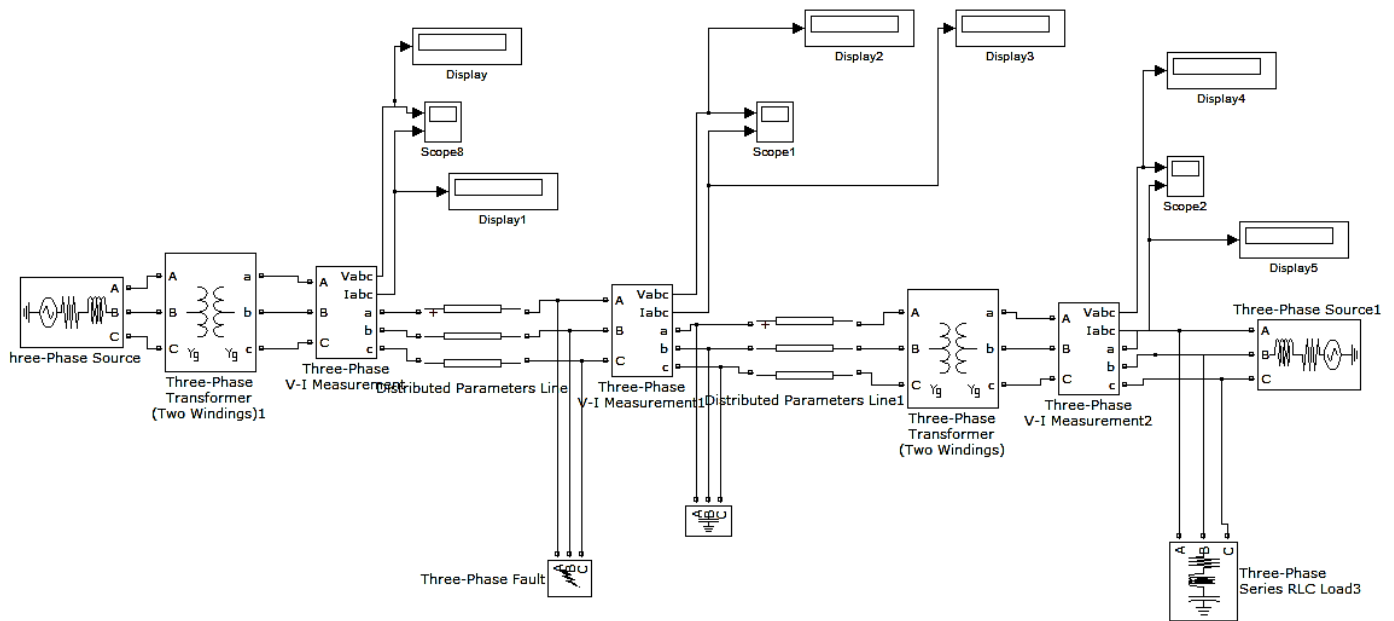


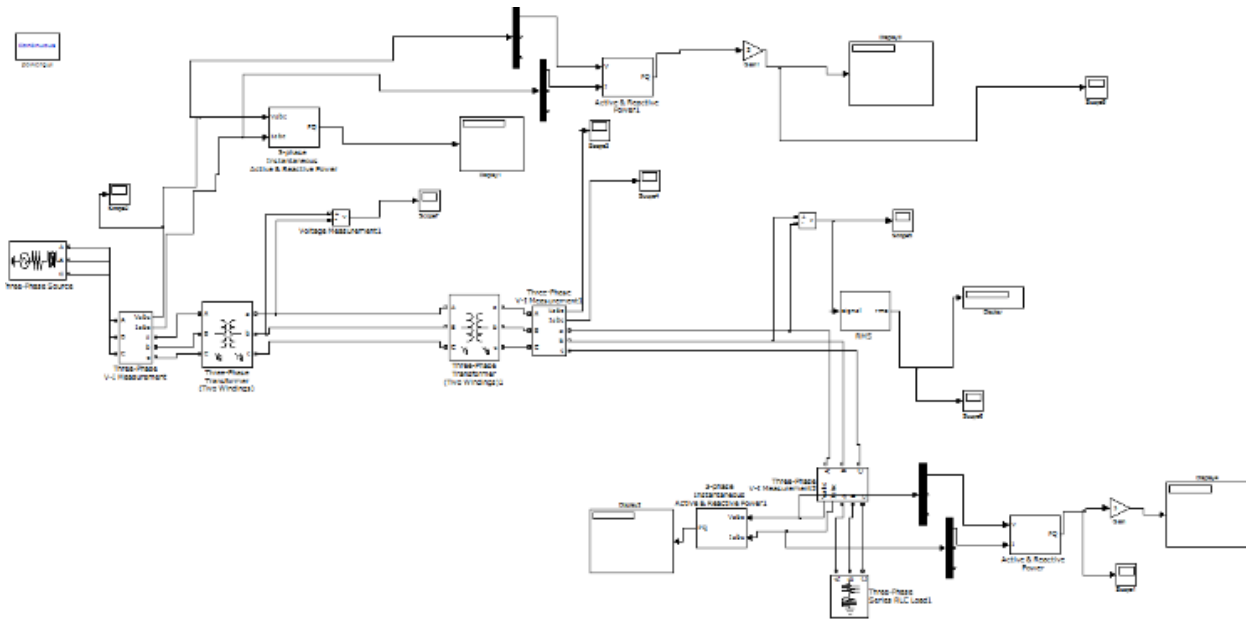
Figure 3. Conventional method of compensation

Show simulation modeled in MATLAB/SIMULINK without STATCOM controlled. SIMULINK is used to model, analyze and simulate dynamic systems using block diagrams. Further, it provides a graphical user interface for constructing block diagram of a system and hence is easy to use. Sim Power Systems libraries of SIMULINK contain models of typical power equipment such as transformers, lines, machines, and power electronics. These models are provide and their validity is based on the experience of the Power Systems the active and reactive power flow in line is same at the

sending end side and receiving end side. The voltage at the load drops due to loss of voltage on lines. This simulation model work at  $P=203.9KW$  and  $Q=200KVAR$ .

#### IV. MODELLING OF STATCOM BY USING MATLAB/SIMULINK.

Figure 4 below shows the modelling of transmission line without STATCOM. The modelling is done by connecting a three phase source and RL load through transmission line without using any compensation method.



**Figure 4.**Transmission line without STATCOM / compensation

The sending end and receiving end details for the power system without STATCOM is given in the Table 4.1 and Table 4.2

**4.1 Case A:** Keeping the active power of the load is constant and varying the reactive power.

**Table 4.1.** Simulation result without STATCOM for RL load with constant active load power.

Sr N O.	Load values P(KW),( QVAR)	Ps (K W)	Qs (VAR)	V <sub>lo ad</sub> (K V)	Pr (K W)	Qr (VA R)
1.	5, 1000	203.9	200.0*10 <sup>3</sup>	10.9	4.9	994.1
2.	5, 500	203.9	199.6*10 <sup>3</sup>	10.9	4.9	497.1
3.	5, 200	203.9	199.3*10 <sup>3</sup>	10.9	4.9	198.8
4.	5, 100	203.9	199.2*10 <sup>3</sup>	10.9	4.9	99.41

From the Table 4.1, in the first reading, the load is set to absorb 5 KW real and 1000 VARs reactive power at the voltage of 11 KV. It has been observed that the source is supplying real power of 203.9 KW and 200\*10<sup>3</sup>. VARs inductive reactive power but the load is consuming 4.9 KW of real power and 994.1 VARs of inductive reactive power. The receiving end voltage has also been reduced

to 10.9 KV from 11 KV. Hence the remaining real and reactive power is absorb by the transmission line. From the above table it is conclude that the receiving end active power is approximately equal to the respective load power with no change in sending and receiving end active power as no active power of the load changed.

Hence Here P<sub>s</sub> and Q<sub>s</sub> represent sending end real and reactive power respectively. P<sub>r</sub> and Q<sub>r</sub> represent receiving end real and reactive power. V<sub>load</sub> represents RMS voltage across the load.

**4.1. Case B :** Keeping reactive power of the load is constant and varying the active power.

**Table 4.2.** Simulation result without STATCOM with constant reactive load power.

Sr N O.	Load values P(KW),Q( VAR)	Ps (K W)	Qs (VAR )	V <sub>l oa d</sub> (K V)	p <sub>r</sub> (K W)	Q <sub>r</sub> (VAR)
1.	5, 100	203.9	199.9*10 <sup>3</sup>	10.9	4.9	99.41
2.	10, 100	208.8	199.2*10 <sup>3</sup>	10.9	9.9	99.41
3.	15, 100	213.8	199.2*10 <sup>3</sup>	10.9	14.9	99.41
4.	20, 100	218.8	199.2*10 <sup>3</sup>	10.9	19.8	99.41

From the Table 4.2, in the first reading, the load is set to absorb 5 KW real and 100 VARs reactive power at the voltage of 11 KV. It has been observed that the source is supplying real power of 203.9 KW and  $199.9 \times 10^3$  VARs inductive reactive power but the load is consuming 4.9 KW of real power and 99.4 VARs of inductive reactive power. The receiving end voltage has also been reduced to 10.9 KV from 11 KV. Hence the remaining real and reactive power is absorbed by the transmission line. From the above table it is concluded that the receiving end reactive power is approximately equal to the respective load inductive reactive power with no change in sending and receiving end reactive power for all readings as no reactive power of the load changed. It is also observed that when the load reactive power is reduced, the sending end real and reactive power is reduced and the load real power is increased. Hence Here  $P_s$  and  $Q_s$  represent sending end real and reactive power respectively.  $P_r$  and  $Q_r$  represent receiving end real and reactive power.  $V_{load}$  represents RMS voltage across the load.

#### 4.2. Transmission line with STATCOM

The effect of STATCOM on the performance of a power system with RL series and RC Load is studied under MATLAB-SIMULINK environment. The real and reactive power flow in the line as well as in the load are

observed without STATCOM. The variations of power flow after the introduction of the STATCOM is noted. A PI-based controller is designed for the STATCOM and then its performance is studied using MATLAB/SIMULINK. The real and reactive power flow of the models are analyzed. The power flow with the STATCOM is compared with the power system model without connecting STATCOM and thus its performance is evaluated

The modelling of STATCOM with power system is done by using the Simpower systems toolboxes in MATLAB /SIMULINK. The modelling is done by connecting a three phase source and RL load through a transmission line. The AC voltage at source is maintained at 11KV and the frequency is 50Hz. The load voltage and phase angles are varied and the real and reactive power flow in the bus are observed. Using the active and the reactive power blocks available in Simpower system, the real and the reactive power flow through the line are measured at both the ends. The MATLAB/Simulink diagram of the power system is shown in Figure The simulink diagram of a power system has AC source, load, transmission line and measurement blocks. The source is of 3 phase, 11KV and 50 Hz AC supply. The load is RL which has 5KW real and 100VAR inductive reactive power at 11KV AC. The transmission line is of 200km length.

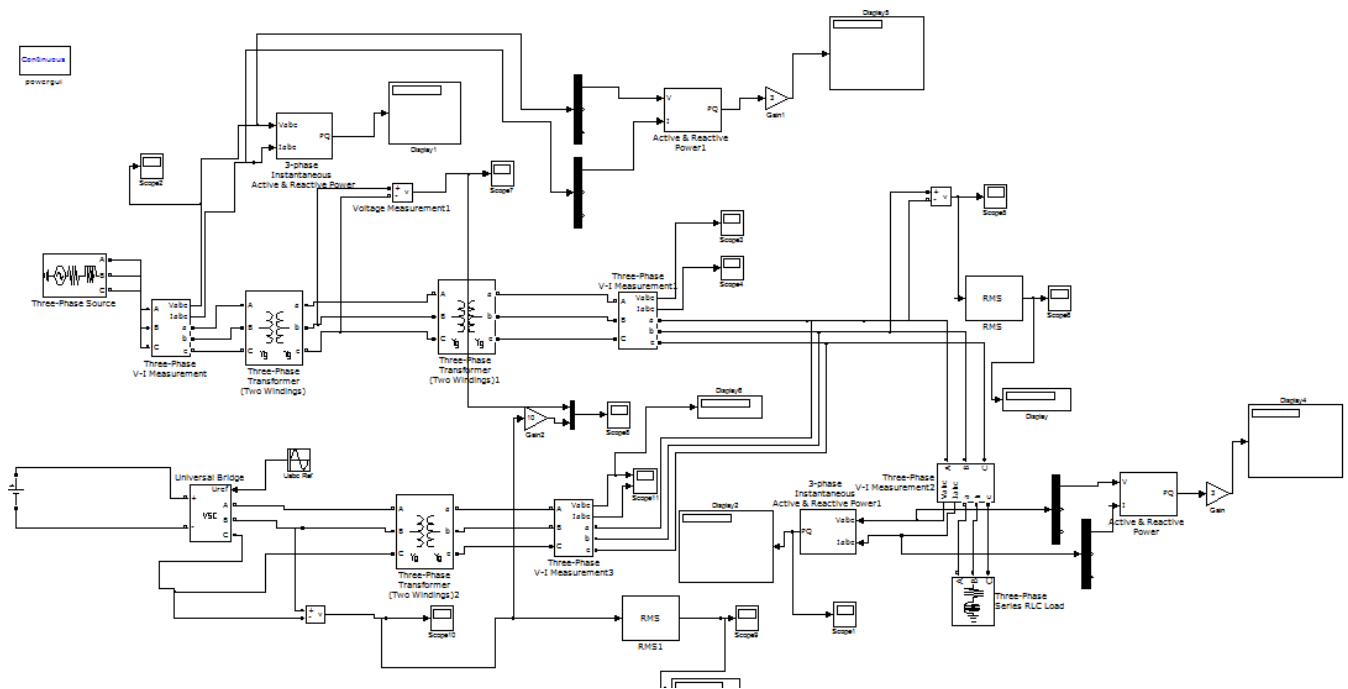
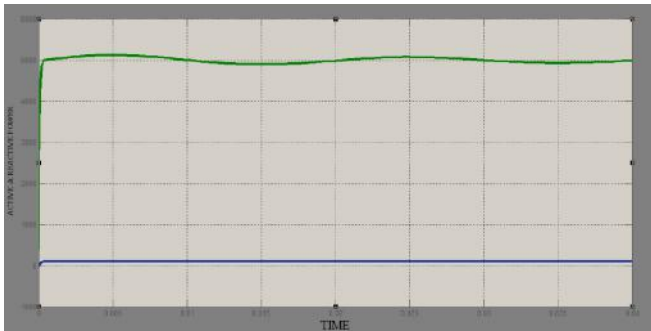


Figure 5. Transmission line with STATCOM, MATLAB/ SIMULINK

**Table 4.3** Simulation result with STATCOM for RL load with constant active and reactive load power.

Sr.no.	V dc (KV)	Load value P(KW),Q(VAR)	P <sub>R</sub> (KW)	Q <sub>R</sub> (VAR)
1.	2	5, 100	5	99.84
2.	4	5, 100	14	282.6
3.	6	5, 100	29.8	596.3
4.	10	5, 100	75	1509



**Figure 6.** Active and Reactive power at load side

The real and reactive power generated or absorbed by the voltage sourced converter can be controlled independently, provided that the VSC is connected to a DC storage battery, DC voltage source or another VSC instead a DC capacitor. The real power that is being exchanged by the transmission system must be supplied or absorbed at its DC terminals by the DC energy storage or any other previously mentioned device. In contrast, the reactive power exchange is internally generated or absorbed by the VSC without the DC energy storage device. The converter simply interconnects the three-AC Terminals in such a way so that the "reactive" current can flow in either direction. The principle of operation of VSC based STATCOM depends on the control strategy for regulating the interchange of power between the converter/inverter circuit and the grid and it depends also on the output AC voltage of the converter/inverter circuit. If the magnitude of the voltage of the converter is equal to the voltage of the grid .  $V_{sh} = V_{bus}$  , the interchange of reactive power between the STATCOM and the grid is equal to zero. In contrast, if the voltage of the converter is less than the grid voltage at point of common connection (PCC),  $V_{sh} < V_{bus}$  the STATCOM absorbs reactive power (draws lagging current).

However, if the STATCOM controlled happens to be in such a way that the output voltage of the converter is higher than the grid voltage at PCC,  $V_{sh} > V_{bus}$  reactive power is injected into the grid. Also, note that the capacity for injecting reactive power into the grid is limited by the maximum voltage and the maximum current allowed by the semiconductors.

**B. Restriction of Operation**

1. In a STATCOM, the maximum reactive power that can be supplied to the grid depends on the maximum voltage and current permitted by the power semiconductor, so it is necessary to include the following restriction. The VSC output voltage must fall within the allowed limits of operation:

$$V_{sh}^{min} \leq V_{sh} \leq V_{sh}^{max}$$

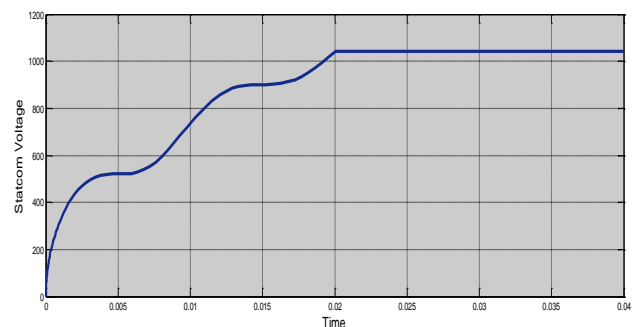
Where  $V_{sh}^{max}$  is the maximum voltage rating of the STATCOM .

While  $V_{sh}^{min}$  is the minimal voltage limit of the STATCOM.

2. The current flowing through a STATCOM  $I_{sh}$  , must be less than the current rating: that is  $I_{sh} < I_{sh}^{max}$  . Where  $I_{sh}^{max}$  is the current rating of the STATCOM converter while  $I_{sh}$  is the magnitude of current through the STATCOM and given by

$$I_{sh} = \frac{V_{bus} - V_{sh}}{Z_{sh}}$$

In contrast, it is necessary to include external restriction of the grid voltage at the PCC. According to the specific regulation of the grid operator, the grid voltage at the PCC must be within certain allowed limits.  $V_{bus}^{min} < V_{bus} < V_{bus}^{max}$



**Figure 7.** Output voltage of STATCOM

Figure 7 shows the output voltage characteristic of STATCOM. A simulink model of the STATCOM based on the VSC is designed. 'RL' load is connected to the power system. The STATCOM is connected at the load side of the transmission line. The results are taken in the power system model with and without the STATCOM for RL load. The readings are taken for with and without the STATCOM.

## V. CONCLUSION

The STATCOM is a shunt device used in improving the bus voltage profile. It is commonly used to maintain a constant voltage across ac transmission lines and also serve as automatic reactive power control. The MATLAB/SIMULINK environment was used to simulate a model of power system with STATCOM connected to an interconnected power system. The control and performance of STATCOM intended for installation on a transmission line for power quality improvement is presented.

The STATCOM dynamic response is very fast (in millisecond) and able to pass from capacitive mode of operation to an inductive one in a few cycles. When the source voltage decreases, the STATCOM reacts by generating reactive power, so the DC voltage increases; this is the capacitive mode. On the other hand, when the AC voltage increases, the STATCOM reacts by absorbing the reactive power, so the DC voltage decreased. This is the inductive mode. Simulation results show the effectiveness of STATCOM for regulating bus voltage and control reactive power flow through the line.

## VI. ACKNOWLEDGMENT

The authors would like to thanks Dr. Irfan Ahmed, Anjuman college of engineering and technology MH., India, for their Valuable suggestions regarding for FACTS controllers.

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## Segmentation of Human Body Image

**Prof. T. R. Harinkhede, P. R. Girhepunje, S. S. Dekate, D. S. Dable, A. R. Pawar, A. P. Korde,  
R. P. Yenurkar, D. D. Ganvir**

Department of ETC, RTMNU, SRMCEW, Nagpur, Maharashtra, India

### ABSTRACT

Human body image segmentation is a difficult process that can use in important application, like scene understanding and activity recognition. In order to deal with the highly dimensional pose space, scene complexity, and various human appearances, the majority of have being works require computationally composite training and template matching processes. We have to converse a bottom-up methodology for segmentation of human bodies from single images, in the case of almost upright poses in cluttered environments. The position, dimensions, and colour of the face are used for the localization of the human body, construction of the models for the upper and lower body according to anthropometric constraints, and approximation of the skin colour. Different levels of segmentation granularity are combined to extract the pose with highest ability. The segments that belong to the human body arise through the joint approximation of the upper and lower during the body part search phases, which make easy the need for exact shape matching.

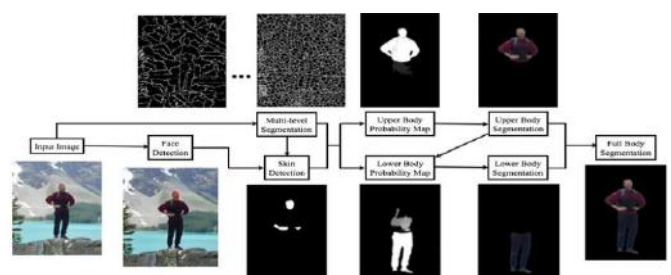
**Keywords :** Adaptive Skin Detection, Anthropometric Constraints, Human Body Segmentation, And Multilevel Image Segmentation

### I. INTRODUCTION

Knowledge about the human body parts can benefit various tasks, such as determination of the human layout, recognition of actions from static images, and sign language recognition. Human body segmentation and silhouette extraction have been a common practice when videos are available in controlled environments, where background information is available, and motion can aid the segmentation through background subtraction. In static images, however, there are no such cues, and the problem of silhouette extraction is much more challenging, especially when we are considering complex cases. In this study, We decompose the problem into three sequential problems: Face detection, upper body segmentation, and lower body segmentation, since there is a direct pair wise correlation among them. Face detection provides a strong indication about the presence of humans in an image, greatly reduces the

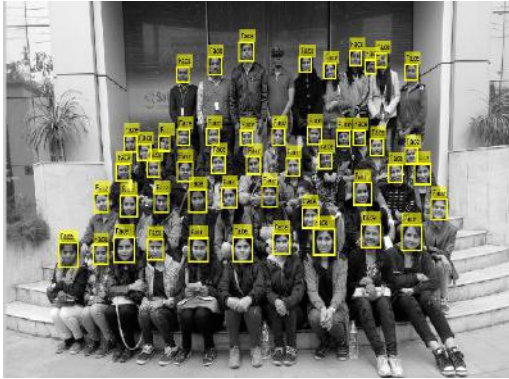
search space for the upper body, and provides information about skin colour. This information guides the search for the upper body, which in turns leads the search for the lower body. Moreover, upper body extraction provides additional information about the position of the hands, the detection of which is very important for several applications.

### II. WORKING METHODOLOGY



**Figure 1.** Overview of the methodology.

Figure1 shows overall working method However, we make some assumptions about the human pose, which restrict it from being applicable to unusual poses and when occlusions are strong. In the future, we intend to deal with more complex poses, without necessarily relying on strong pose prior. Problems like missing extreme regions, such as hair, shoes, and gloves can be solved by incorporation of more masks in the search for these parts, but caution should be taken in keeping the computational complexity from rising excessively.



**Figure2.** Face Detection

Face detection guides estimation of anthropometric constraints and appearance of skin, while image segmentation provides the image's structural blocks. The regions with the best probability of belonging to the upper body are selected and the ones that belong to the lower body follow.

### III. RELATED WORK (LITERATURE REVIEW)

“Recovering Human Body Configurations: Combining Segmentation and Recognition” Greg Mori, Xiaofeng Ren, Alexei A. Efros† and Jitendra Malik.

“Estimating Human Shape and Pose from a Single Image” Peng Guan Alexander Weiss Alexandru O. B’alan Michael J. Black Department of Computer Science, Brown University, Providence, RI 02912, USA.

“A Methodology for Extracting Standing Human Bodies From Single Images” Athanasios Tsitsoulis, *Member, IEEE*, and Nikolaos G. Bourbakis, *Fellow, IEEE*

## IV. OBJECTIVE

We give the methodology for segmentation of human bodies from single images. It is a bottom-up combining process that combines information from multiple levels of segmentation in order to discover salient regions with high potential of belonging to the human body. The main component of the system is the face detection step, where we estimate the rough location of the body, construct a rough anthropometric model, and model the skin's color. Soft anthropometric constraints guide an efficient search for the most visible body parts, namely the upper and lower body, avoiding the need for strong prior knowledge, such as the pose of the body. Experiments on a challenging dataset showed that the algorithm can outperform state-of-the-art segmentation algorithms, and cope with various types of standing everyday poses.



**Figure 3.** Various poses of human body

## V. RESULT

Thus we have get and evaluate our algorithm, we used samples from the publicly available INRIA person dataset This is a challenging dataset, since the photos are taken under various illumination conditions, inheavily cluttered environments and people appear in various types of clothing. We estimated the performance of our algorithm in segmenting not occluded persons in images and compared the results with those of five generic algorithms (not designed specifically for human body segmentation): Proposals [11], GrabCut [12], the original version of GraphCut [14], geodesic star convexity (GSC) [13], and random walker (RW) [11].

## VI. DISCUSSION

There remain prevailing complexities of the main steps. One of the important complexities is the complexity of the image segmentation algorithm. Here, we use the proposed Lgorithmic in [17], which has an avera average requires 2.5 s for image size  $481 \times 321$ . Global and adaptive skin detection can be performed in almost real time, so this step is performed quickly, excluding the super pixel creation.Face detection is also fast, since the main step [13] runs in real time and significantly restricts the search space for [16]. The graph matching process described in [15] is generally computationally expensive, but considering that it is only performed on the produced regions of [13], it can be calculated quickly. The most computationally demanding steps are those of mask validation during the upper and lower body extraction processes.ge complexity of  $O(n \log n)$  and on average requires 2.5 s for image size  $481 \times 321$ . Global and adaptive skin detection can be performed in almost real time, so this step is performed quickly, excluding the superpixel creation. Face detection is also fast, since the main step [12] runs in real time and significantly restricts the search space for [15]. The graph matching process described in [16] is generally computationally expensive, but considering that it is only performed on the produced regions of [13], it can be calculated quickly. The most computationally demanding steps are those of mask validation during the upper and lower body extraction processes.

## VII. CONCLUSION

In this study we cover all the algorithms. For segmentation we use SOBEL and KNN and form image from background. For face detect, face detection algorithm. And for upper and lower body segmentation K-MEANS algorithm. we segment whole body by this algorithms. We presented a novel methodology for extracting human bodies from single images. It is a bottom-up approach that

combines information from multiple levels of segmentation in order to discover salient regions with high potential of belonging to the human body. The main component of the system is the face detection step, where we estimate the rough location of the body, construct a rough anthropometric model, and model the skin's color. Soft anthropometric constraints guide an efficient search for the most visible body parts, namely the upper and lower body, avoiding the need for strong prior knowledge, such as the pose of the body. In the future, we intend to deal with more complex poses, without necessarily relying on strong pose prior. Problems like missing extreme regions, such as hair, shoes, and gloves can be solved by incorporation of more masks in the search for these parts, but caution should be taken in keeping the computational complexity from rising excessively. And research to detect twins, also increases more reliability for security application.

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- 338 *IEEE TRANSACTIONS ON HUMAN-MACHINE SYSTEMS*, VOL. 45, NO. 3, JUNE 2015



## Smart Driving License Issuing Test for Smart City

Pranay Burade, Akshay Dohe, Ankita Jaiswal, Radha Gaikwad, Prachi Motghare, Prof. V. N. Mahawadiwar  
Department of Electronics, KDKCE, Nagpur, Maharashtra, India

### ABSTRACT

To prevent illegal licenses and therefore causing accidents, a new automated system is proposed. This system can be implemented using Bayesian logic classification algorithm and feature extraction algorithm. The proposed system need to design the wireless sensor network and also the multi sensor fusion based detection approach for detecting result. The map management is also needed to compare the test data from Global Positioning System with reference data & also manipulate speed of the vehicle. Mapping and multi fusion sensor combination transmission is done using remote server. The Bayesian classification algorithm is implemented with data mining for result. GPRS is used as a gateway. The proposed system is the elimination process of existing process to issue Indian driving license. For this the applicant will be allotted the test vehicle for test drive with the number of sensors connected embedded in vehicle sending data using wireless sensor network to remote server to get processed. Result analysis is done by comparing the received data with previous data.

**Keywords:** GPS, Data Mining, Map Matching, Multi Sensor Fusion –Based Detection Approach, GPRS module.

### I. INTRODUCTION

A driving license is an official document certifying that the holder is suitably qualified to drive a motor vehicle. One person is dying in road accident in every 30 seconds because of ineligible drivers with illegal license. 30% of Indian driving population have a fraudulent License according to 2015-16 reports of the Transport Ministry. So it is very important to disassociate the driving ability test from the licensing authority.

The proposed work is thus the elimination process of existing scenario to issue Indian driving license. For this the applicant will be allotted the test vehicle for test drive with the number of sensors connected embedded in vehicle sending data using wireless sensor network to remote server to get processed. Result analysis is done by comparing the received data with previous data. Bayesian algorithm is used for decision making by comparing data from sensors. The sensors used are Gyro sensor to define coordinates in terms of longitude and latitude of a test vehicle. While RPM sensor is used to sense and measure speed at every angle of test vehicle. Wireless sensor network includes Global Positioning

System (GPS) and GSM/GPRS device. GPS provide data for mapping, receives X, Y, Z coordinates according to position of a vehicle. GSM/GPRS is used as a gateway.

Map management includes map matching using grey scale and pattern matching. Data mining is used to filter data & the camera is used for monitoring. The Software required for proposed work is, .Net for visual data, while MS ACCESS for back end application. The software is designed for front end and back end separately.

### II. Research Methodology

The block diagram of hardware design for proposed work is as shown in Fig 1.

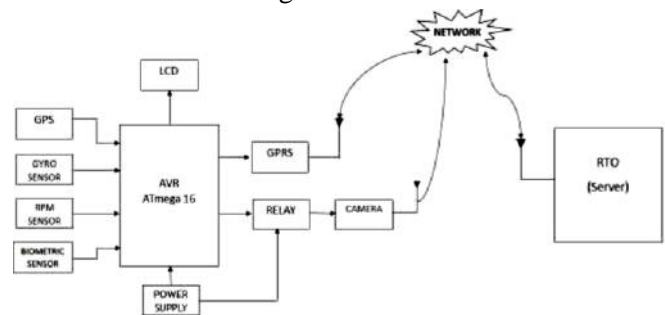
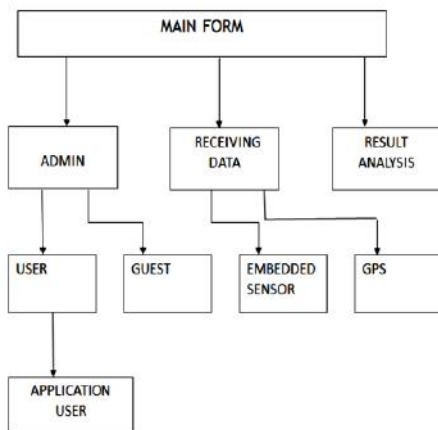


Figure. 1: Hardware architecture

The block diagram of software design of proposed work is as shown in Fig. 2, below



**Figure 2.** Software architecture

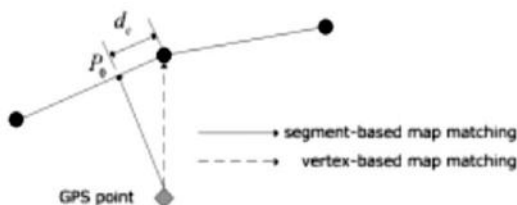
The software architecture is design to manipulate following task & algorithm:

1) Multi Sensor Fusion Method using Dynamic Bayesian Network:

Multi-sensor fusion strategy is a novel road matching method to support real-time navigational features within advanced driving-assistance systems. Managing multi hypotheses is a useful strategy for the road-matching problem. The multisensor fusion and multi-modal estimation are implemented using Dynamic Bayesian Network.

2) Map Matching Algorithm of GPS Data

Many map matching algorithms have been introduced to match GPS points to a digital map previously. But there was short polling time intervals (about 1 second) of the GPS data. The map matching algorithms of such studies are not appropriate for the GPS data with relatively long polling time intervals (about 2~5 m)



**Figure 3:** Vertex-based and Segment-based Map Matching

3) Result analysis of receiving data and previous Data

Bayesian Theorem is a means of quantifying uncertainty. Based on probability theory, the theorem leads to a number representing the degree of probability that the hypothesis is true. To demonstrate an application of Bayesian theorem can be given by

$$p(A|B) = p\{A + B\}/p\{B\}$$

**III. RESULTS AND DISCUSSION**

In Receiver side Finger Print Sensor is used to detect the entry of the candidate. For the first time the candidate details like name, address, enrolment ID are entered at the server manually. Then the next times the candidate details are generated automatically.

**IV. CONCLUSION**

The proposed automated driving license test is advantageous over existing manual test. It not only promises the accuracy in driving ability test but also disassociate the test from licensing authority. Hence, it will reduce the manpower and there will be reduction in number of road accidents due to illegal licenses.

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## Live Energy Meter and Tempered Detection using Zigbee

**Rinku Nandagawali, Pranjali Bagde, Aashana Meshram, Pooja Dangi, Amar Banmare**

Electronics and Telecommunication Engineering, GNIET, Nagpur, Maharashtra, India

### ABSTRACT

Smart energy meter is the requirement of today's market. Zigbee system is utilized in today's smart system as a communication protocol due to advantages of high speed data rate and lower power consumption and cost. In this paper the remote wireless energy meter reading system is proposed. The aim of the system is to resolve the short comings of the traditional energy meter by combining the characteristics of the Zigbee technology and IEEE802.15.4 standard with AVR Microcontroller ATmega16. The hardware implementation was designed, and then analyzed the use cases for Energy Meter. This paper also focuses on implementation and analysis of the function of energy meter.

**Keywords:** AVR, IEEE802.15.4, ZigBee, AMI, AMR, RF, GSM, GPRS

### I. INTRODUCTION

The automatic metering system is designed to make the prevailing electricity billing system simpler and efficient. The conventional metering system is done manually. An employee of the Electricity Board will be coming to take the reading and enter in the card. There are more chances of manual error, delay in processing, tampering of the meter and misuse of the Electricity by other sources. It requires so many workers, one set of workers to note down the reading and other set to cut the power if the payment is not paid at the right time and we have very poor servicing. The system is installed at the site of a standard utility meter and is configured for monitoring and operation by a user via keyword command programming on a data terminal or personal computer. In the Automatic System designed, the units consumed are measured at the consumer side in the form of pulses, it transmitted to the Electricity Board side where the units consumed and amount equivalent is calculated. The monetary values are displayed both at the consumer module and electricity board side. In this paper [1]

they describe automatic meter reading based on zigbee.

### II. LITERATURE SURVEY

ZigBee is a new global standard for wireless communications with the characteristics of low-cost, low power consumption, and low data rate. It has a good market in wireless meter reading. The design and implementation of a ZigBee-based wireless automatic meter reading system are proposed in this paper. The experimental results show that the design can meet the basic needs of automatic meter reading with flexibility and expansibility. It can act as a platform of wireless monitor system and supplies a new hardware design approach for wireless ZigBee networks.

With the rapid development of automation and measuring techniques, automatic recording of the data.

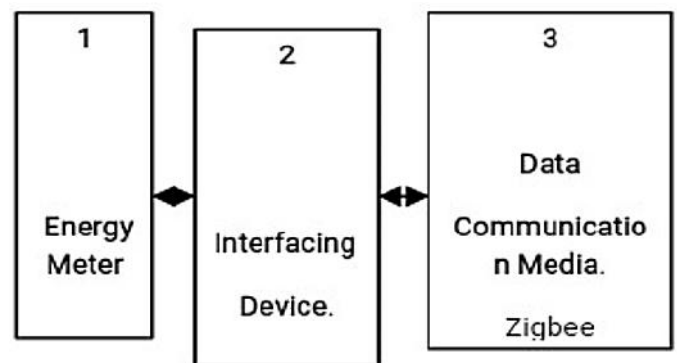
In the meter reading instrument has gradually become the target of people whose working, living, and home conditions are of increasingly high level of intelligence. Meanwhile, utilities also hope that the development of new technologies to solve the



problems they encountered in the practical work about cumbersome meter reading and no reliable protection of accuracy and real time; and enable both user friendly and improving public sector efficiency and management level. Existing wire-line meter reading system has a large number of risks. Wires are more complex, detrimental to adjustment and maintenance of the system. The long-term indoor and outdoor installation easily leads to aging, resulting in a risk of short circuit and breakage. For these reasons, it has become the industry very unresolved problem to design a remote meter reading system, with long-term reliance and convenient installation & maintenance, which not only read data automatically but also monitor operation status. With the development of wireless communication technology, in recent years there comes requirement for low cost equipment of wireless networking technology, called ZigBee. It is a short range, low-complexity, low cost, low power consumption, low data rate two-way wireless communication technology with high network capacity, short time delay, safety and reliance. Its main application areas include industrial controls, consumer electronics, car automation, agricultural automation, and medical equipment control. The core of this technology is established by IEEE 802.15.4 Working Group, and the ZigBee Alliance founded in 2002 is responsible for high-level applications, interoperability testing, and marketing. Till now, the ZigBee Alliance has reached over 150 members of famous companies in the world including IBM, Ember, Mitsubishi, Motorola, and Philips, etc. Many semiconductor companies are targeting the ZigBee market. Since the standards were launched not long ago, chips in line with protocol have been available of multi-chip solution and single-chip solution. It can be expected that ZigBee will have comprehensive applications in the field of automation. The main methods of metering at home and abroad are: manual meter reading, IC Card prepaid meter, wire-line and wireless meter reading system. Manual meter reading has been for decades, but with the implementation of one home one meter, drawbacks of this method of reading are

more and more, like difficult entrance to home, low efficiency of fee settlement, etc. In this paper [4] they describe development of a smart power meter for AMI based on zigbee communication.

AMR stands for Automatic Meter Reading. A device which remotely obtain meter readings and transmits this data to the system's computer via communication media such as phone lines, power lines, GSM, or dedicated cables for processing. AMR devices can detect outages, remotely connect and disconnect services, detects tampering as well as other uses. Economic benefits include increased cash flow, lower labor and equipment cost, increased accuracy and lower costs. Some customer satisfaction benefits include improved service quality, more customer choices and faster response time. A typical Automatic Meter Reading (AMR) set up can be conceptualized using the following block diagram. In this paper [2] they describe design and implementation of wireless AMR system.



**Figure 1.** Block Diagram Of ARM System

Energy meter is a device which is used to measure the energy consumed by the customer. Basically energy meter is of two types Electro-Mechanical meter and Digital meter. Now a days digital meter are used because they are having high accuracy, with limited control and theft detection capability at nodes.

1. Interfacing Device: It is a device which takes out readings from meter and passes those readings to the remote pc through communication media. It also consists of a

circuit which can switch ON/OFF power supply of customer.

2. Data Communication Media: For transporting the data from the energy meter to the Host PC a communication media is necessary. Communication can be done by two ways., Wired Communication: power lines, phone lines, dedicated lines. Wireless Communication: RF, GSM, GPRS. Service provider can use any communication media depending upon the services available to the service provider.
3. Remote PC with compatible software: The heart of the meter reading station is the Meter Reading Software which resides in the PC at the Meter Reading Station. It is a standalone system which is responsible for collecting meter reading, storing them to the data base, calculation of bills, switching ON/OFF of power supply, and providing analysis facility.

### III. CONCLUSION

This device will obtain meter readings and transmits this data to the system's computer via communication media such as Zig Bee (RF communication module) or dedicated cables for processing. AMR devices can detect outages, remotely connect and disconnect services, detects tampering as well as other uses. Economic benefits include increased cash flow, lower labor and equipment cost, increased accuracy and lower costs. Some customer satisfaction benefits include improved service quality, more customer choices and faster response time.

In future this can include events alarms such as tamper, leak detection, low battery, or reverse flow. Many AMR devices can also capture interval data, and log meter events. The logged data can be used to collect or control time of use or rate of use data that can be used for water or energy usage profiling, time of use billing, demand forecasting, demand response, rate of flow recording, (leak detection, flow monitoring, water and energy conservation enforcement, remote shutoff, etc. The meters in an

AMI system are often referred to as smart meters, since they often can use collected data based on programmed logic.

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# Disease Diagnosis Using RBCs & WBCs Cell Structure by Image Processing

**Prof. Hina Malik, Roopali Randiwe, Jyotsna Patankar, Priya Bhure**

Department of Electronics and Telecommunication, SRMCEW, Nagpur, Maharashtra, India

## ABSTRACT

The human blood consists of the RBCs, WBCs, Platelets and Plasma. The complete blood count defines the state of health. Blood is a health indicator therefore segmentation and identification of blood cells is very important. Complete Blood Count (CBC) includes counting of all the cells which determines person's health. The RBC and WBC count is very important to diagnose various diseases such as anemia, leukemia, tissue damage, etc. Old conventional method used in the hospital laboratories involves manual counting of blood cells using device called Hemocytometer and microscope. But this method extremely monotonous, laborious, time consuming, and leads to the inaccurate results due to human errors. Also there are some expensive machines like Analyzer, which are not affordable by every laboratory. The objective of this paper is to produce a survey on an image processing based system that can automatically detect and count the number of RBCs and WBCs in the blood sample image. Image Acquisition, Pre-Processing, Image Enhancement, Image Segmentation, Image Post-Processing and Counting algorithm these are six steps involved in an image processing algorithm. The objective of this research is to diagnosed the different diseases of the blood cells.

**Keywords:** RBC, WBC, Platelets, Digital Image Processing, Morphology, Hough Transform.

## I. INTRODUCTION

The complete blood count (CBC) is the blood test used to evaluate the health of person and to detect the disorders like anemia, infection and leukemia. In medical diagnosis Complete blood count is very important. There are mainly four categories of cells. Red Blood Cells (RBCs), White Blood Cells (WBCs), Platelets and Plasma. These groups can be differentiated using texture, color, size, and morphology of nucleus and cytoplasm. Cells count is important to determine the immunity and capability of the body system. The abnormal count of cells indicates the presence of disease and person needs medical help. Current research is on an implementation of image processing based automated counting of RBCs and WBCs from blood image. WBCs are also called leukocytes. These cells are an important part of immune system. These protect body by removing viruses and bacteria in a body. Medical term use to describe low count is Leukopenia. Leukopenia indicates the presence of infection. Medical

term use to describe high count is Leukocytosis. Leukocytosis indicates an existence of infection, leukemia or tissue damage. RBCs are also known as erythrocytes. The function of RBC is to carry oxygen and collects carbon dioxide from a lung to the cells of body. They contain protein called hemoglobin. The presence of inner and outer layers of protein gives red color to blood. Hemoglobin do the work of carrying oxygen. An abnormal count of RBCs leads to anemia which results in mental tiredness, illness, weakness, dizziness. If it is not treated immediately it results into more serious symptoms like malnutrition and leukemia. RBC indices give information about size and shape of cells and are also useful in differentiating types of anemia. Platelets are also called as thrombocytes. The function of the platelets is to stop bleeding by clumping and clotting blood vessel injuries. A low platelet count is called thrombocytopenia. It avoids blood clotting and causes a person to bleed. High platelet count is called thrombocytosis. It clots blood inside blood vessel and

stops blood from flowing properly. Therefore for proper blood flow platelets count must be in normal range.

## II. METHODS AND MATERIAL

### A. Literature Review

Diagnosis method is a tourniquet test which has sensitivity 33.5-34%, specificity 84-91%, and positive predictive values 85-90% and negative predictive values 32.5-34%. This testing has low sensitivity and relatively little value to the diagnosis of suspected dengue[7].

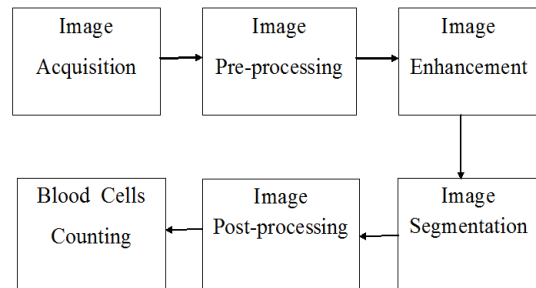
Previous research used image processing and image segmentation methods to classify white blood cells based on the edges of cells. The focus is selection of feature extraction and classification method. Alfred R. J. Katz [8] did a research for classification of five major types of white blood cells. The best accurate technique for classification of supervised learning is a neural network technique.

Ms. Mina I. D. Joshi, Prof. Atul H. Karode, and Prof. S. R. Suralkar [9] did a research and studied white blood cell detection and classification of acute Leukemia by image of blood cells. And classification using a K-nearest neighbour (kNN), with 93% of accuracy. Monica Madhukar and colleagues [10] research decision support tools for the classification of acute lymphoblastic leukemia. They used K-means Clustering techniques of the Lab color model for image segmentation at accuracy 93.5%. A white blood cells classification was done using image processing to apply the detection of dengue virus.

### B. Objectives

We implement low cost disease diagnosis method using RBC & WBC cell structure. To detect the cell structure we use Hough transform algorithm in which the purpose of this technique is to find imperfect instances of objects within a certain class of shapes. The classical Hough transform was concerned with the identification of lines in the image. But, later the Hough transform has been extended to identifying positions of arbitrary shapes, most commonly circles or ellipses. We use Sobel algorithm for segmentation. This algorithm is used to separate object from background. For the result we use K-means clustering for data base comparison.

### C. Proposed Work



**Figure 1.** Block Diagram of Blood Cells Counting

### D. Working

As shown in above fig. there are six major steps involved in blood cells estimation.

#### 1. Image Acquisition

Image acquisition acquires digital images of blood samples in either .jpeg or .png format. These images are in RGB color plane. These are microscopic images that are obtained from hospitals or from laboratories using digital microscopes or using a digital camera placed at the eye piece of a microscope. Images are also available on online medical library. To examine the RBCs and WBCs stained blood images may be captured with the help of thin glass slides and Digital microscope. Giesma stained thin blood film image should be taken so that platelets, RBCs and WBCs can be easily distinguished. In order to differentiate RBCs from WBCs and Platelets, RBCs are less stained as compared to WBCs and platelets leaving a bright patch with intensity value similar to background value. These images are digital images in either .jpeg or .png format and are in RGB color plane.

#### 2. Image Pre Processing

It is a technique of adjusting images, improving the quality of image and making them suitable for the next step of process. Image pre-processing usually includes removing noise, contrast enhancing, isolating regions and use of different color models grayscale image and HSV image, Binarization. Grayscale represents the intensity of the image.

As acquired images have low contrast and due to clustered white blood cells noise get included. To overcome and reduce these effects contrast enhancement is done. After contrast stretching image is converted into grayscale, noise get added into resultant image is salt n

paper noise. Also at the time of capturing the microscopic blood images noise get added into it, Median filtering is used to remove noise. After observing various sample images it was found that median filter would be the best noise removal filter.

### 3. Image Enhancement

Enhancement techniques improves the quality, contrast and brightness characteristics of an image, also sharpen its details. Histogram plotting, histogram equalization, image negation, image subtraction and filtering techniques, etc. are basic Image enhancement techniques.

To enhance the image, its contrast is adjusted by plotting its histogram. In canny edge detection and connected component labeling is used as image enhancement techniques. The goal of edge detection is to extract the important features like line, corners, curves etc. from the edge of images.

### 4. Image Segmentation

The segmentation is used to separate object from the background. Different segmentation methods are segmentation by using Histogram Thresholding, Otsu Adaptive Thresholding, Global Thresholding, Hough Transform and Watershed transform algorithm, as well as by K- Means Clustering, nucleus segmentation by Gram-Schmidt Orthogonalization and a snake algorithm.

The Circular Hough Transform detects some unnecessary circles due to overlapping, therefore removing one of the overlapping circles and then taking average of the count of both the method provides very accurate results.

Circular Hough transform is a frequently used method for detecting circles in an image, it often suffers from degradation in performance, especially in terms of speed, because of the large amount of edges given by complex background or texture.

### 5. Image Post Processing

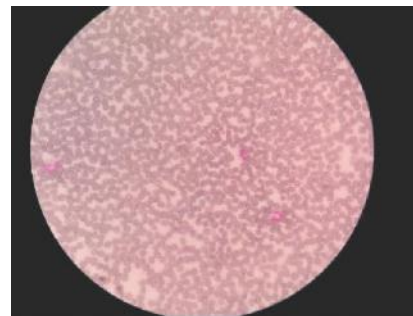
Image post processing includes Feature extraction and morphological operations. Morphology includes dilation, erosion, granulometry and morphological filtering. Closing operation is used to fill the holes and gaps and opening operation is used to smoothen an image. Different types of structuring of elements are

there for dilation and erosion. In the concentric ring is used for dilation and a disk for erosion.

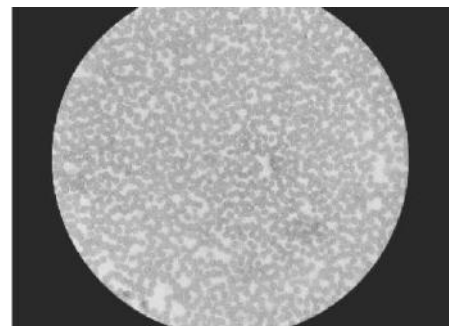
Morphological operations eventually removes platelets and other stained parasites. In author used morphological area closing to lower pixel value image and dilation and area closing to higher pixel value image.

### 6. Blood Cells Counting

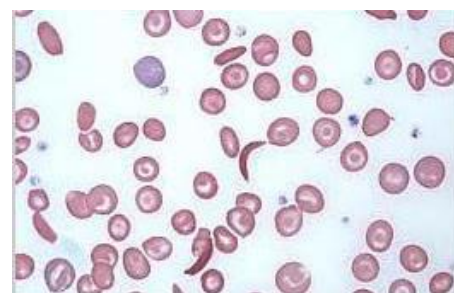
Counting algorithm is applied to measure number of RBCs and WBCs. The most popular method used for counting is connected component labeling. Counting of RBCs and WBCs is done by finding number of connected components in segmented image. It labels the connected objects in an image used these labels for the subsequent feature extraction procedure. CHT is also a popular method for counting RBCs in an image. CHT counts number of circular objects i.e. RBCs in an image.



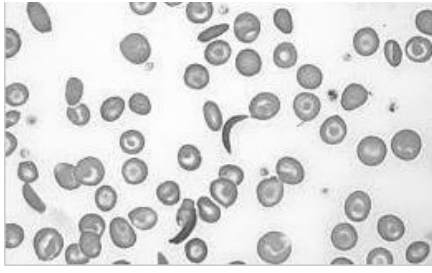
**Figure 2.** The original image of red blood cell



**Figure 3.** The gray scale image of red blood cell



**Figure 3.** RGB color image of sickle cell

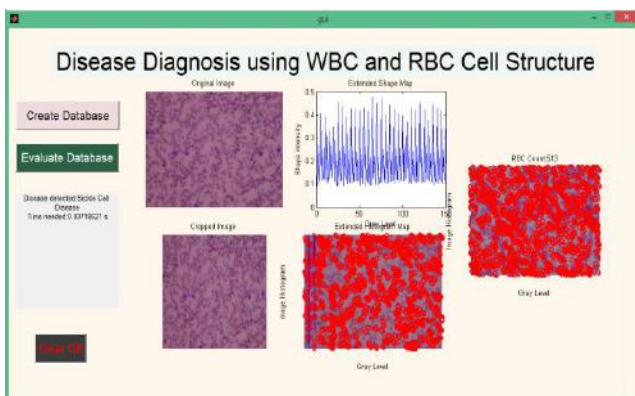


**Figure 5.** Gray scale image of sickle cell

As the above fig.4 shows the RGB color image of sickle cell and fig.5 shows gray scale image of sickle cell. Digital Image Processing provides various techniques for the identification of shape, edge and size of cells present in blood. This method deals with designing an automated system for detecting the shape of deformed blood cells within seconds with higher accuracy. The highest, lowest and mean distance from centre of mass of the blood cell to its perimeter is calculated. These parameters confirm whether the blood cell is circular or sickle shaped. The effectiveness of an automatic image processing method to detect normal red blood cells (RBCs) by peripheral blood smear microscope image. When single RBCs were extracted from sickle RBCs component, its blood cell images were analysed.

### III. RESULTS AND DISCUSSION

In this project various diseases are diagnosed using RBCs and WBCs cell structure by image processing with the help of hough transform, K-mean clustering, morphological. In this method we calculated RBCs in the blood cell of image by applying hough transform to detect the circles of RBCs i.e. RBC count is 513.



**Figure 6.** Disease diagnosis method to detect disease.

As the above fig.4 shows the sickle cell disease is detected within 0.03718 seconds and as shown in the

fig.4 the histogram graph shows the shape of intensity and the gray level in the blood sample image. In this method we used the required 600x800 image size and the main feature is it runs in real time. In old conventional methods costly machines like Analyzer, which are unaffordable by every laboratories. Therefore this method is less expensive and calculated cell count and diagnosis disease quickly.

### IV. CONCLUSION

Image processing techniques are helpful for cell counting and reduce the time of cell counting and disease diagnosis effectively. Proper recognition of cell is important for cell counting. According to this detects the disease and diagnosis. Using this method detect and diagnosis the disease in less time consuming, no used of chemicals, no human error, and easily diagnosis. The accuracy of the algorithm depends on camera used, size of cells, whether or not cell touching and illumination condition.

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# Survey of Industrial Automation Systems for Material Handling and Packaging

**Yogesh M. Motey, Rupali V Bhange**

Department of Electronic and Telecommunication Engineering, RTMNU, Nagpur, Maharashtra, India

## ABSTRACT

Today, Industrial automation programming and design is based on PLCs. After forty years of PLCs introduction, they are still the most prevalent implementation platform for automation systems in many industries. In 1992, IEC 61131 standard in PLC was introduced, which reduces the number of languages available on PLC platform. However, it is difficult to develop complex distributed control system by using tool available in IEC 61131. This paper proposes to introduce new software and methodological tools yet available in industry and research to build control applications. This allows the synthesis of the controller for controlled system's behaviour and its specification.

**Keywords:** IEC 61131, automation, PLC.

## I. INTRODUCTION

Today, most of programming of automation systems is based on the International Electro technical Commission (IEC) 61131 standard but this standard does not meet OOP requirements while making programming of large distributed systems hence it quite difficult to program. To overcome this deficiency the standard is currently being revised. The IEC 61131 already contains simple class concept, the FB which has an internal state, used to a routine manipulating this state, and it may be instantiated several times. So extending the existing functional block with the help of object oriented features is a natural path of introducing object orientation in the IEC 61131. This is the path that the current working draft of IEC 61131 revision is following adding methods, inheritance and interface abstraction to FB

Object oriented programming has demonstrated its capability in handling complex software development problems and producing flexible and reusable software component. In industrial automation, objects are often related to physical devices built in a specific industrial domain context. Thus, in industrial automation the application of object oriented programming is expected to be more intuitive than it has been in software

engineering. Industrial control systems are not basically generic computer systems, then OOP tools oriented to industrial automation should satisfy the additional requirements, direct access to I/O signals;

Multi-paradigm programming i.e., objects programming should be optional to offer a stepwise and reversible transition to OOP. Object oriented programming should be supported in all languages provided by IEC 61131 so that both textual and graphical languages can be used, the latter being very useful when programming sequences. Real time software requirements are implicit in most of industrial automation. Industrial control systems are usually equipped with real time operative systems, which guarantee the meeting real time constraints from a control engineering point of view.

On the other hand, there exists another IEC standard i.e. the IEC 61499. This standard built on IEC 61131 and on the functional block concept, provides an implementation-independent distributed control standard. One of the main achievements in IEC 61499 standard is that introduction of the event based execution order for program organization unit. Main drawbacks of IEC 61499 standard that is very different from IEC 61131 thus requiring a steep learning curve, it supports

partially OOP and there are few commercial implementations. A huge amount of manpower and money has been spent in industry in order to establish applications using IEC 61131 and this makes difficult to adopt new standards or new paradigms. The main purpose of this paper is the paper is to introduce new software and methodological tools yet available in industry and research to build control application and allow the synthesis of the controller for controlled systems behavior and its specification

## II. METHODS AND MATERIAL

### A. Literature Review

In [1] the automation can be on the same machine level on a production line, or in a whole department where the workers tasks is monitoring, inspection, and maintenance. This paper presented the automation of material handling and packaging in a production line of which this process is done manually in different companies. PLC today are advancing in terms of applicability and capability. The experimental prototype uses a programmable logic controller specifically the Mitsubishi FX 2N 48MR PLC and the electro-mechanical devices. The system works during normal operation and greatly improved the automation processes with the use of the PLC ladder diagram. The wiring and installation procedure are also improved because the PLC input and output devices are assigned with specific addresses, and thus; further simplifies troubleshooting. Cost reduction mainly on the manpower or personnel cost is achieved in this paper. Hence, only one or two personnel are needed for the operation and maintenance with the automated system.

In [2] the paper presents the elaboration of a concept to develop and implement real-time capable industrial automation software that increases the dependability of production automation systems by means of soft sensors. An application example with continuous behaviour as it is a typical character treat of process automation is used to illustrate the initial requirements.

Accordingly, the modelling concept is presented which supports application development and which is supplemented by an implementation approach for standard automation devices, e.g., programmable logic controllers. The paper further comprises an evaluation which adapts the concept for two use cases with discrete behaviour (typical character treat of manufacturing automation) and validates the initially imposed requirements.

In [3], a generalized approach is presented which provides a means for the evaluation of alternative container designs in the transportation of multiple package types of random size and weight between multiple locations. It is assumed that each of the package types are small in comparison to the size of a semi-trailer and resources (such as fork lib, pallets) are available to move moderate sized filled containers (less than 2,000 pounds). The generalized approach is motivated by a case study. The case study demonstrates the effectiveness of the approach. In the case study, there is quantitative justification of the dimensional design of an alternative container design. Furthermore, statistical evidence is provided to support the evolutionary direction of dimensional specifications of semi-trailers purchased in the future.

In [4] Lithography for Advanced Packaging is considered a market with a high potential for growth as it includes many different players along the supply chain. In addition, due to the remaining challenges to solve in the lithography processes for Advanced Packaging, there are huge business opportunities in this area which are driving photolithography equipment demand to meet the requirements in terms of performances and cost. The opportunity to meet the packaging area's lithography needs has driven the entrance of Front-End and Back-End equipment suppliers. This creates a battleground between vendors who crave market share in the Mid-Process space.

In [5] an object oriented approach, the programming language SFC together with a proper way to organize the inputs and outputs of FBs and



supervisory control are proposed to implement industrial automation control systems to meet the new challenges of this field. FBs are assumed to be objects with methods and proper- ties. Methods together with a SFC help to make event-based the execution order of FBs. Moreover, FBs are seen as service providers, according to a service-oriented paradigm. Further- more, it has been shown that supervisory control can be adopted to solve the coordination, in the context of industrial control, of the concurrent behaviour of the several FBs which constitute a typical automation software application. Indeed, the desired behaviour of such an application results to be expressed in terms of desired sequences of events. PNs have been chosen since efficient methodologies are available to apply supervisory control using this formal model and it has been shown that they can be easily implemented on commercial PLCs.

**B. Methodology**

This is a step by step process which corresponds to both input and output peripherals that are needed in programming the ladder diagram. In automation includes the placement of box, filling of materials in box, transferring, checking, and sealing of the final product. The overall design is implemented with the help an experimental prototype.

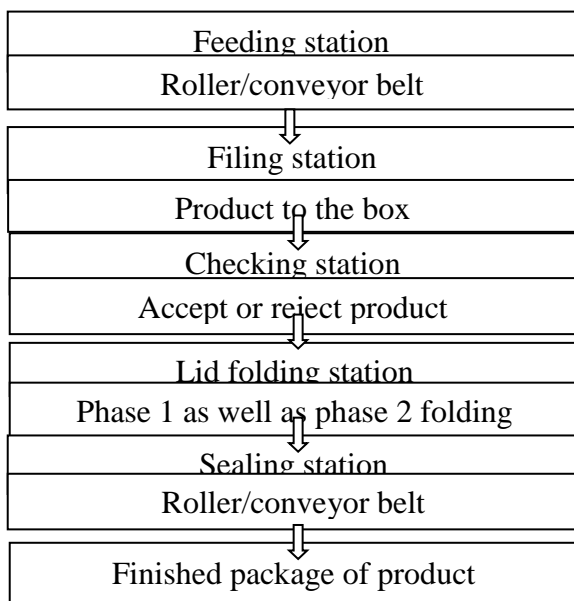


Fig. 1.1 illustrates the process of material handling as well as packaging system which shall be automated by using new processor

Below is the discussion of whole operation which is perform during automation

1. When the start button is pressed then, box shall be push inside the hopper by cylinder 1.
2. Box sensor 1 is provided as to sense the presence of box inside the hopper. When a box is detected, hopper motor start runs, thus; dropping marbles to the box this box is stationary.
3. The correct number of marbles being drop to the box is counted by counting sensor which provide monitor.
4. A load sensor activates as to determine if the loaded box is overload or exact load after the desired numbers of marble balls is dropped. Good items are pushed to the next phase by cylinder 2, while the inside load box and the overload box is pushed away from the line by cylinder 3, then which is to be checked manually.
5. Having a good item box triggers the conveyor 2, to start its operation. The approaching box is monitored by sensor 2 box.
6. When a box is sensed by sensor 2 box then, it shall activate cylinder 4 and folding the lid of the first section of side of box.
7. The second section and lid is folded, when the box moved on the specialized lid folding the obstacle or the box makes progress on the conveyor.
8. Having a partially closed box on a continuous running conveyor, it passes to the sealing station which finishes the packaging process of box. At this station, a cutter and a packaging tape is positioned on a flip type window as to allow the incoming box to pass beneath it.
9. When the flip type window is moved from upward to downward position the tape cutter sensor shall be triggered, this shall turned the tape cutter to move downward via cylinder 5, and cut the tape.

10. Having finished the required task then the system shall point out another process is to be commenced as invoke by the operator.
11. The finished item shall be collected out at the end of the line by person which on duty.

### III. CONCLUSION

Today, software requirements in industrial automation include capability to implement applications involving largely distributed devices, reuse of software components, formal verification that specifications are fulfilled. In this paper, an OOP language approach, that by using this language provides proper way to organize the inputs and outputs of FBs and to meet the new challenges of this field, supervisory control are provides by this proposed to implement industrial automation control systems.

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## Soft Computing Technique and PCA Based Unsupervised Change Detection Method in Multitemporal SAR Images

Shahla Pathan, Pooja Thakre

Department of Electronics (Communication), RTMN University, Nagpur, Maharashtra, India

### ABSTRACT

In order to get the change detection image. An unsupervised change detection algorithm context-sensitive technique multitemporal remote sensing images. Change detection analyze means that according to observations made in different times, the process of defining the change detection occurring in nature or in the state of any objects or the ability of defining the quantity of temporal effects by using multitemporal data sets. There are lots of change detection techniques met in literature. It is possible to group these techniques under two main topics as supervised and unsupervised change detection. While that process is being made, image differencing method is going to be applied to the images by following the procedure of image enhancement. After that, the method of Principal Component Analysis is going to be applied to the difference image obtained. To determine the areas that have and don't have changes, the image is grouped as two parts by Fuzzy C-Means Clustering method. For achieving these processes, firstly the process of image to image registration is completed. As a result of this, the images are being referred to each other. After that, gray scale difference image obtained is partitioned into 3x3 non overlapping blocks. With the method of principal component analysis, eigenvector space is gained and from here, principal components are reached. Finally, feature vector space consisting principal component is partitioned into two clusters using Fuzzy C-Means Clustering and after that change detection process has been done

**Keywords :** Remote sensing, Change detection, Multi-temporal images, K-means

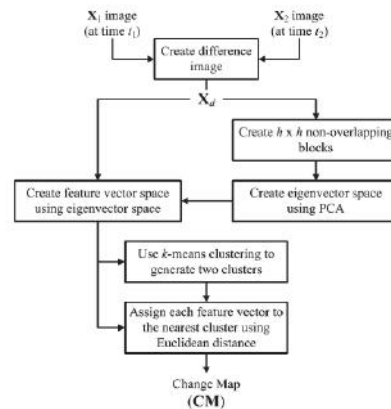
### I. INTRODUCTION

In remote sensing, change detection aims to identify changes occurred on the Earth surface by analysing multitemporal images acquired on the same geographical area at different times (Coppin et al. 2004, Lu et al. 2004, Radke et al. 2005, Bruzzone and Bovolo 2013). Over the past few years, many change detection methods have been imposed for various remotely sensed data. Generally, these methods can be grouped into supervised (post-classification) and unsupervised types (Bruzzone and Prieto 2000, Yetgin 2012). Though the supervised change detection methods supply the land-cover transformation, unsupervised change detection methods are more widely used and researched, thanks to the limitations of classification accuracy and ground reference absence (Bruzzone and Prieto 2000, Bovolo et al. 2008).

In this paper, we focus on the unsupervised change detection. Unsupervised change detection could be seen as a clustering process to partition pixels into changed and unchanged parts using some methods, such as image differencing, image ratio, image regression, and change vector analysis (CVA), etc. (Yetgin 2012, Shi and Hao 2013). One of the most widely used change techniques is to analyse the difference image created by subtracting corresponding bands of the multitemporal images pixel by pixel. Some literatures proposed automatic analysis for the difference image instead of an empirical threshold to identify changes (Huang and Wang 1995, Bruzzone and Prieto 2000, Baziet al. 2005, Imet al. 2008). Additionally some methods of pattern recognition or machine learning have also been applied to this issue like active contour model (Bazi et al. 2010), support vector machine (SVM) (Bovolo et al. 2008), wavelet transform (Bovolo and Bruzzone 2005, Celik and Ma 2010), fuzzy c-means (FCM) (Ghosh et al. 2011), and so

on. Indeed, when FCM is used to detect changes, it is unreasonable to identify changes just using membership probability since the ranges of pixel values of the difference image belonging to the two clusters (changed and unchanged) generally have overlap (Ghosh et al. 2011). To reduce speckle noise of the change map, the spatial context information has also been utilized, for example, Markov randomfield (K-MEANS) is a classic approach to exploit the context information (Bruzzone and Prieto 2000, Melgani and Bazi 2006, Liu et al. 2008, Moser and Serpico 2009, Marchesi et al. 2010, Wang et al. 2013). Though K-MEANS is commonly robust in its change detection (or classification) performance, the resulting change map will eventually reveal an over-smooth result (i.e., loss of significant details and generating too large patches) without well defining for the boundary pixels (Wang and Wang 2004, Tso and Olsen 2005). In this paper, a novel change detection approach is proposed using FCM and K-MEANS to address, for example, the absence of detailed information of traditional K-MEANS and the value overlap of changed and unchanged pixels in the difference image of FMC. As shown in figure 1, the proposed approach is made up of three blocks as follows. First, the difference image is generated using CVA method based on multitemporal remotely sensed images. Then FCM is performed to the difference image, so the initial change map and the cluster membership probability of pixels belonging to changed and unchanged parts are obtained. Finally, the membership probability is introduced into K-MEANS using the spatial attraction model to control the boundary pixels in this process and the change map is produced.

Unsupervised change detection techniques mainly use the automatic analysis of change data which are constructed using multitemporal images. The change data are generally created using one of the following: 1) *image differencing*; 2) *normalized difference vegetation index*; 3) *change vector analysis*; 4) *principal component analysis (PCA)*; and 5) *image rationing*



**Figure 1.** General scheme of the proposed approach

**Simple Differencing**

In this technique, spatially registered images of time I, and 1, are subtracted, pixel by pixel, to produce a further image which represents the change between the two times. Mathematically

$$Dx_{ij}^k(t_2) = x_{ij}^k(t_2) - x_{ij}^k(t_1) + C$$

Where =pixel value for band k and i and j are line and pixel numbers in the image, t1, =first date, t2r, =second date and C=a constant to produce positive digital numbers. The input data can be comprised of raw images or spatially filtered ones. Procedure yields a difference distribution for each band .

**Image Ratioing**

Ratioing is considered to be a relatively rapid means of identifying areas of change (Howarth and Wickware 1981, Howarth and Boasson 1983, Nelson 1983, Todd 1977, Wilson et al. 1976). In ratioing two registered images from different dates with one or more bands in an image are ratioed, band by band. The data are compared on a pixel by pixel basis. One computes

$$Rx_{ij}^k(t_2) = x_{ij}^k(t_1) / x_{ij}^k(t_2)$$

Where  $x_{ij}^k(t_2)$  , is the pixel value of band k for pixel x at row i and column j at time t2. If the intensity of reflected energy is nearly the same in each image then  $Rx_{ij}^k(t_2)$  , this indicates no change.

### Principal Components Analysis (PCA)

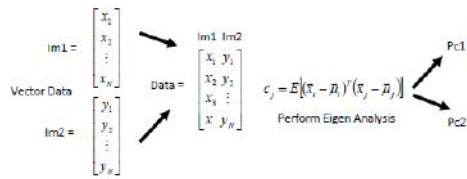


Figure 2. PCA algorithm for change detection

Principal Component Analysis is a linear transformation technique and probably the most common of these techniques. The main principal of the PCA approach is to use as input a set of images and to reorganize them via a linear transformation, such that the output images are linearly independent. The new coordinate system for the data is projected such that the greatest variance lies on the first axis or the first principal component and the second greatest variance on the second axis. This technique is usually used to reduce the number of spectral bands or in compression schemes. In CD studies, the consequence of this linearization is that unchanged pixels or common information shared by a pair of images are expected to lie in a narrow elongated cluster along a principal axis equivalent to the first component (PC1). On the contrary, pixels containing a change would be more unique in their spectral appearance and would be expected to lie far away from this axis (PC2).

### K-means Clustering

The K-means clustering is a simple clustering method which uses iterative technique to partition  $n$  observation into  $k$  clusters. The partition of  $n$  observation into  $k$  clusters is based on the nearest mean principle. Even though it is fast and simple in execution, the clustering will not converge if the selection of initial cluster center is not made properly. K-means algorithm is an unsupervised clustering algorithm that classifies the input data points into multiple classes based on their inherent distance from each other. The algorithm assumes that the data features form a vector space and tries to find natural clustering in them. [Dalmiya et.al, 2012].

The basic  $k$ - means clustering algorithm is as follows:

- Step 1 : Choose  $k = \#$  of clusters.
- Step 2 : Pick  $k$  data points randomly from the dataset. These data points act as the initial cluster centers

- Step 3 : Assign each data point from the  $n$  observation into a cluster with the minimum distance between the data point and cluster centre.
- Step 4 : Re-compute the cluster centre by averaging all of the data points in the cluster.
- Step 5 : Repeat step 3 and step 4 until there is no change in cluster centers

Therefore K-means clustering, the key endeavor is to partitions the  $n$  observation into  $k$  sets ( $k < n$ )  $s = \{s_1, s_2, s_3, \dots, s_k\}$  so as to minimize the within cluster sum of squares.

$$\arg \min \sum_{i=1}^K \sum_{x_j \in S_i} \|x_j - u_i\|^2$$

Where  $u_i$  is the mean of points in  $S_i$ ,  $K$  is the number of clusters and  $x_j$  is the  $j^{th}$  data point in the observations [Ramani et.al, 2013][Gumaei et.al,2012].

### Fuzzy C-means clustering

The Fuzzy C-means (FCM) algorithm is a method of clustering which allows one of the  $n$  observations belongs to two or more clusters. It is a frequently used method in pattern recognition [Thangavel and Mohideen, 2010]. It is based on the minimization of the following objective function to achieve a good classification.

$$v_{ij} = \frac{\sum_{k=1}^n (\mu_{ik})^m x_{kj}}{\sum_{k=1}^n (\mu_{ij})^m} \tag{1}$$

2) Calculate the distance matrix  $D_{[c,n]}$

$$D_{ij} = \left( \sum_{j=1}^m (x_{ij} - v_{ij})^2 \right)^{1/2} \tag{2}$$

3) Update the partition matrix for the  $r^{th}$  step,  $U^{(R)}$  as

$$\mu_{ij}^{r+1} = \left( 1 / \sum_{j=1}^c (d_{ik}^r / d_{jk}^r)^{2/m-1} \right) \tag{3}$$

Where  $m$  is any real number greater than 1,  $u_{ij}$  is the degree of membership of  $x_i$  in the cluster  $j$ ,  $x_i$  is the  $i^{th}$  of the  $d$ -dimensional measured data,  $c_j$  is the  $d$ -dimensional center of the cluster and  $\|*\|$  is any norm expressing the similarity between any measured data and

the center. Fuzzy partitioning is carried out through an iterative optimization of the objective function shown above, with the update of member ship  $u_{ij}$  in equation and the cluster centers  $C_j$  by equation

## II. CONCLUSION

An unsupervised change detection technique is developed by conducting *fcm* means clustering on feature vectors which are extracted using  $h \times h$  local data projection onto eigenvector space. The eigenvector space is generated using PCA on  $h \times h$  nonoverlapping difference image blocks. The proposed method uses  $h \times h$  neighborhood to extract feature vector for each pixel so that it automatically considers the contextual information. The proposed algorithm is simple in computation yet effective in identifying meaningful changes which makes it suitable for real-time applications. It produces results comparable, even better, with the MRF-based approach [5], which requires computationally expensive data modeling and parameter estimation. Simulation results show that the proposed algorithm performs quite well on combating both the zero-mean Gaussian noise and the speckle noise, which is quite attractive for change detection in optical and SAR images

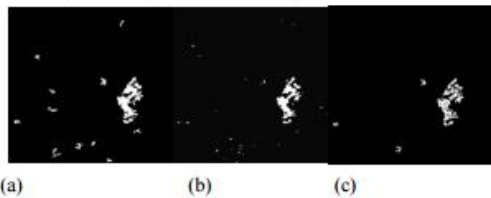


Figure 3. Change detection results obtained by using Kernel FCM-means clustering

**Table 2. Change Detection Results Obtained By Using Kernel K-means Clustering on the Difference Images.**

Difference Image	Accuracy
Mean-Ratio	89.999
Log-ratio	92.542
Fused Image	94.357

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# Secure Data Key Retrieval for Decentralized Disruption Tolerant Military Networks

Prof. Devika Deshmukh, Aditi Zade, Dhanashri Jumade

Anjuman College of Engineering and Technology, Nagpur, Nagpur, Maharashtra, India

## ABSTRACT

In the Disruption tolerant network technologies have successful solutions that has wireless devices carried by soldiers to communicate and access the confidential information reliably by external storage nodes. Some of the most challenging problem in this way the enforcement of authorization system and the policies are for secure data retrieval. The Ciphertext policy based encryption has a cryptographic solution to the access control problem. The problem of applying in decentralized has several security and privacy problem with regard to the attribute key, and supplies for the different authorities. The propose a secure data retrieval scheme using 3DES for decentralized where multiple key authorities manage their attributes independently. To demonstrate how to apply the proposed system to securely and which manage the confidential data distributed in the disruption military network.

**Keywords:** Triple Data Encryption Algorithm, Disruption-Tolerant Network, Multiauthority, Secure Data Retrieval.

## I. INTRODUCTION

This nodes in military environments such as a battlefield in a region are likely to get from intermittent network connectivity and frequent partitions. Disruption based tolerant network technologies are becoming useful solutions that make wireless devices carried by soldiers to communicate amongst themselves and access the confidential data reliably by exploiting external storage nodes. Some of the most challenging issues in this scenario are the enforcement of authorization policies and the policies update for secure data retrieval. Ciphertext policy based encryption is a promising cryptographic solution to the access control issues. However, the problem of applying 3DES in decentralized introduces several security and privacy challenges with apply to the attribute revocation, key , and coordination of attributes issued from different authorities., we propose a secure data retrieval scheme using 3DES for decentralized DTNs where multiple key authorities has their attributes. To apply the proposed mechanism securely and efficiently manage the

confidential data distributed in the disruption military network.

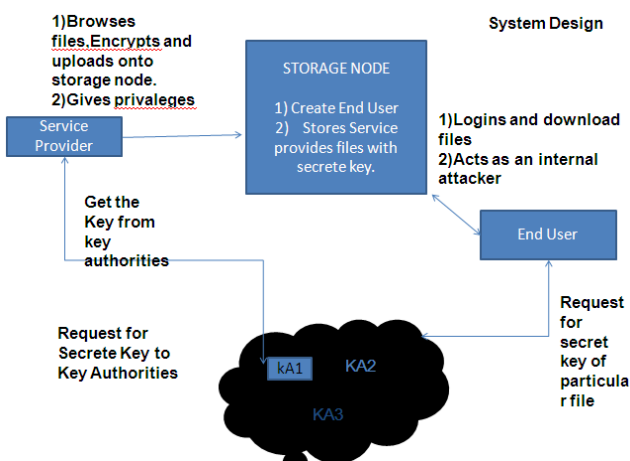
## II. METHODS AND MATERIAL

### 1. Existing

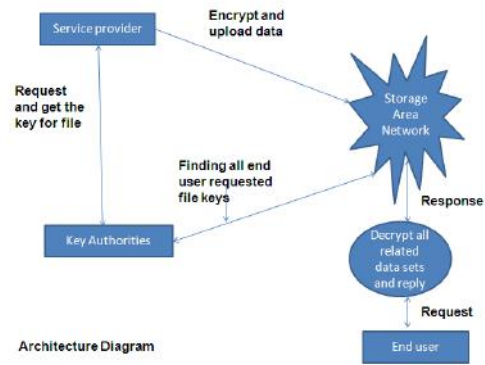
Military applications need increased protection of confidential data including access method It is desirable to provide differentiated access services Data access policies are defined over user roles, which are managed by the key authorities. Wireless Sensor Networks are based on elementary sensors that detect the occurrence of particular events in a monitored area. [1] J. Burgess, B. Gallagher, D. Jensen, and B. N. Levine, "Maxprop: Routing for vehicle-based disruption tolerant networks," in *Proc.IEEE INFOCOM, 2006, pp. 1-11* Wireless Sensor Networks applications will find the border surveillance applications. The first aim of this applications is to monitor a country border and detect the presence of intruders in border line. [2] M. Chuah and P. Yang, "Node density-based adaptive routing

scheme for disruption tolerant networks,” in *Proc. IEEE MILCOM, 2006*, pp. 1–6. In this paper, the effects of natural factors on dynamic deployment scheme Wireless Sensor Networks based solution providing the surveillance. Parameters such as the wind effect, and velocity of the airplane from which the sensors are thrown are put to optimize the area coverage and Wireless Sensor Networks connectivity. [7] L. Ibraimi, M. Petkovic, S. Nikova, P. Hartel, and W. Jonker, “Mediated ciphertext-policy attribute -based encryption and its application,” in *Proc. WISA, 2009*, LNCS 5932, pp. 309–323. Then, the propose models that evaluate the quality of connectivity and coverage of the deployed network and allow planning of a border solution. [9] D.HuangandM.Verma,“ASPE:Attribute-based secure policy enforcement in vehicular ad hoc networks,” *Ad Hoc Netw.*, vol. 7 Integrity and authentication is necessary to check sensor nodes to detect modified, injected packets. With the safety critical applications require authentication, it is wise to use it even for the applications since otherwise the owner of the sensor network to get the wrong of the sensed thus making inappropriate decisions. However, authentication alone does not solve the problem of node takeovers Hence authentication system should be “collective” and aim at securing the entire network. [4] S. Roy andM. Chuah, “Secure data retrieval based on ciphertext policy attribute-based encryption (CP-ABE) system for the DTNs,” Lehigh CSE Tech. Rep., 2009.

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**Figure 1.** Key generation



**Figure 2.** Data Encryption

Implementation of the project when the design is turned out into a working system. It can be considered to be the most important stage in achieving a successful new system and giving the user, confidence that the new system will work and be effective. The implementation involves careful planning, investigation of the existing system and it the implementation, designing of methods to get changeover and check of changeover methods.

**2. Modules Description**

**A. Key Authorities**

They are key generation that generate secret parameters for 3des. The key authorities consist of a central authority and number of local authorities. That there are secure and reliable communication channels between a central authority and each authority during the initial key and generation time . Each authority manages different attributes and issues corresponding attribute keys to users. They give differential rights to individual users based on the users attributes. The key authorities are assumed to be honest. That has honestly execute the assigned tasks in the system they would have information of encrypted contents as much as possible.

**B. Storage Nodes**

This is an entity values that stores data from senders and provide corresponding access to users. Similar to the previous schemes, we also assume the storage node to be semi trusted that is honest but curious .

**C. Sender**



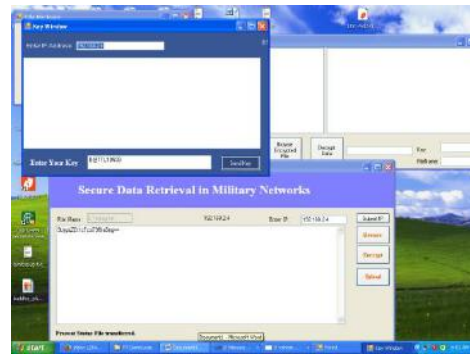
This is an entity who owns confidential data and wants to store them into the external data storage node for simplicity of sharing or for reliable delivery to users in the severe networking environments. A sender is responsible for defining access policy and implementing it on its own data by encrypting the data under the policy before storing it to the storage node.

**D. User**

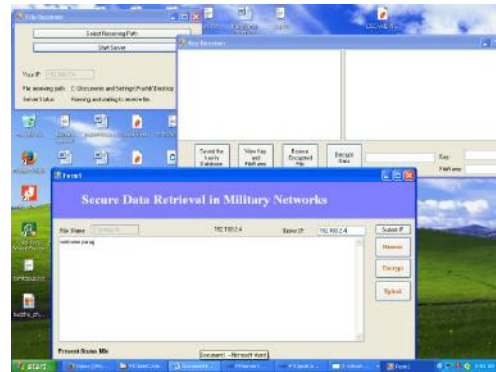
This is a mobile node who want to access the data stored at the storage node. If user owns the set of attributes satisfying the access policy of the encrypted data defined by the sender, and is not invalidate in any of the attributes, then he will be able to decrypt the ciphertext and obtain the data. Cipher text method is one of the techniques for encrypting the data into some format which cannot be understood by anyone except the sender and the one who is the authorized user of data so even if the data gets leaked, because of mingle of words, it can't be understood by unauthorized users. In this cryptographic method, they are two steps, encryption and decryption. Sender of the node share the information from one to another in the network and share the message in the format of intermixed data with the help of private or public key which was called encryption. Another one is decryption where the receiver of the node decrypts the data or removes the intermixed words with the help of the private or public key. Then the message will show clearly to the receiver node.

**3. DES with MD5 ALGORITHM**

3DES encrypts a 64-bit block of plaintext to 64-bit block of ciphertext. It uses a 128-bit key. The algorithm has of eight identical rounds and a half round final transformation. There are 216 possible 0000000000000000, 1111111111111111. Each operation with the set of possible 16-bit blocks is an algebraic group. Bitwise addition modulo 2, and addition modulo 216 is the usual group operation. Some spin must be put on the elements – the 16-bit Blocks to make sense of multiplication modulo 216 + 1, however, 0 (i.e., 0000000000000000) is not an element of the multiplicative group.



**Figure 3. User key Authorization**



**Figure 4. Secured Data retrieval system**

**Confidentiality:** In order to protect data and communication exchanges between sensor nodes it is important to guarantee the secrecy of messages. In the sensor network case usually achieved by the use of symmetric cryptography or public key cryptography in general is considered too expensive. However, while encryption protect against all outside attacks, it does not protect against inside attacks, as an attacker can use recovered cryptographic key material to successfully eavesdrop, impersonate or participate in the secret communications of the network. While confidentiality guarantees the security of communications inside the network it does not prevent the misuse of information reaching the base station. Hence, confidentiality must also be coupled with the right control policies authorized users can have access to confidential information.

**Integrity and Authentication:** Integrity and authentication is necessary to enable sensor nodes to detect modified, injected, packets. While it is clear those safety-critical applications authentication, It is still wise to use it even for the rest of applications. Since the owner of the sensor network may get the wrong picture of the sensed world thus making inappropriate decisions. However, authentication alone does not solve the

problem of node takeovers as compromised nodes can still authenticate themselves to the network. Hence authentication system should be “collective” and aim at securing the entire network.

### III. CONCLUSION

The corresponding attribute group keys are updated and delivered to the justifiable assigned group members securely (including the user). In addition, all of the components encrypted with a secret key in the ciphertext are reencrypted by the storage node with a random, and the ciphertext components corresponding to the attributes are also reencrypted with the updated attribute group keys. Even if the user has stored the previous ciphertext exchanged before he obtains the attribute keys and the holding attributes satisfy the access policy, he cannot decrypt the pervious ciphertext.

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# Design Enhance AES Data Encryption and Decryption

Shraddha Wade, Ashmika Gadikar, Aafreen Khan, Vikram Deshmukh

Department of Electronics and Telecommunication, Smt. Rajashree Mulak Collage of Engineering For Womens  
Affiliated to RTM University, Maharashtra India

## ABSTRACT

Advance Encryption Standard (AES), it is used to specify a Federal Information Processing Standard (FIPS) approved cryptographic algorithm that can be used to protect our electronic data. This paper present the AES algorithm with regard to Field Program Gate Array (FPGS), offers a very fast method and most customizable solution. The approach in order to minimize the hardware consumption for the transformation of Encryption and Decryption are simulated using an iterative design. Implementation of code carried out in Xilinx ISE 9.2i. In this paper, we present the implementation of the AES 128-bit encryption and decryption. AES Encryption is a method for scrambling data. A key is used to mix up data such that it can be securely stored or transfer over a network. The design is based on substitution and permutation network. In this system we have message, a plain text and a secret key. The 128 bits cipher text block is produce after the round function is processed plaintext block.

**Keywords :** AES, FPGA, VHDL, Encryption, Decryption.

## I. INTRODUCTION

The Advanced Encryption Standard was launched in 2001 by the National Institute of Standards and Technology (NIST).It is now the most widely used symmetric key encryption algorithm in the world. AES algorithm have been proposed for different applications and their performance have been evaluated by using ASIC libraries and FPGA.[1]

Cryptographic algorithm AES is currently used in a very large variety of scenarios. The common examples: e-commerce and financial transactions, which have strong security requirements. The Advance Encryption Standard (AES) is a standard for the encryption of electronics data. The AES 192-bits algorithm includes the following function i.e. 192-bit key size, Automatic Round key calculation and Encryption or decryption functions. In this paper, we design the 192 bit AES algorithm in encryption and decryption process. We conduct a fault attack against the unprotected AES by using VHDL code. The AES was accepted in 2001 by the National Institute of Standards and Technology

(NIST) and since its acceptance, it has been utilized in a variety of security-constrained applications. For instance, it has been included in wireless standards of Wi-Fi as well as WiMAX and many more other applications, ranging from the security of smart cards to the bit stream security mechanisms in FPGAs. Various hardware implementation architectures of AES algorithm have been proposed and their performances are evaluated.[2,3]

In this paper, Encryption and Decryption process of AES algorithm is implemented. A fault attack is conducted and fault detection scheme is applied. Maximum fault coverage is achieved through this detection scheme and then different parameters like Area; Hardware requirement is to be compared. Power analysis is to be performed to show that proposed design is more power efficient.

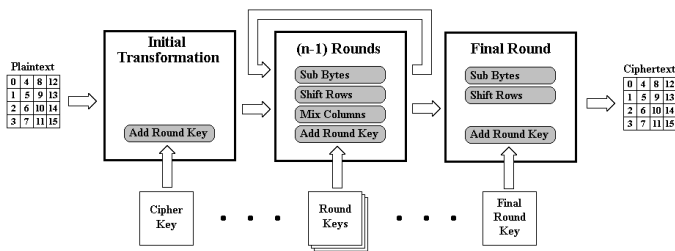
## II. METHODS AND MATERIAL

### 1. AES Algorithm

To encrypt a message, we supply the message along with the key. The AES Encryption algorithm scrambling

the message and the output unrecognisable data. A key is used to mix up data that it can be securely stored or transferred over network, and only with the key can unscramble the data. It is symmetrical key algorithm. This means that the same key is used to scramble the data and unscramble it.

The Data is encrypted or decrypted in blocks of 16 bytes. The state is manipulated internally during a variable number of rounds. There are 10, 12, or 14 rounds needed for cipher keys of length 128, 192, or 256 bits respectively.



**2. Block Cipher**

AES is a block cipher which encrypts 128 bits of data at a time. It treat a 16-bytes as a grid of 4\*4. Messages which are longer than 128 bit are broken into block of 128 bits. Each block is encrypted separately using exactly the same steps.

**3. Key Lengths**

When using AES we can select a key length. The keys can be 128-bits, 192 bits or 256 bits. The size of the key dictates how many round or cycle of scrambling we have to perform. With large keys corresponding to more round, And, in theory, more secure but slower encryption.

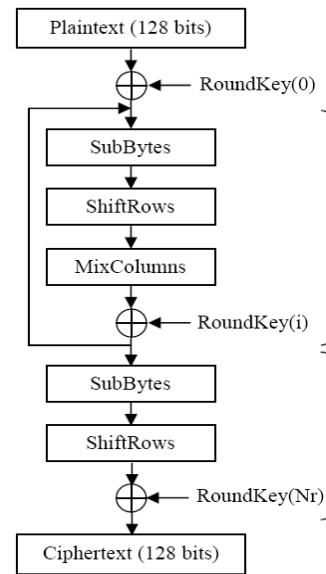
**4. AES Encryption**

AES encrypt information by repeatedly using four kinds of data transformations: SubBytes, ShiftRows, MixColumns and AddRoundKey. while the final round does not have the MixColumns transformation. Each round contain four transformations (linear and nonlinear) called Layers. Each round has round key derived from original key. Round transformation and its steps generate intermediate data called States. State considered as rectangular array of bytes with four rows and no. of columns that depend on size of key length.

Key length: 128 bit

Key arranged in 4\*4 matrix

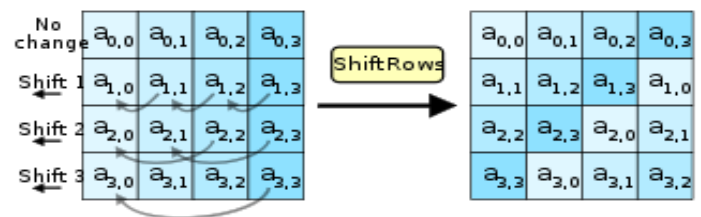
Each element is byte.



**Figure 1. AES Encryption Structure**

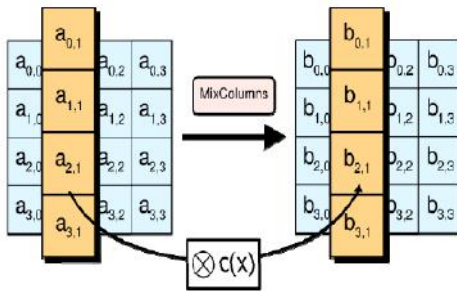
**A. ShiftRows Transformation**

It is linear transformation. This provides resistance against truncated differential and saturation attacks. The Shift Rows transformation is a circular shifting operation on the rows of the state with various numbers of bytes. The first row of the state is kept as it is, while the second, third and fourth rows cyclically shifted by one byte, two bytes and three bytes to the left respectively.



**B. MixColumn transformation**

This transformation operates on each 4 byte column separately and is omitted in last round. Columns of state are considered as polynomials over  $GF(2^8)$  which are multiplied by fixed polynomial  $c(x)$  modulo  $(x^4 + 1)$ .

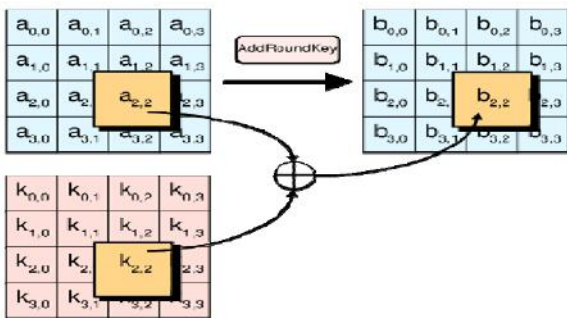


Fixed polynomial  $c(x)$  is given by  $c(x) = \{03\}x^3 + \{01\}x^2 + \{01\}x + \{02\}$   
 In matrix form, the MixColumns transformation can be expressed as:

$$\begin{bmatrix} b_0 \\ b_1 \\ b_2 \\ b_3 \end{bmatrix} = \begin{bmatrix} 02 & 03 & 01 & 01 \\ 01 & 02 & 03 & 01 \\ 01 & 01 & 02 & 03 \\ 03 & 01 & 01 & 02 \end{bmatrix} \times \begin{bmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \end{bmatrix}$$

C. AddRound Key

The add round Key is a xor operation that adds a round key to the state in each iteration, where the round keys are generated during the key expansion phase. Key consisting of 128 bits which are arranged in 4\*4 byte matrix is added to output of mix column transformation. A different round key is added to state at end of each round.



D. AES Decryption

The transformations in the decryption process perform the inverse of the corresponding transformations in the encryption process. In the AES decryption rounds, four transformations are used: InvShiftRows, InvSubBytes, AddRoundKey and InvMixColumns.

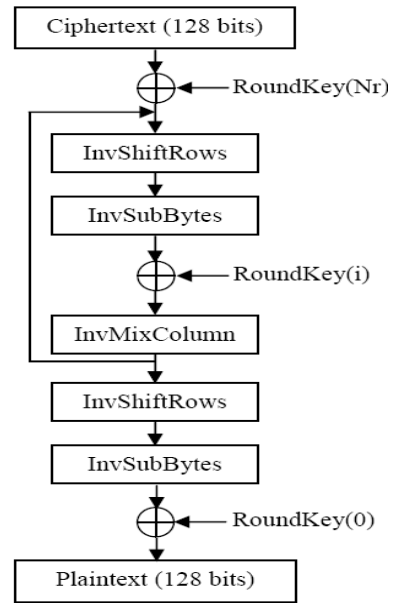


Figure 2. AES decryption Structure

III. CONCLUSION

In order to improve the security of the AES, AES algorithm in encryption and decryption is implemented. In this paper, we propose the Encryption and Decryption of Plain text. Initial Transformation, Rounds and Final rounds are the transformation which is being used in this project.

AES Design	Area(Slice)	Delay	Power	Frequency	Throughput
Conventional Encryption	250	3.356ns	3.806W	297.97MHz	3814.06Mbps
Conventional Decryption	3712	3.808ns	3.577W	382.77MHz	4899.328Mbps

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## RFID Based Smart Shopping Trolley with IR Sensor

Shivani Titarmare , Monali Thakre , Rasika Shingote, Sakshi Shukla, Vikram Deshmukh

Department of Electronics and Telecommunication, Smt. Rajshree Mulak Collage of Engineering For Womens , Nagpur, Maharashtra, India

### ABSTRACT

Nowdays, people are getting too busy in their schedule but still they need to spend time on their basic need like purchasing goods and all stuffs from shopping market. In shopping malls, long queues for billing waste their time again. Thus to reduce the time consumption during shopping our system is introduced. In our trolley system we use RFID tags on products that one wants to buy, which are read by barcode scanner and the cost of that product is displays on the LCD screen attached to our system. As customer buy the next product its price is add on the previous amount. The cost of the product is given to microcontroller by using Zigbee communication from host PC. Zigbee supports bidirectional communication between microcontroller and host PC. Customer get direct bill at the billing section which is already stored at host PC which ultimately reduces queue.

**Keywords :** Microcontroller AT89S52 , RFID Tags , Barcode Scanner , Liquid Crystal display.

### I. INTRODUCTION

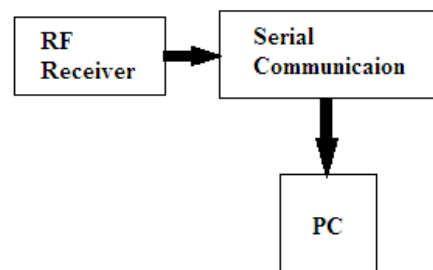
The invention of wireless technology with other communication techniques has been helping us in making electronics domain very popular. A modern futuristic product is the one that provides the comfort, convenience and efficiency in everyday life. Shopping is one of the interesting things and basic need for every human. At present no such embedded system is used in shopping. But this simple task cannot be easily perform because customer has to wait for billing procedure for long time.

The aim of this project is to utilize new updated technologies and overcome from the difficulties during shopping in consumer retail shop. Thus we are proposing the smart trolley system by using microcontroller as an updated technology. The System consists of an RFID based trolley which communicates with the billing counter wirelessly through Zigbee Transmitter. Each trolley will consist of a same type of hardware with unique trolley address. The customers will be able to scan the items by their own and the LCD screen on the shopping cart will keep updating the total.

The billing counter can at any point of time inquire about the current items present in the trolley. This will turn out to be very beneficial for the retail stores as more people will enjoy the shopping experience and come more often to shop.

### II. METHODS AND MATERIAL

#### 1. Block Diagram



**Figure 1.** Block Diagram of Server Section

The Block diagram shows the different component used in the Smart Shopping trolley is Microcontroller, Power Supply, barcode reader, IR Sensor, LCD display, buzzer, zigbee software. RFID and barcodes are similar in that they both are data collection technologies, means they automate the process of collecting data. However, they

also differ significantly in many areas. An RFID reader can access the information of the tag. Reader send this code to microcontroller, after matching code with codes stored in memory, controller reads product's name, cost & other details. Then it displays on LCD. The item details like name, cost & total bill of items inserted in trolley are displayed on LCD.



Figure 2. Barcode scanner

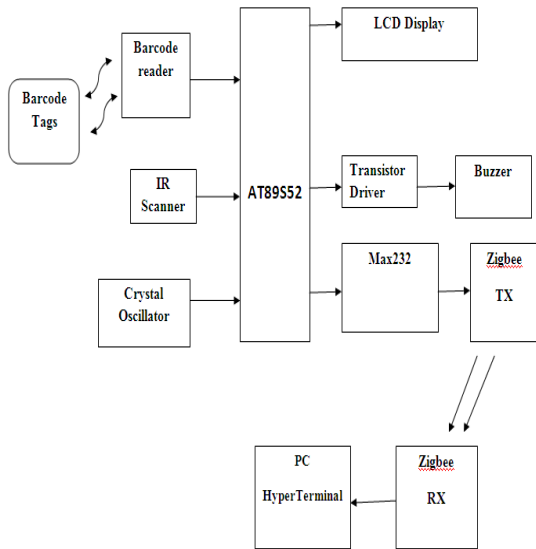


Figure 2. Block Diagram

A. When person puts an item in the trolley, its code will be detected by BARCODE Scanner which is interfaced with processor. BARCODE Scanner is interfaced serially with nRF24L01. As we put the items, the costs will get added to total. Thus the billing is done at the trolley itself. LCD used is 16X2 character alphanumeric type display which interfaced with processor to transmit the billing details from trolley to the host PC at counter wirelessly when customer completes putting the items in trolley and reaches at counter of billing section.

2. Hardware Design

A Barcode Scanner:-A barcode is an optical device which shows data on certain products like unique ID. Purpose of using barcode scanner is to automatically identify the product from its unique barcode label printed on it. This barcode reader is combination of hand held unit (LED array type source & CCD capture) and decoder circuit which receives raw data of barcode and outputs serial data at 9600 bps with RS232 level output suitable for interfacing with microcontrollers or host PC serial port

B. IR sensor :- An infrared sensor is an electronic device which emits in order to sense some aspects of the surroundings. An IR sensor can measure heat of an object and detects the motion. In infrared spectrum, all objects radiate some form of thermal radiations and these types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED.

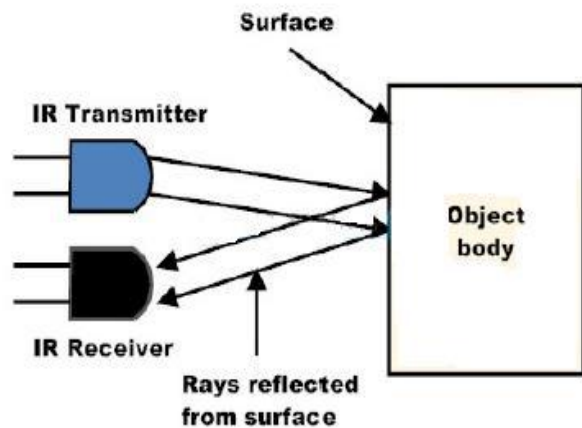


Figure 2. IR sensor

C. AT89S52

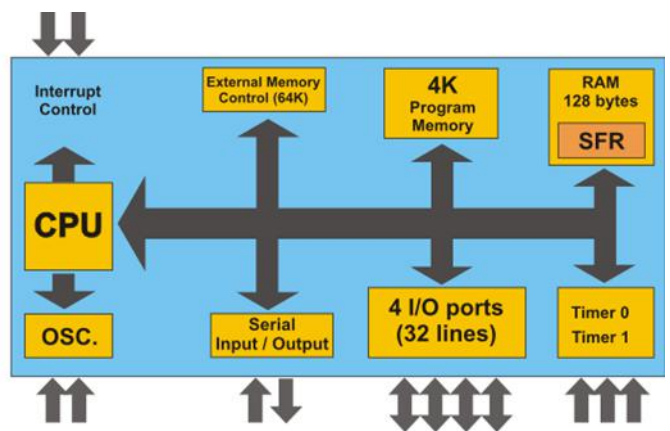


Figure 3. Microcontroller Internal Structure

The AT89S52 is low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of the in-system programmable Flash memory. The device is manufactured with using Atmel’s high-density nonvolatile memory technology and is compatible with industry- standard 80C51 instruction set, protocol and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and is cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, the Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and the clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and also supports two software selectable for the power saving modes.

D. Liquid Crystal Display

A liquid crystal display (LCD) is a flat, thin display device made up of any number of monochrome pixels or color arrayed in front of a reflector or light source. Each pixel consists of a column of liquid crystal molecules suspended between two polarizing filters, and two transparent electrode. the polarization of light is twisted by liquid crystal entering one filter to allow it to pass through the other. ‘Smart LCD’ display to output visual information is used by many microcontroller devices. They have a standard ASCII mathematical symbols and set of characters. For an 8-bit data bus, the display requires 11 I/O lines and +5V supply. For a 4-bit data bus it only requires the seven extra lines and supply lines. When the LCD display is disabled and they do not interfere with the operation of the microcontroller. Data can be placed at any location on the LCD.

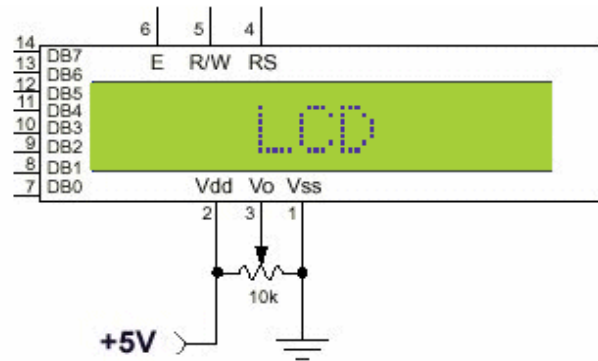


Figure 4. Liquid crystal display

E. ZigBee

The Zigbee RF Modules was engineered to meet IEEE802.15.4 standards and support the unique needs of low-cost and ,low-power wireless sensor networks. The modules requirement of minimal power and provide reliable delivery of data between devices. The modules functions within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other.

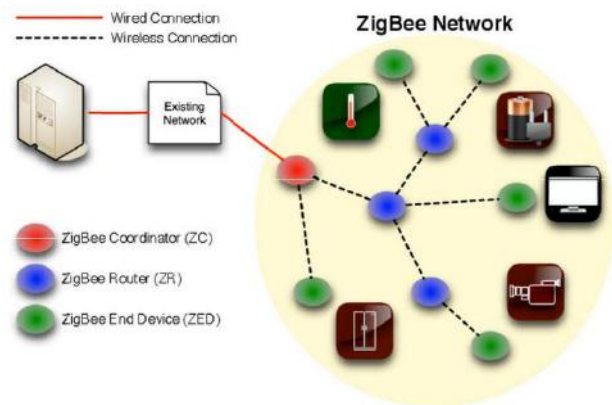


Figure 5. Zigbee network

Key Features:

- Gives 100mW output power
- It has Long range: 4000 feet
- Provides Miniature footprint: 0.9” x 1.63”
- Integrated PCB F antenna or UFL connector for external antenna
- Has Worldwide acceptance: FCC, IC and CE
- Consist Powerful Texas Instruments 256k MSP430 with 802.15.4 MAC or ZigBee Stack
- Consists of LSR serial interface based on 802.15.4 MAC
- Supports Low power operation .
- RoHS compliant
- Streamlined development with LSR design services.



- License options are available to purchase design or integrate design.

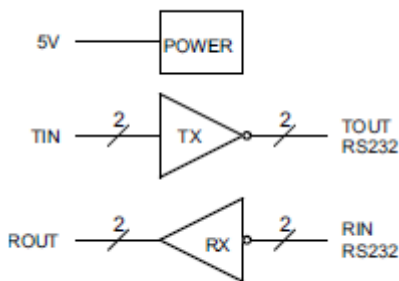
#### F. Max232

The MAX232 device is a dual driver or receiver that includes a capacitive voltage generator to supply TIA or EIA-232-F voltage levels from a single 5-V Power Supply. Each receiver converts TIA or EIA-232-F inputs 1.0- $\mu$ F to 5-V, TTL/CMOS levels. These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V, and can accept  $\pm$ 30-V inputs. Each driver converts TTL or CMOS input levels into TIA 3 Description.

#### Features:

- Meets or Exceeds TIA/EIA-232-F and ITU
- Operates up to 120 kbit/s
- Two Drivers and Two Receivers
- $\pm$ 30-V Input Levels
- Low Supply Current: 8 mA Typical
- Upgrade With Improved ESD (15-kV HBM) and

#### MAX232x PDIP



**Figure 6.** Systematic Schematics of Max 232

#### IV. ALGORITHM

- Step 1. Allotment of trolley
- Step 2. Initialize the System
- Step 3. Search for RFID on product
- Step 4. Check the RFID tag
- Step 5. If the tag is registered, read related data from memory of micro-controller.
- Step 6. Display data on LCD
- Step 7. Add item cost as items are added in trolley.
- Step 8. Displays total cost of items in trolley
- Step 9. Step 9: When upload key is pressed send data to the counter.

Step 10: Print the Bill

Step 11: Stop

### III. RESULTS AND DISCUSSION

The utility of trolley will be first for its commercial use. This device records the data of the different products with the help of suitable sensors like RFID Tags and IR sensor. This recorded data helps the shop owner with detailed analysis of shopping by the customer & their preferences through the computer software, Printout of the same can be obtained. In smart trolley, there is no need to wait in billing queue and no need of thinking about budget during payment of bill. It gives number of products in trolley and total cost of the products on the spot. Theft detection is also a key feature of smart shopping trolley by using IR sensor.

### IV. CONCLUSION

The developed product is easy to economical, use and do not require any special training. This project simplifies billing process, makes it swift and increases the security using RFID technique. This takes the overall shopping experience to a different level. A scheme for automated retail shop based on RFID is introduced in this paper. The RFID technology is the most promising technology for identification and tracking purpose and it is an excellent option for deployment in enterprise applications like retail stores, supply chain management etc. Require the correct orientation toward the reader to be read and any damage makes them unreadable. Moreover using barcodes is a human-intensive activity at the point of sales. Hence RFID technology is the better approach to overcome these shortcomings.

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# Density Based Traffic Signal System Using Image Processing

Prof. Vikram Deshmukh, Shruti Pantawane, Sonali Hajare, Anushree Kale

Electronics and Telecommunication, RTMNU, SRMCEW, Nagpur, Maharashtra, India

## ABSTRACT

The work is designed to create a density based traffic signal system. The signal timing is programmed to change depending on the density of the traffic density at the junction. As traffic issues are increasing in the cities at major junctions; it has become a nightmare for the commuters. Conventional traffic light system has a fixed time pattern which doesn't vary as per the current traffic situation at the junction. This project will help sort the problem by capturing and converting the image into gray scale of each lane. threshold value will be calculated which will indicate the number of vehicles present at the particular lane. Denser lane will be given priority and the signal will remain green for longer duration as compared to other lane. The project is based on image processing using MATLAB software and microcontroller AT89S52.

**Keywords :** Image Processing, Microcontroller-AT89S52, Density Measurement, Traffic Management System

## I. INTRODUCTION

Traffic lights play a very significant role in traffic control and regulation on a daily basis. The traffic lights that are used nowadays comprise of three lights: Red for stop, Yellow For wait and Green for go. [1]

Users are made to wait for the signal to change from red to yellow and then from yellow to green. The time that a commuter has to wait for is decided by the traffic signals. The traffic lights used nowadays are pre-programmed to wait for a fixed duration of time after every change in signal. [7]

Sometimes there is a situation where one particular road is very crowded as compared to others. A simple way of decongesting the road is by allocating more time for the vehicles on the densest road. [2] The system should be intelligent enough to decide the priority on a daily basis. In doing so, the images for each lane are taken and processed simultaneously and a decision is passed as to which lane should be given how much amount of time and which should be the highest priority.

A camera is used to take pictures of the roads that connect in a traffic junction. The pictures taken are then

processed to determine the density of vehicles on each road at that instant. A list of priority is assigned to each road in one cycle and the waiting time for that road is made to vary according to its density.

Using MATLAB the density of the roads is determined and the microcontroller changes the duration of green light given for each road as per the output after image processing.

## II. METHODS AND MATERIAL

### A. System Architecture

1. Image acquisition refers to capturing of image by configuring the camera with the help MATLAB tool
2. Thresholding is used to compare the vehicle density of the lanes. [6]
3. Depending on the density the microcontroller AT89S52 controls the Led at the traffic signal.
4. Denser lane will be cleared first and the signal will remain green for longer duration for that lane.
5. The signal will operate in default state when there is no traffic congestion in any lane.

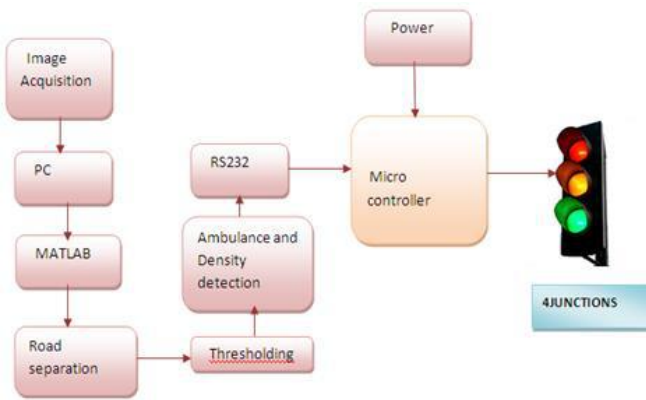


Figure 1. Proposed Architecture

**B. Methodology**

**1. Image Acquisition**

The image is captured by a webcam. It is then transferred to the computer via a USB cable. The image acquisition and further processing is done by using MATLAB.



Figure 2. Image acquisition flow diagram

**2. Image Processing**

The image is captured by using a webcam placed at the road junction. It has the capability of taking images of all the roads meeting at the junction. The webcam is mounted on the DC motor. The motor is responsible for capturing images from all directions in steps of fixed time interval. The speed of rotation of the camera is designed to be such that it is greater than the click-to-capture time of the camera. The acquired image is converted to grey scale image for further processing. The grey scale image is then converted to a binary image that contains only two Colors, black and white. This image is known as the threshold image. The threshold image is then complemented for further image processing.

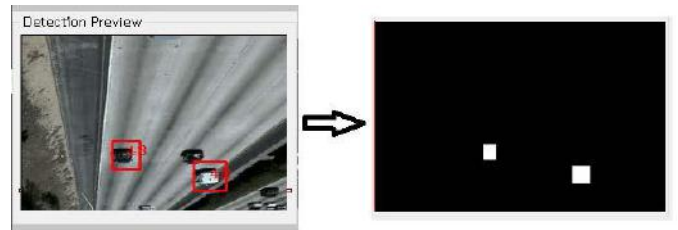


Figure 3. Image Detection

**3. Image Enhancement**

In this process the images are adjusted in such a way that the results are more suitable for further processing. In this, they obtained image is converted into a grayscale image.

**4. Thresholding**

Thresholding is transforming the grayscale image into black and white image (binary: white=1, black=0). The main purpose of thresholding is a radical reduction of information in order to simplify further processing. White color is assigned to all the pixels that have luminosity greater than the threshold level and the others as black.



Figure 4. Thresholding Image

**5. Edge Detection**

Edge detection refers to the process of identifying and locating sharp discontinuities in an image. The discontinuities are abrupt changes in pixel intensities which characterize the boundaries of objects in an image. [2] It filters out useless information, while keeping the important structural properties of an image. In this proposed system, canny edge detection technique is used. The boundaries of each image are found and the number of objects is calculated .



**Figure 1.** Edge Detection

## 6. Density Measurement

To maximum density present in the image, the close boundaries of the objects are identified. The exterior boundaries of the objects as well as the boundaries of holes inside these objects in the binary image are counted.

## III. RESULTS AND DISCUSSION

### A. Changing the Duration of Traffic Light

The duration of the traffic signal is monitored as follows:

1. The camera controlled by AT89S52 Microcontroller rotates in clockwise direction and stops to take pictures of each lane. The clicked pictures are sent to MATLAB for image processing.
2. Then the camera rotates in anticlockwise direction and repeats the above step.
3. The images are processed in MATLAB and the priority of each lane is decided as per its traffic density.
4. The lane with the highest relative traffic density is given the highest priority and the lane with the lowest traffic density is given the least priority.
5. The lanes are arranged in the descending order of their priorities.
6. The duration of green signal of the lane with the highest priority is more as compared to others, so that the traffic in that lane can pass and reduce the congestion. The other lanes have their green signals as per their decreasing priorities.
7. This process repeats and the duration of green signal given to each lane keeps adjusting itself after every rotation of the camera.

### B. Communication Between AT89S52 Microcontroller & MATLAB Interface

The procedure for connecting the AT89S52 Microcontroller board to MATLAB via the USB port for serial communication is as follows:

The first step is to establish serial connection between the AT board and MATLAB via the USB port. The code for the AT89S52 Microcontroller board is written in the software AT89S52 Microcontroller and loaded on the board. In MATLAB the COM port is first configured. The configuration settings of serial port should match to that of AT89S52 Microcontroller. Then the data is sent serially from MATLAB to AT89S52 Microcontroller. This data is then processed by the AT89S52 Microcontroller board. After processing the output is given to the traffic light to change its duration as per the priority of the lanes.

## IV. CONCLUSION

This project presents an Automatic traffic density control for vehicles and to clear the traffic in case of any emergency preference will be given to that particular vehicle such as Ambulance and automatically the traffic will be cleared by obtaining a green signal on traffic signal such that all the traffic can be cleared automatically. The project is been designed and implemented with Atmel 89S52 MCU in embedded system domain. Experimental work has been carried out carefully.

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## Calciamicus : Smart Shoes for Visually Impaired People

Prof. Muzaffar Khan, Shruti Chauhan, Sultan Ahmad, Pooja Thakre, Mayuri Raut

Department of Electronics and Telecommunication Engineering, Anjuman College of Engineering and Technology,  
Nagpur, Maharashtra, India

### ABSTRACT

The purpose behind developing this project is to provide a cost effective solution to visually impaired people. Visually impaired people and blind people face many difficulties in independent mobility and navigation due to which they are unable to walk like normal people. Also their daily activities are hampered by their inability to adapt or accurate identification of their surroundings, which becomes the main reason of accidents, mishaps, falling off, getting lost in unknown areas etc. Our developed model will ensure the safety of visually impaired person by guiding him through areas whether known or unknown to him. This will be achieved through mini vibrators dedicated for each side of shoes, the Ultrasonic sensors (both on cap and shoe unit) used for Obstacle detection etc. The Microcontroller is the main control unit with Embedded Software design. The GPS (global positioning system) and GSM(global system for mobile communication) modules are also used to track the location of the blind person. These Smart Assistive Shoes would prove to be a new interface between the surrounding and the people who cannot see it. It will alert them of any kind of obstacle in their way and spot any small or big object without using their hands thus it would be surely a user friendly solution.

**Keywords :** Smart Assistive Shoes, Visually Impaired People, Blindpeople, Navigation, Ultrasonic Sensors, Microcontroller.

### I. INTRODUCTION

Different research works have been done till date on the utilization of the fast growing technology for the benefit of visually impaired people and blind people. We too had the same idea in our mind to use the smart technology but with a new perspective and some modifications. Recent study shows that there are around 37 million blind people in the world and approximately 27% i.e. 10 million out of them are present in India. The blind and visually impaired population is ever increasing and thus it was the need of the hour to develop a technology to solve their problems. Calciamicus is that device which will prove to be a simple, cheap, user friendly and smart guidance system for both visually impaired people and blind people of all ages irrespective of their height, weight etc.

#### 1. Our Motivation

We are motivated with the thought of helping the poor people (below poverty level) who are facing difficulties because of their blindness but could not afford any such kind of innovative technology and the reason is "COST".

Hence we are developing this innovative affordable solution called Calciamicus. Calciamicus consists of two units (shoe and cap unit) consisting of sensors, microcontroller, actuators etc. to detect the obstacle, its distance from user etc. Calciamicus is also using the GSM and GPS modules to ensure the safety of the person using it. The vibrators in the shoes and cap will continuously alert the visually impaired person about the obstacles in his/her way.

## 2. Literature Survey

### A. Paper I

The smart white cane is a pure mechanical device dedicated to detect static obstacles on the ground, holes, uneven surfaces, steps and other hazards via simple tactile force feedback. It can be folded in to a small piece and its light weight can be advantageous to carry around when not require. These simply designed canes are only capable of detecting below waistline obstacles. Haptic sensors and controller were emedded in the cane. Battery life was ten hours.

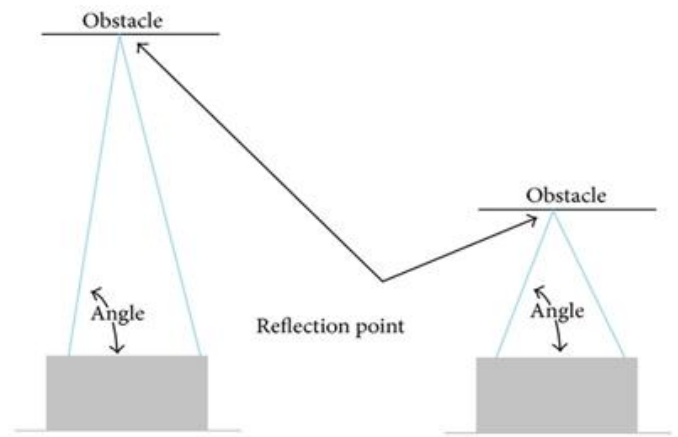
### B. Paper II

This paper showed the development of a detachable unit consisting of ranger, vibrator and microcontroller that could be mounted on the top fold of the white cane. The device employs directional ultrasound based ranging to detect obstacles in front or above knee height within a range of 3m. The user obtains distance information through vibratory stimuli which supplement the auditory cues emanating from the environment and those produced by tapping the cane. The module runs on a standard Li-ion rechargeable battery. For charging the user connects an AC or USB adapter (similar to charging a cell phone).

### C. Paper III

Here the developed model consisted of two units shoe and cane unit to guide the blind person. The sharp IR(Infrared) range finder fitted in the circuit placed in shoe circuit works by process of triangulation. A pulse of light (wavelength range of 850nm +/- 70nm) is emitted and then reflected back at an angle that is dependent on the distance of the reflecting object as shown in the figure below.

Bluetooth technology is also used for connecting the shoe and cane modules. PIC microcontroller processes the data of three Infrared sensors on the cane and shoe and gives output command to the voice chip to playback the pre-recorded message.



**Figure 1.** Reflection of light making different angles depending on the distance of the reflecting object.

### D. Paper IV

In this paper we found that shoes with cane are used as smart assistive device with bluetooth technology. Sensors used ultimately ping the user about the problem by the vibrations. Now the vibrations will be produced through another device which can be placed inside the pocket of the user. Arduino controller keeps polling the ultrasonic sensors. The advantage here was that the blind shoes can charge the battery by itself through kinetic generator pinned under the soles of shoes. The battery will be charged automatically when the user step.

### E. Paper V

This paper addressed the development of a model that consisted of two modules, shoe and cane unit. Both are integrated together, working as a single unit facilitated by "Bluetooth" connectivity and offers solution for orientation through digital compass. PIC microcontroller is used here as the commanding system. Rechargeable battery is used here which can last for approximately 12 hours. The advanced feature used here is the GPS(global positioning system) technology of the smart phone which will help to track the location of the visually impaired in case of any emergency.

## II. METHODS AND MATERIAL

### A. Hardware Requirements

1. Atmega16 microcontroller
2. Ultrasonic sensors (HC-SR04)
3. GSM-sim 900 Module



4. GPS Module(EM-410)
5. Vibrators
6. Voltage Regulator(3-terminal positive- LM78M05CDT)
7. Rechargeable battery-FG20121.

- ix. Trigger Input Pulse width: 10uS
- x. Dimension: 45mm x 20mm x 15mm
- xi. Pins

VCC: +5VDC

Trig : Trigger (INPUT)

Echo: Echo (OUTPUT)

GND: GND

**B. Hardware Specifications and features**

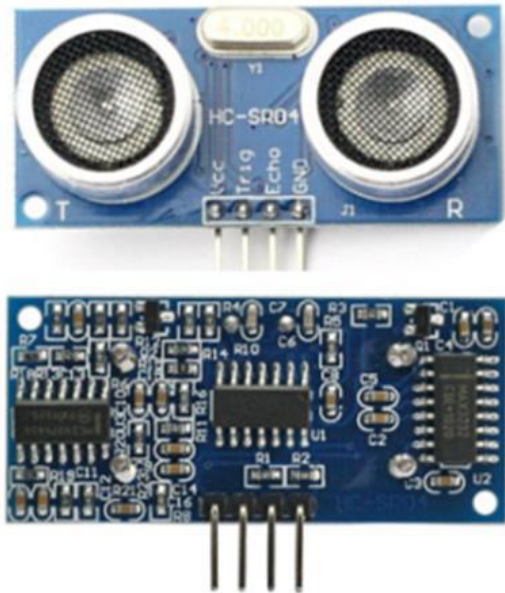
**1. Atmega16 Microcontroller**

- i. High-performance ,Low-power AVR 8-bit Microcontroller.
- ii. Advanced RISC Architecture - 131 Instructions - Most Single Clock Cycle Execution.
- iii. I/O and Packages
  - 32 Programmable I/O Lines
  - 40-pin PDIP, 44-lead TQFP, and 44-pad MLF.
- iv. Operating Voltages- 4.5-5.5V.
- v. Power Consumption at 4 Mhz, 3V, 35 °C
  - Active: 1.1mA
  - Idle Mode: 0.35mA
  - Power-down Mode: < 1µA.
- vi. 512 Bytes EEPROM - Programming Lock for Software Security.

The reason of using microcontroller is because they have the ability to store and run unique programs make it extremely versatile.



**Figure 2.** Atmega 16 Microcontroller



**Figure 2.** Ultrasonic sensors (front and back view)

The ultrasonic sensor is a robust and flexible sensing agent with relatively few limitations.

**3. GSM sim 900 Module**

- i. Power supply – 5V.
- ii. Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- iii. Low power consumption: 1.5mA(sleep mode)
- iv. Operation temperature: -40°C to +85 °C.
- v. InterfacePinDescription

Rst -- Reset the SIM900 module

P -- Power switch pin of SIM900 module

Tx--UART data output

Rx--UART data in

DT--Debug UART data output

DR--Debug UART data input

'-'—GND

'+'—VCC

vi) Current Consumption (pulse)-2000mA

Current Consumption (continuous)-500mA

vii) Baud rate115200bps.

**2. Ultrasonic Sensors**

- i. Offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. From 2cm to 400 cm or 1” to 13 feet.
- ii. It operation is not affected by sunlight or black material like Sharp rangefinders.
- iii. Power Supply :+5V DC
- iv. Quiescent Current : <2mA
- v. Working Current: 15mA
- vi. Effectual Angle: <15°
- vii. Resolution : 0.3 cm
- viii. Measuring Angle: 30 degree



**Figure 3.** GSM Sim 900 Module

4) GPS Module(EM-410)

- ✓ New improved GPS Module with external high-gain patch antenna and memory back-up for OEM and hobbyists projects.
  - ✓ This unit features low power consumption, high sensitivity.
  - ✓ The unit is ideally designed for navigation systems, distance measurements, vehicle monitoring and recording, boating direction and location, together with hiking and cross country exploring.
  - ✓ SiRF Star III high performance GPS Chipset
  - ✓ Very high sensitivity(Tracking Sensitivity:159dBm)
  - ✓ Extremely fast TTFF (Time To First Fix) at low signal level.
  - ✓ Supports NMEA 0183 and SiRF binary data protocol
  - ✓ Built-in SuperCap to save system data for rapid satellite acquisition.
  - ✓ External patch antenna with 27dB Gain
  - ✓ Acquisition Time, cold start 42 seconds
  - ✓ Includes Connecting Cable
  - ✓ Power Supply - 3.3Vdc
  - ✓ Dimensions - GPS: Length - 47mm , Width - 25mm, Height - 7.5mm
- Antenna: Length - 18mm , Width - 18mm, Height - 4mm.



**Figure 4.** GPS Module(EM-410)

5) Mini Vibrators

Minivibrators used in mobile phones are having leads are small and weak, so when we apply too much voltage across it, it would vibrate too much and break the leads. In addition, if it vibrates too much, it may be uncomfortable for the user. We limited the vibrator's output by outputting only if the output voltage would be less than  $50/255 \times 5V = 0.98V$



**Figure 5.** Minivibrators

6) Voltage Regulator

- ✓ Employs built-in current limiting .
- ✓ Thermal shutdown and safe-operating area protection
- ✓ Adequate heat sinking.
- ✓ Eliminate the noise.
- ✓ Output voltages of 5V,12V,and 15V possible.
- ✓ Line regulation  $7.2V \leq V_{IN} \leq 25V$ .

7) Rechargeable Battery

- ✓ Nominal Voltage 12V.
- ✓ Nominal Capacity 1.2Ah,20 hours rate.
- ✓ Maximum Charging current 0.3 A.
- ✓ Weight 0.60 kg
- ✓ Operative temperature range-20°C to 50°C.

**C. Software Used**

- A. Atmel studio 6.1 used for simulation.
- B. Embedded C coding language used for programming purpose.
- C. Eagle software used for PCB designing.

**III. RESULTS AND DISCUSSION**

**Comparison of the Existing And Proposed Technology**

**TABLE I**

Existing	Proposed
----------	----------

1.Includes Shoe and cane units which kept the hands busy of the blind person.	1.Shoe and cap units together work to alert the blind person keeping his/her hands free.
2.Some technologies had Only rechargeable batt - ery with no piezoelectric transducers.	2.Array of piezo electric generators are introduced for self power generation along with 12V rechargeable battery.
3.Bluetooth connectivity provide.	3..No Bluetooth connectivity provided
4.No facility of GSM.	4.GSM module provided.

**1. Working Principle**

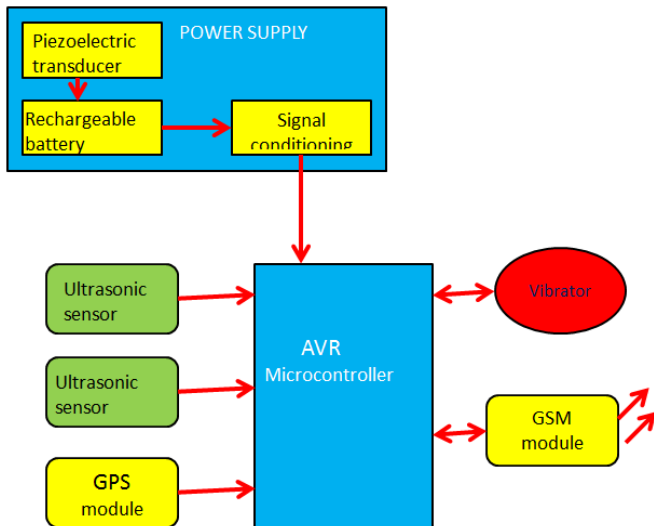


Figure 6. Block diagram of Calciamicus

**2. Obstacle Detection**

The Ultrasonic sensors installed on the outer surface of the shoes and cap play the vital role of obstacle detection. An electromagnetic wave is transmitted which strikes the obstacle in the surrounding area and returns back as an echo signal. This signal is received by the sensor which is given to microcontroller. Microcontroller produces appropriate signal which is given to the corresponding vibrator which in turn produces vibrations.

**TRACKING –**

The GSM and GPS modules installed play a significant role in tracking the visually impaired person’s location

and sending the required information i.e. address and distance information to the concerned person.

The GPS module with the help of satellite continuously keeps a track of the location (longitude, latitude etc.) on a timely basis. This information in case of an emergency is sent to the relative or friend of the blind person at home or some other location with the help of the GSM Module.

In emergency situations for vision impaired, this information helps tremendously.

**3. Hardware Implementation**

We have tried our best to keep the hardware implementation as compact as we can. The heart of the system is the microcontroller which has been mounted in the shoe unit. The sensors are placed over the shoe and cap surfaces as per the requirement. For the cap unit we have tried to fit the entire circuitry in to a compact box. The wirings are also placed such that they do not disturb the user.

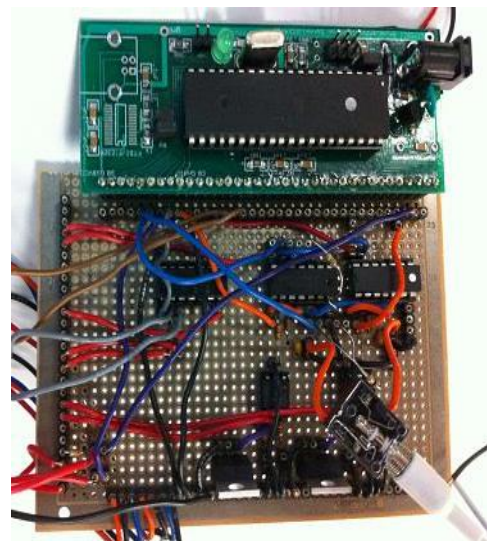


Figure 7. Shoe unit

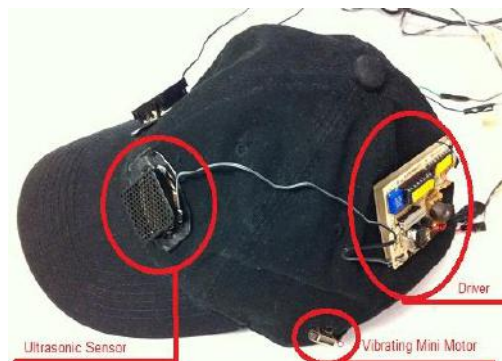


Figure 7. Cap unit

#### IV. CONCLUSION

It is found that the developed model's support system is accurately alerting the user about the obstacles coming in his/her way and the tracking system is also proving its appropriate function. Using this system the blind person bypasses every obstacle and reaches the desired destination.

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# Hand Gesture Recognition System for Blinds

**Prof. Devika Deshmukh, Ashlesha Bhandarkar, Shyam Chandak, Sarthak Patil,  
Shubhangi Gaikwad, Shivani Bhise**

Department of Computer Technology, Rajiv Gandhi College of Engineering & Research, Nagpur, Maharashtra, India

## ABSTRACT

A real time embedded system is used to interact with an external environment. This external environment may be humans, animals, plants etc. Hand Gesture Recognition System uses a sign language in the form of hand gestures to type the characters on computer screen. Blinds face many problems in their day-to-day life. The most critical of all the problems is their reading and writing. They cannot access computers independently because of difference in the communication medium. They use Braille script for reading and writing purpose, which cannot be interpreted by the existing computers. Also their existing technology is very expensive and not up to the mark. To overcome this problem, we have made a Hand Gesture System for Blinds. The sign language is designed according to Braille script. The six fingers represent the six dots in the Braille. The microcontroller interprets the gestures and sends the data to the computer. The computer recognizes the gesture and prints it on the display. The feature of text to speech is added to the module for error detection and correction purpose.

**Keywords:** Braille Script, Microcontroller, Flex Sensors, Hand Gestures, Combination Matrix, Text-To-Speech

## I. INTRODUCTION

There are many different technologies which are used by blind people for using computers. Many blind people use software's like speech to text. This software's uses speech for accessing or writing on computers. And also these software's are able to convert text to speech in which the things which are on computer are read by the software and the blind person can listen to it.

A hand gesture recognition system is used by the blind people to use a computer. With the help of the gestures, a person can directly write in computer without the help of any typewriter.

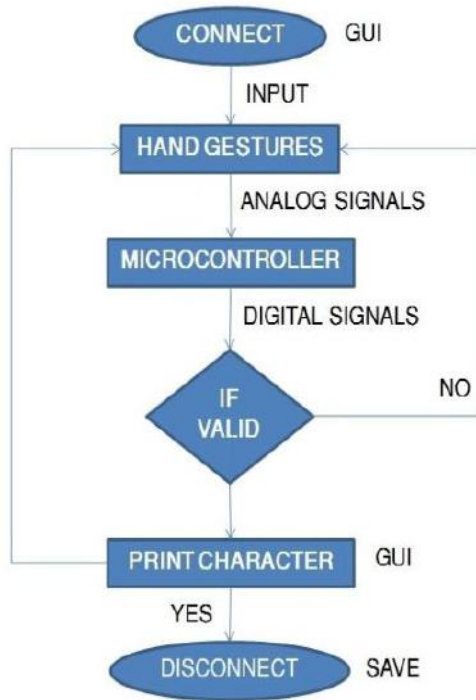
To represent a particular symbol in computer we used braille script. The flex sensor is attached to the gloves and the users wear those gloves. With the help of hand gestures, the analogue signal is transferred from flex sensor to the microcontroller. The microcontroller

receives these analogue signals and converts them into digital signals.

These digital signals are serially transferred to the computer for identifying letter or number. In this way, the user can write the letter in both English and braille font together very efficiently. To recognize errors an error recognition module is added to the project along with auto correct module. This software is very fast and saves more time and expenses as compared to the conventional typographical systems used by the blinds currently. The autocorrect module will correct the misspelled words.

## II. METHODS AND MATERIAL

### 1. Flow Chart



1

### 2. Working

The flex sensors are fixed in the gloves. The user has to wear those gloves and according to the degree of bend, the resistances of the sensors change. The resistance range of the sensors is between 250-350 kilo ohms without bending. After bending, the range is of about 45-150 kilo ohm. There are 8 sensors on eight fingers, excluding the thumbs. Each sensor sends its resistance in the form of analog signals. These values are converted into a string of 0's and 1's depending on the valid acceptance range. For example, if range for input "1" is below 125 k ohm, then the all the values below 125 are converted to a digital "1" others to "0". Each bit is assigned to a sensor input and two 0's are inserted in between for two thumbs. Thus a 10 bit string is generated for each character.

This string is then sent to the computer to compare with the pre-defined combination matrix. The character matching with the input string is printed on the user interface. The fonts present in the interface are both English and Braille script. The file is saved automatically and can be printed on the braille printer.

### 3. Description of Modules

#### A. Flex Sensors

Flex sensors are the sensor which is used to read the bending angle. Flex sensor change the resistance according to the bending angle. Flex sensors produce the analog signals and these signals are passed to the microcontroller to convert the analog signals into digital signals. Then microcontroller sends the signals to the GUI and corresponding alphabets will print on the screen.



Figure 2

#### B. Microcontroller

Microcontroller is used basically to convert the analog signals to digital signals. Then these digital signals are passed to the GUI and corresponding number or alphabet will print on the screen. Analog signal are converted into 10 digital bits. The string is serially passed to the computer and according to the combination matrix it will print on the GUI.



Figure 3

**C. GUI**

The GUI receives input from microcontroller through USB drive. Body of the interface contains 2 partitions in which left hand side prints English alphabets and right side prints the Braille language.

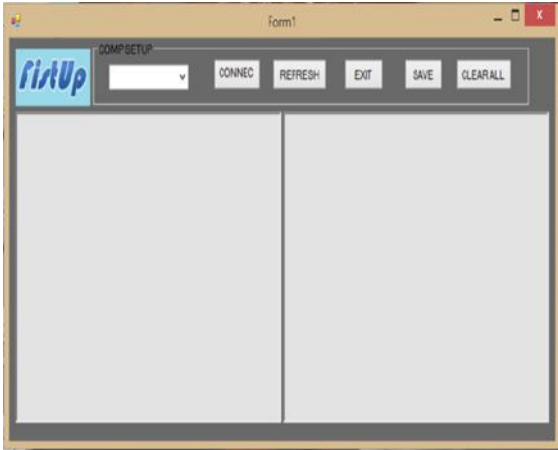


Figure 4

**D. Text-to-speech and Autocorrect**

In order to be able to know what has been written, a text to speech convertor has been added to the module. As the words get printed over the screen simultaneously it will be pronounced, so the user will be able to rectify the errors if autocorrect has written it in wrong way.

The detection of error and correction features will increase the accuracy of the system. It will make user more comfortable that user need not learn the spellings of each and every word. If it goes wrong then it will correct it.

**III. RESULTS AND DISCUSSION**

Output : Table no.1

Letter\N	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
A	0	1	1	1	0	0	0	1	1	0
B	0	1	1	1	0	0	0	0	1	0
C	0	1	1	0	0	0	0	1	1	0
D	0	1	0	0	0	0	0	1	1	0
E	0	1	0	1	0	0	0	1	1	0
F	0	1	1	0	0	0	0	0	1	0
G	0	1	0	0	0	0	0	0	1	0
H	0	1	0	1	0	0	0	0	1	0
I	0	1	1	0	0	0	1	0	1	0
J	0	1	0	0	0	0	1	0	1	0

**Future Work**

**1) Full automation**

The hand gestures can be created for full control over the system through hand gestures. This will give the visually impaired a complete independence to use a system. The user will be able to excess the computer through hand gestures, opening and closing of computer and computer applications can be done through the gestures.

**2) Digitalization of books**

It increases the speedy digitalization of books as they are available in softcopy format. For printing the hardcopy books it needs more time and Braille book requires more pages as compared to simple books

**3) Wireless module**

In order to make it portable device and easy to use, we can make it wireless. The user has to wear the sensor gloves and it has the microcontroller mounted on one of the gloves.

**IV. CONCLUSION**

In this paper we conclude that, the given system is quick and easy to access. It represent the use of hand gestures for writing purpose in easy method .Those gestures we used in the system have less possibility to cause error than any other method. The system is very cost effective and save time as compared to other typographical system for example their Brailier keyboard etc. The text to speech module also adds reliably to the system.

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# Simulation and Implementation of Three Phase Inverter in MATLAB software

S. S. Walke, R. S. Bansod, S. S. Meshram, S. G. Ganvir, P.S. Harinkhede, P. P. Khobragade, S. R. Verma  
Department of Electrical Engineering, DBACER, Nagpur, Nagpur, Maharashtra, India

## ABSTRACT

Nowadays an Inverter is most commonly used device in almost every field. An inverter gives ac square wave output. The objective of this paper is to obtain a three-phase ac output of 3-phase inverter in Simulation. An inverter receives dc supply as input and generates an ac output. The dc input of 3-phase inverter is obtained by constant dc source. The inverter circuit consists of six IGBTs which are used for conversion of dc to ac supply. Simulation of 3-phase inverter is done in MATLAB software.

**Keywords :** Three Phase Inverter, Constant Dc Source, MATLAB Software, Simulink.

## I. INTRODUCTION

An inverter is a DC to AC converter, used to convert a dc input voltage into a symmetrical ac output voltage of desired magnitude and frequency. The waveshape of output ac voltage of inverter should be sinusoidal. However, practical inverters give output voltage that are non-sinusoidal and contain harmonics. The waveshapes of output voltage are square, quasi-square or distorted sinusoidal. Inverters used in low and medium power applications normally give square or quasi-square wave output. However, in high-power applications sinusoidal waveform is required, so inverters are carefully designed to give sinusoidal output with low distortion.

The inverters are classified on the basis of nature of input source, type of commutation, configuration of circuit, waveshape of output voltage. Basically inverters are divided into two types - Voltage Source Inverter (VSI) and Current Source Inverter (CSI).

The dc voltage input to the inverter is provided by battery, fuel cell, solar cell or any other voltage source. The switching devices used in inverters include BJTs, MOSFETs, MCTs, SITs, GTOs, SCRs and IGBTs.

Inverters are widely used in various industrial and household applications such as ac drive (variable speed, ac motor controller), induction heating, stand-by power supplies, uninterruptable power supplies (UPS), battery-vehicles drives, regulated-voltage and frequency power supplies, ultrasonic wave generators, static VAR generators, active power line filters.

In inverters, a step is defined as the change of conduction from one controlled switch to another. For example, in one cycle of  $360^\circ$ , each step will be of  $60^\circ$  for a six-step inverter. This implies that each controlled switch of a six-step inverter will get a control pulse at interval of  $60^\circ$  in a proper sequence so that a three phase AC voltage is synthesized at the output terminals of the inverter.

There are two patterns of supplying the controlled pulses to the inverter switches. In one pattern each switch conducts for  $180^\circ$  and in the other, it conducts for  $120^\circ$ . In both these cases the control pulse is applied at an interval of  $60^\circ$  and these modes requires six controlled switches.

## II. METHODS AND MATERIAL

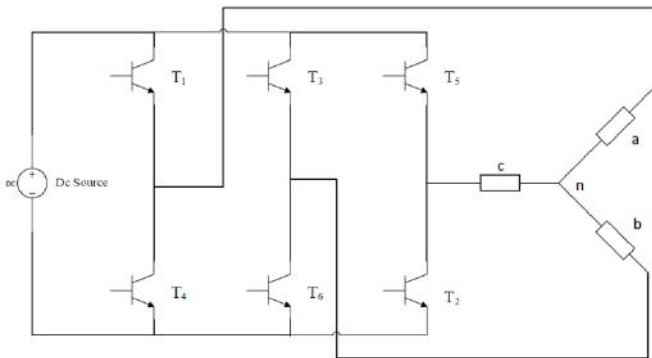
### A. Bridge Inverter

Bridge inverter are of two types:

1. Single phase bridge inverter
  - i) Single phase half bridge inverter.
  - ii) Single phase full bridge inverter.
2. Three phase bridge inverter

**Three Phase Bridge Inverter:**

The circuit arrangement of three phase bridge inverter is shown in fig (a). It employs six IGBTs which are arranged in three pairs, each is a half bridge. Thus three-phase bridge inverter is a combination of three half bridge inverters arranged side by side. The commutation circuit is not shown to maintain simplicity. The three phase bridge inverter is basically a six step bridge inverter. In a cycle (360o), firing of IGBTs in a particular sequence forms six steps. Therefore each firing is delayed by 60o from earlier firing.



**Figure 1:** Three Phase Bridge Inverter

There are two modes of operation for three phase bridge inverters:

- a. Three phase 1800 mode bridge inverter
- b. Three phase 1200 mode bridge inverter

**A. Three Phase 180° Mode Bridge Inverter**

In this mode of inverter, each IGBT conducts for 180o, and the IGBTs are fired at regular interval of 60o in a sequence. Referring to power circuit.

*Operation:* It is noted be that both IGBTs in an arm i.e. S1 and S4 or S3 and S6 or S5 and S2, should not be ON simultaneously, otherwise there will be short circulating of input dc source and capacitor. If S1 is fired first, it will conduct for 180o and then turn off. Other IGBTs in the same arm i.e. S4 must be fired after turning off of S1. Thus firing of S4 must be after 180o from the firing

of S1. The sequence of firing of IGBT is S1, S2, S3, S4, S5, S6, S1.....with an interval of 60o between two successive firing. The conducting IGBT in different steps are as follows.

**Table 1:** Switch Conduction period for 1800 mode

Steps	I	II	III	IV	V	VI
Conducting IGBT	T <sub>5</sub> T <sub>6</sub> T <sub>1</sub>	T <sub>6</sub> T <sub>1</sub> T <sub>2</sub>	T <sub>1</sub> T <sub>2</sub> T <sub>3</sub>	T <sub>2</sub> T <sub>3</sub> T <sub>4</sub>	T <sub>3</sub> T <sub>4</sub> T <sub>5</sub>	T <sub>4</sub> T <sub>5</sub> T <sub>6</sub>
$\omega t$	0 to 60°	60° to 120°	120° to 180°	180° to 240°	240° to 300°	300° to 360°
	0 to $\pi/3$	$\pi/3$ to $2\pi/3$	$2\pi/3$ to $\pi$	$\pi$ to $4\pi/3$	$4\pi/3$ to $5\pi/3$	$5\pi/3$ to $2\pi$

**B. Three Phase 1200 Mode Bridge Inverter**

In this mode, each IGBT conducts for 120o and the IGBTs are fired at regular interval of 60o in a sequence.

*Operation:* The firing sequence of IGBT is S1, S2, S3, S4, S5, S6, S1.....During conduction of S1, S2 each fired at 60o and S3 is fired at 120o and S4 fired at 180o. During this 60o interval, the commutation is ensured and possibility of short circuiting of source due to conduction of both the devices in same arm, is eliminated.

As each IGBTs conducts for 120o after firing, two IGBTs conduct during any step of 60o. The conducting IGBTs in different steps are as follows.

**Table 1:** Switch Conduction period for 1200 mode

Steps	I	II	III	IV	V	VI
Conducting IGBT	T <sub>6</sub> T <sub>1</sub>	T <sub>1</sub> T <sub>2</sub>	T <sub>2</sub> T <sub>3</sub>	T <sub>3</sub> T <sub>4</sub>	T <sub>4</sub> T <sub>5</sub>	T <sub>5</sub> T <sub>6</sub>
$\omega t$	0 to 60°	60° to 120°	120° to 180°	180° to 240°	240° to 300°	300° to 360°
	0 to $\pi/3$	$\pi/3$ to $2\pi/3$	$2\pi/3$ to $\pi$	$\pi$ to $4\pi/3$	$4\pi/3$ to $5\pi/3$	$5\pi/3$ to $2\pi$

**B. Insulated Gate Bipolar Transistor (IGBT)**

The Insulated Gate Bipolar Transistor (IGBT) is a power switching device that combines power MOSFET and bipolar technology to provide the circuit designer with a device that has power MOSFET input characteristics and bipolar transistor (BJT) output characteristics. An IGBT is basically a hybrid MOS-gated turn on/off bipolar transistor that combines the attributes of MOSFET, BJT and thyristor. An IGBT is gate turn off power semiconductor device whose electrical characteristics approach those of an ideal switch.

*Why IGBT not SCR:*

1. An IGBT is a voltage controlled device, the gate voltage controls the conduction. The SCR is a current control device, the gate current causes turning on of device.
2. After turning on IGBT it is not stay into ON state. Gate voltage is required to maintain it on. If gate voltage is removed it will turn off. In SCR, once it is turned on, even if gate current is removed, it remains in ON state.
3. On state voltage drop of IGBT (2-3 V) is greater than SCR(1.5-2.5 V).
4. The turn-on di/dt rating of IGBT is very high as compare to that of SCR.
5. The turn-on time of IGBT is less than that of SCR.
6. The turn-off time of IGBT ( $<2\mu\text{sec}$ ) is much less than SCR (200 $\mu\text{sec}$ ).

**III. RESULTS AND DISCUSSION**

In this MATLAB Simulation, we have made a three phase inverter by using IGBTs for inverting action. A constant DC Voltage Source is given at the input of the inverter.

There is one leg for each phase. Each leg consist of two IGBTs each conducting for 180°. Thus the total circuit contains 6 IGBTs.

IGBT have property of conducting only if the gate signal is given to it. It will not conduct if gate voltage supply is removed from it. So we have given the gate signals to each IGBT in each leg such a way that there will be only one IGBT in one leg conducting at a time. If both IGBTs of one leg turn on at same time there will be possibility

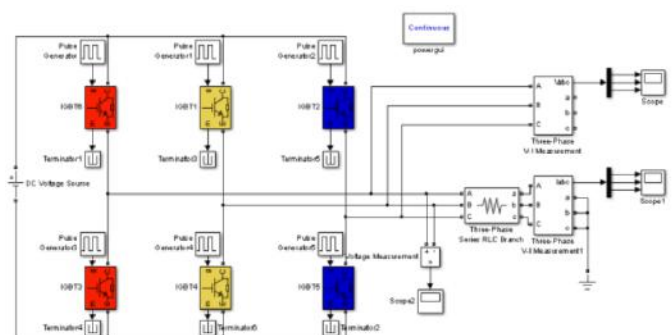
of short circuit. We used Pulse generator for supplying the gate signal to each IGBT.

Each IGBT have separate pulse generator connected to it. So total 6 Pulse generators are used in this circuit.

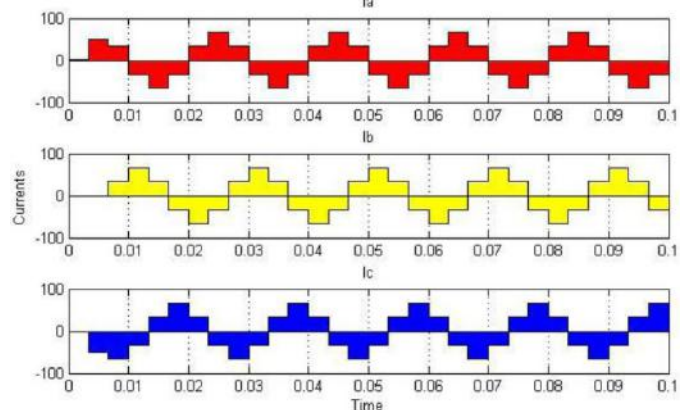
The Supply given is 415 volt DC supply. The load is star connected resistive load. The conduction mode is 180° conduction mode.

The numbering to each IGBT is given according to their switching sequence.

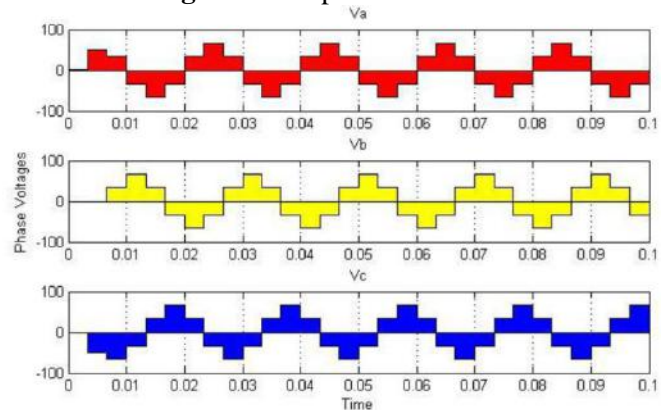
**A. 180° mode Conduction**



**Figure 2:** Simulation of three phase Inverter



**Figure 3:** Output of Currents



**Figure 4:** Output of Phase Voltages

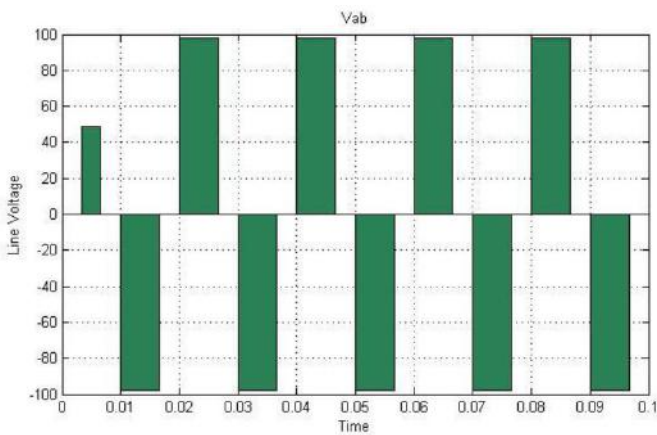


Figure 5: Output of Line Voltage

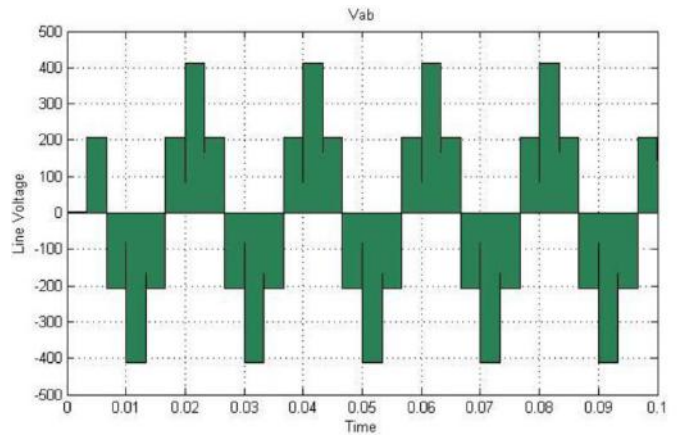


Figure 9: Output of Line Voltage

**B. 1200 mode Conduction**

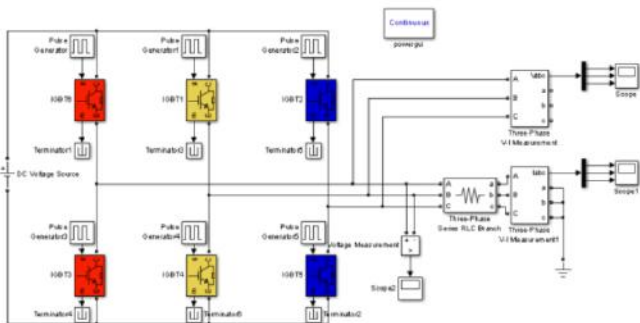


Figure 6: Simulation of three phase Inverter

**IV. CONCLUSION**

The simulation of the three phase inverter has carried out. Simulation was done in two modes of operation where load is star connected resistive and the outputs of phase voltage and currents are same.

**V. REFERENCES**

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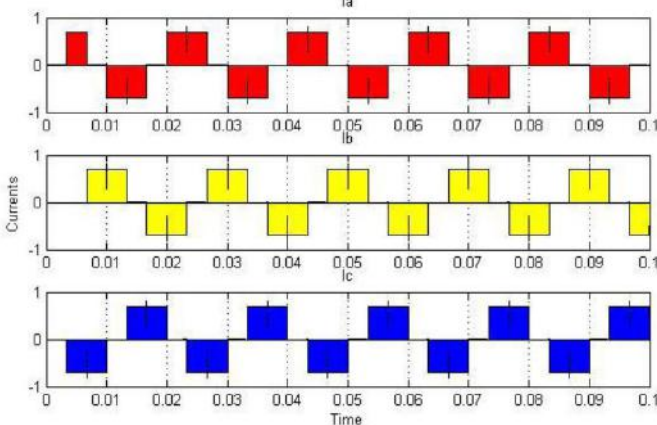


Figure 7: Output of Currents

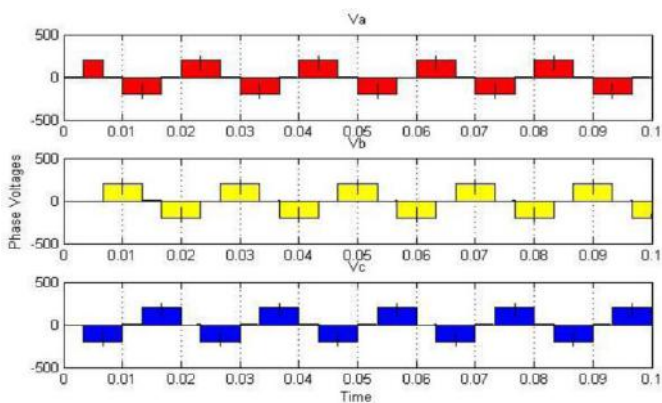


Figure 8: Output of Phase Voltages



# Comparative Study of Data Compression Techniques

Supriya Gabhane<sup>1</sup>, Songa Bhattacharyya<sup>2</sup>, Snehalata Shende<sup>3</sup>

<sup>1,2,3</sup>Department of Electronics & Telecommunication, S. B. Jain Institute of Technology Management & Research, RTMNU,  
Nagpur, Maharashtra, India

## ABSTRACT

Source Coding is used to reduce the redundancy for transmission of data. This leads to need for 'data compression' that is, which requires less storage with high transfer rate. Thus the cost of storage hardware and bandwidth decreases. The paper deals with the number of data compression techniques named Huffman Coding, LZ coding and Shannon-Fano Coding and these coding are used for lossless data compression. Lossless data compression techniques regenerate the original data from the compressed file. The paper provides a detail survey and comparison of the different lossless data compression techniques.

**Keywords :** Lossless Data Compression, Huffman Coding, L-Z W, Shannon- Fano Coding.

## I. INTRODUCTION

In today's era of technological advancement, there is demand for multimedia that has made the use of wireless data occur frequently (i.e. redundancy). The transmission of such data requires a lot of bandwidth and for its reliable communication. The limited accessibility of these requirements is constraints in the reliable design and efficient communication system. Thus, the technique of data compression is used. This technique is used for transmission of the required information and to reduce the redundancy of the data. The conversion of source (i.e. analog signal) into digital or binary form (i.e. binary code) is called as source coding. This technique also reduces the size of the data & transmits it more efficiently whereas in channel coding the size of the data is increased by adding redundant bits. The source encoder does the process of conversion from analog to digital. The source encoder will get the input from the original source (which is generally analog signal) and the output of the source encoder is in digital form. Thus, source encoder does data compression. Data compression is also known as source coding or bit-rate reduction. There are two types of data compression techniques namely Lossy and Lossless.

## II. METHODS AND MATERIAL

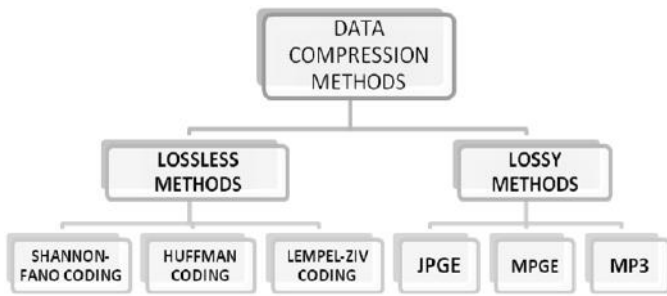
### 2. Compression Techniques

In compression, the original data is recovered back when we restore it. There are two types of data compression techniques. They are as follows:

- Lossy Compression.
- Lossless Compression.

#### 2.1 Lossy Compression

It describes coding algorithms that are characterized by an irreversible loss of information. Only an approximation of the original source data can be reconstructed. Lossy coding is the primary coding type for the compression of speech, audio, picture, and video signals, where an exact reconstruction of the source data is not required. In this technique, the data is not restored back to 100% of the original signal. In lossy compression, the data is permanently lost especially the redundant data but the user may not notice it. For example, the Joint Photographic Experts Group (JPEG), which is an image format, uses this type of compression technique.



**Figure 1.** Block diagram of Data Compression

**2.1 Lossless Compression**

It describes coding algorithms that allow the exact reconstruction of the original source data from the compressed data. Lossless coding can provide a reduction in bit rate compared to the original data, when the original signal contains dependencies or statistical properties that can be exploited for data compaction. It is also known as noiseless coding or entropy coding. Lossless encoding methods guarantee to reproduce exactly the same data, as was input to them. In lossless compression every single bit is restored back to get the same data which was transmitted at the transmitter side. For example, the Graphics Interchange File (GIF), which is an image format, uses this type of compression technique.

**3. Lossless Compression Techniques**

There are three types of lossless compression techniques they are as explained below:

**3.1 Shannon Fano Coding**

Shannon–Fano coding is named after Claude Shannon and Robert Fano, is a technique for constructing a prefix code based on a set of symbols and their probabilities (estimated or measured). It was invented in 1949. It does guarantee that all code word lengths are within one bit of their theoretical ideal. This is one of the three earliest technique for data compression that was invented by Claude Shannon & Robert Fano in 1949. In this technique a binary tree is generated that represents probabilities each code symbol occurring. The symbols are encoded in a way such that the most frequent symbol appears at the top of the tree and the least likely symbols appear at the bottom. An efficient code can be obtained by the following procedure **Algorithm:**

**Step 1:** For given list of symbols, develop a corresponding list of probabilities or frequency counts so that each symbol’s relative frequency of occurrence is known.

**Step 2:** Sort the list of symbols according to the frequency, with the total frequency with the most frequently occurring symbols at the left and the least common at the right.

**Step 3:** Divide the list into two parts with the total frequency counts of the left part being as close to the total of the right as possible.

**Step 4:** The left part of the list is assigned the binary digit 0, and the right part is assigned a digit 1. This means that the codes for the symbols in the first part will all start with 0, and the codes in the second part will all start with 1.

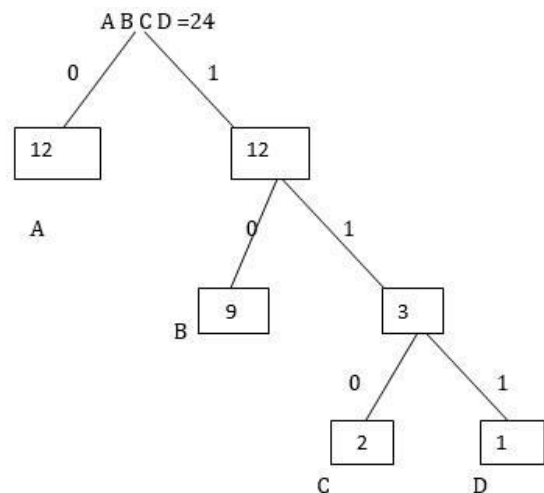
**Step 5:** Recursively apply the step 3 & 4 to each of the two halves, sub diving groups and adding bits to the codes until each symbol has become a corresponding code leaf on the tree.

For Example, Let us consider a data stream as given below:

Source Stream:

ABBBAAAABCABAACBBABBDAAA

Source	A	B	C	D
Frequency	12	9	2	1



Source	Code
A	0
B	10
C	110
D	111

No. bits required for uncompressed data:  $24 * 8 = 192$  bytes  
 No. bits required for compressed data :  $9 * 8 = 72$  bytes

### 3.2 HUFFMAN CODING TECHNIQUE

Huffman Coding was named after its inventor, David Huffman in year 1950 while he was student in MIT. In general, Huffman coding results in optimum code. Thus, the code has the highest efficiency.

The symbol occurring more number of times will have least code as compared to that of the symbol, which does not, occur more number of times. The symbol that occurs same no of times will have same length. In general, Huffman coding results in an optimum code. Thus, the code has the highest efficiency. The Huffman encoding procedure is as follows:

**Step 1:** Put all the nodes sorted order of their frequencies/ probabilities.

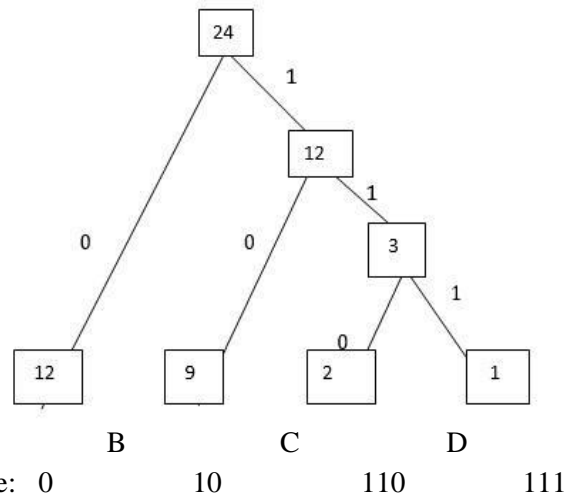
**Step 2:** Repeat the following steps until we are left with a single node.

- (i) From the sorted list pick two nodes having least frequencies/ probabilities and create a parent node of them.
- (i) Assign the sum of children's frequencies/ probabilities to the parent node and insert it into the list in such a way that its order is maintained.
- (ii) Delete the children node from the list.

**Step 3:** Assign code 0, 1 to the two branches of the tree on the path from the root.

For Example, Let us consider a data stream as given below:

Source Stream:  
 ABBBAAAABCABAACBBABBDAAA



A                      B                      C                      D  
 Code: 0                      10                      110                      111

No. bits required for uncompressed data:  $24 * 8 = 192$  bytes  
 No. bits required for compressed data :  $9 * 8 = 72$  bytes

### 3.3 Lempel-Ziv Coding Technique

Terry Welch created the Lempel- Ziv-Welch (LZW) algorithm in 1984. It removes the characters, which occurs more no of times in the output (i.e. redundant character) and includes every character before starting compression and employees other techniques to improve compression.

#### Lempel Ziv Coding Algorithm

- Step 1:** Initialize the dictionary to contain all blocks of length one ( $D=\{a, b\}$ ).
- Step 2:** Search for the longest block **W** that has appeared in the dictionary.
- Step 3:** Encode **W** by its index in the dictionary. **Step 4:** Add **W** followed by the first symbol of the next block to the dictionary.
- Step 5 :** Go to Step 2.

For Example, Let us consider a data stream as given below:

Source Stream:  
 ABBBAAAABCABAACBBABBDAAA

Source	A	B	C	D
Frequency	12	9	2	1

Numeric Position	Sub-Sequence	Codes
1	A	A
2	B	B
3	BB	2B
4	AA	1A
5	AAB	4B
6	C	C
7	AB	1B
8	AAC	4C
9	BBA	3A
10	BBD	3D
11	AAA	4A

No. bits required for uncompressed data:  $24 * 8 = 192$  bytes

No. bits required for compressed data :  $19 * 8 = 152$  bytes

### III. CONCLUSION

In this paper we compared three techniques of data compression and we concluded that Shannon-Fano technique and Huffman Coding Technique is more efficient than Lempel-Ziv Coding Technique. In the example given in the paper Lempel – Ziv Technique requires maximum number of bits for transmission than that of Huffman Coding Technique and Shannon – Fano Coding Technique and gives better results.

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# Reduction of Manufacturing Lead Time in Semi-Automated Industry Using Value Stream Mapping

Neha Badole, Sakshi Supsande, Swati Sahu, Kalpanish Kothari

Department of Mechanical Engineering, RTMNU, Nagpur, Nagpur, Maharashtra, India

## ABSTRACT

Lead time is the time taken from initiation to the end of the procedure. Therefore, in order to get a higher productivity rate the lead time required by the product should be minimized. For this purpose, value, and non-value added elements in the process should be known. Value Stream Mapping, being the most efficient lean manufacturing tool, used in the industries, helps to get into the core detail of the procedure. This paper shows the study done to identify and eliminate the non-value added elements. Current State mapping is made to show the existing layout of the plant and the problems caused due to it. Future state mapping is made to show the corrections made in the current state. Adding to this, small Kaizens were also performed wherever necessary.

**Keywords:** Lead Time, Lean Manufacturing, Current State Mapping, Future State Mapping, Kaizen

## I. INTRODUCTION

In the era of high competition, the companies demand for high productivity rate. For that purpose, it is mandatory to reduce manufacturing lead time of the product. To identify the waiting time which is responsible for the increase in lead time, the most effective tool used is Value Stream Mapping. Value Stream Mapping is a tool used to analyze the product flow in the current state map and thereby making the future state map. It helps to identify the value added and non-value added activities which eventually add up to the lead time. The various tools under VSM not only makes it easy to identify and eliminate the unwanted time and methods involved in the production system but also informs about the process flow, number of operators involved in the same. That is why the company using VSM Methodologies are benefited in terms of cost and productivity than those companies who are not.

## II. METHODS AND MATERIAL

For implementing VSM, we need to set up a journey starting from current state VSM. Current state VSM includes the current process flow, analysis of time required for all the procedure and rectifying the wastage. Later a Future State VSM is implemented by correcting the flaws in the current one. The various steps involved for performing VSM under our project were:

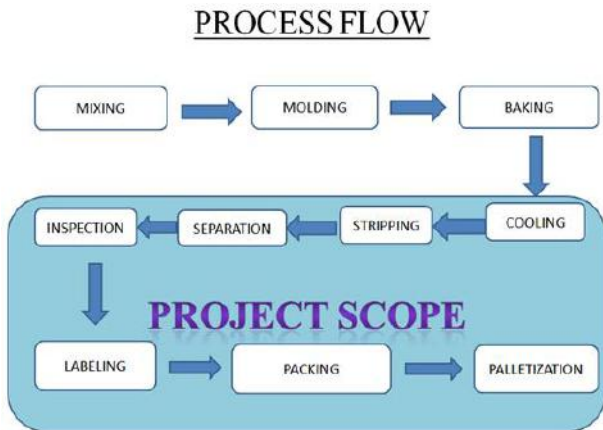
### Step 1: Product Selection.

The product selection criteria for the project are as follows:

- a) Manufacturing Lead Time was quite high for the product.
- b) Number of orders was also the most for the product.
- c) Sale value of the product was quite high since it was the leading product of the company
- d) Frequency of the product was regular
- e) On time in full, i.e., it is the measure whether the company is committed to its customer, was fulfilled.

**Step 2: Analysis of Process flow and sharing macro targets.**

This step includes defining the current flow and analyzing the constraints and performances in the process. Also the handling operations, lead time were analyzed and the small targets were set up. In this step the current state VSM was also prepared as shown in the fig. and the lead time required in the actual process was also prepared.



**Figure 4.** Process Flow of the Industry

**Step 3: Restore Basic Conditions**

In this step the layout of the plant were changed in order to have a smooth and efficient process flow and hence the WIP (Work In progress) does not get hinder. Initial cleaning and stream lining was done and analyzed and accordingly corrections were performed. Also in this step 5 WHY analysis was conducted to ensure that the work was properly implemented.

**Step 4: Develop a Flow Management System**

After analyzing the process flow and lead time in the working procedure, a definite flow process was developed which defines a minimum lead time and a proper management system which would be better for the industry to use. Adding to this several anomalies related to the process flow were also eliminated and the countermeasures were implemented.

**FLOW MANAGEMENT PROCEDURE**

Flow Management Procedure					
	Cooling	Stripping	Separation	Visual & Physical Inspection	Packing
<b>What</b>	Movement of material from oven to the cooling area	Movement of stands for stripping from cooling zone	Movement of stack of wheels on conveyor	Inspection of wheels for visual defects & physical inspection on sampling bins	Labeling and packing of wheels
<b>Why</b>	To cool stands (up to room temperature) for separation.	To de-laminate rods	For separation of wheels and separator plates	To check for compliance of the products wper quality standards before sending to customers	To ensure safe storage and delivery of material. To respect delivery dates & to avoid sale loss due to unavailability of the material to customer
<b>Who</b>	Including operator	Stripping operator	Separation operator	Quality Inspector	Packing operator
<b>Where</b>	Cooling zone	Stripping machine	Separation Area	Inspection Area	Packing Area
<b>When</b>	After oven cycle completion	After stands attain room temperature	After stripping	After separation	After inspection of the material
<b>How</b>	* By 60FT when the material is baled properly * Material is kept in defined area & allowed to cool naturally	* Done on machine by operator * when the material is cooled * Risk to be ensured during stripping * One stand at a time of 180 pcs	* Manually on conveyor * When rods are de-laminated * FIFO to be ensured during separation * One stand at a time of 180 pcs	* Material is kept on conveyor line manually after separation * Inspection is done as per Quality Standards & limit samples * OK material is processed further * Rejected materials kept separately	* Ensure proper packing material is used for packing * Quality standards are followed for packing * Ensure correct material qty is put in the packing boxes * By HCP? after the material is packed completely on pallet

**Figure 4.** Proposed Flow Management Procedure

**Analyse Performances & Constraints**

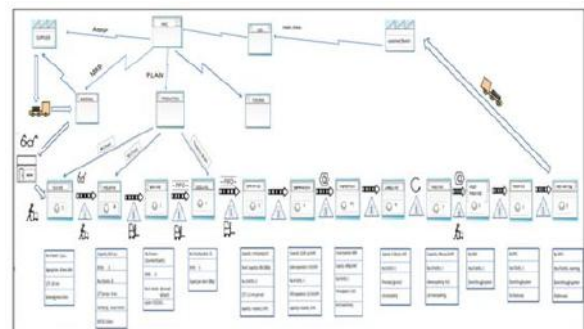
Process	Lead Time (Min)	Value Added Time (Min)	Flow Index	Constraints
Mixing	120	120	1.0	
Molding	520	480	1.1	
Pressing	600	600	1.1	
Clamping	390	390	1.1	
Oven Loading	300	30	30.0	Delays due to other material loading, oven availability, stacker unavailability
Baking	1380	1380	1.0	
Oven unloading	40	20	2.0	
Cooling	840	360	2.3	inefficient cooling, FIFO not followed, lack of training.
Stripping	2460	240	10.3	Material movement to longer distances, heavy load, manual handling, operator shifting to other machine.
Visual Inspection	400	120	5.0	Unavailability of inspector, material waiting for keeping on conveyor line.
Sampling Inspection	45	10	4.5	Manpower unavailability, time spent in M-check searching.
Performance Testing	1440	1440	1.0	Unavailability of inspector, initial stock, trial material.
Packing	660	150	4.4	Labels not available, delay due to other material on line.
Post Packing	720	10	72.0	Pending work due to absenteeism.
Shipping Acknowledgement	720	20	36.0	Only once in a day at 9:30 am
<b>Total Time (Min)</b>	<b>10865</b>	<b>5320</b>	<b>2.04</b>	
<b>Total Time (Days)</b>	<b>7.5</b>	<b>2.7</b>		

**Figure 4.** Minimum Lead Time Calculated

**Step 5: Standardize**

In this last step the lead time of Current state and Future State was compared and successfully implemented. Also a standardize procedure was step for the company to follow for reduced lead time. This step also includes the things known by the operators and workers, current inventory handling, lead time for each and every process, manufacturing orders and processes, variations in the process and quality standards in order to satisfy the customer's needs.

**CURRENT STATE VALUE STREAM MAP**



**Figure 4.** Current State Value Stream Map

### III. RESULTS AND DISCUSSION

According to the project it was clear that the lead time was increasing after cooling zone to palletization. That is why mainly these areas were in focus. Also in these areas the wastes mainly the SEVEN wastes were tried to reduce since these waste leads to increase in lead time. The push and pull system, Milkrun and Just in Time, KANBAN concepts were implemented in current state VSM. In addition to these, KAIZEN was done at every step of procedure just to ensure the improvement is carried out in the next step. The flow index of every procedure was improved than the previous one. Data Collection mechanism, data monitoring and data flow system was properly executed. All the above concepts together were beneficial in reducing the waste and lead time, eventually increasing the productivity.

### IV. CONCLUSION

The clear picture provided by the current state VSM helped to make corrections in the same and transform it to a future VSM. It can be seen that the lead time was reduced from 7.5 to 6.6. The successful future state VSM depicts the reduction in the time waste which was caused due to unwanted activities and resources. In the future state vsm it was seen that the lead time was reduced. The overall aim of the project was to reduce the lead time enhance the quality of the product flow, and a proper material handling process. The total layout of the plant was changed using many concepts. Mainly the concept of FIFO (First In First Out) was cleared among the workers. In short, the objectives of Lean Manufacturing was achieved.

### LEAD TIME STUDY

Process	Lead Time (Min)	Value Added Time (Min)	Flow Index
Mixing	120	120	1.0
Ageing	520	480	1.1
Pressing	630	600	1.1
Clamping	390	360	1.1
Oven Loading	300	10	30.0
Baking	1380	1380	1.0
Oven unloading	40	20	2.0
Cooling	600	360	1.7
Stripping	1440	240	6.0
Visual Inspection	540	120	4.5
Sampling Inspection	45	10	4.5
Performance Testing	1440	1440	1.0
Packing	660	150	4.4
Post Packing	720	10	72.0
Shipping Acknowledgement	720	20	36.0
<b>Total Time (Min)</b>	<b>9545</b>	<b>5320</b>	<b>1.79</b>
Total Time (Days)	6.6	2.7	

Total time  
2370 min  
(1.64 days)

Figure 5. Final Lead Time

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# Efficiency Improvement Methodologies in the Field of Agriculture

Nawaj T Sheikh, Vikki A Kherde, Trupti D Bankar, Prof P. Rajurker

Electrical Engineering Department, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur Institute of Technology, Nagpur, Maharashtra, India

## ABSTRACT

Today's era is proceeding towards the rapid growth of all sectors including the agriculture sector. In order to meet the future food demand, farmers have to implement new techniques which will not affect the field but will increase the overall food production. The comparison between the traditional method and the new proposed machine which can perform a number of simultaneous operations and has a number of advantages. A system with high speed of operation for an advanced automation in agriculture process which includes number of operation i.e. seed sowing, fertilizing and spraying [1]. The main source to drive the model by using solar energy and domestic 230volt supply for purpose of charging the battery. Embedded C language programming is used in microcontroller. The machine is controlled and it monitors the process of system motion of machine with the help of DC motor. The rates of control of seed sowing, fertilizing and spraying are supervised by microcontroller.

**Keywords:** Microcontroller, dc motor, automation, embedded c language.

## I. INTRODUCTION

Indian economy mainly depends on agriculture system and there is very much necessity to make the system efficient. Now a day's population is increasing day by day then there is need of a lot of food crops to satisfied today's population. There is a need of a new technology in agriculture field. Farmers spend lots of money on machines that help them to increase the yield of crops. There are various machines that are available for seed sowing, spraying and fertilizing etc. However these machines have to be manually operated to perform the required operation and moreover separate machine are used for every function. The yield and profit returns from employing this machine are very less as compared to the investment. Automation is the ideal solution to overcome all the above mentioned shortcoming by Creating machine that perform more than one operation and automating those operation to increase Yield on the large scale. Therefore this is the time to automate this field to overcome above mentioned problems, we introduced new technology i.e. DC Motor Based Agri-

Smart Machine. We used non-conventional solar panel to avoid the shortage of electricity to the agriculture field and provided a battery to store a power from non-conventional solar panels. The innovative idea of our project is to automate the process of digging the soil, seed sowing, fertilizing and spraying on the crops seed are automatically done by using dc motor and the distance between the two seeds and flow control by using microcontroller. Also the project consists of sprayer which can be helpful in reducing the wastage of fertilizer. The ON and OFF of the sprayer can be control by microcontroller. When machine reaches the end of the field it can automatically change the direction .This whole process is controlled by microcontroller programming.

## II. METHODS AND MATERIAL

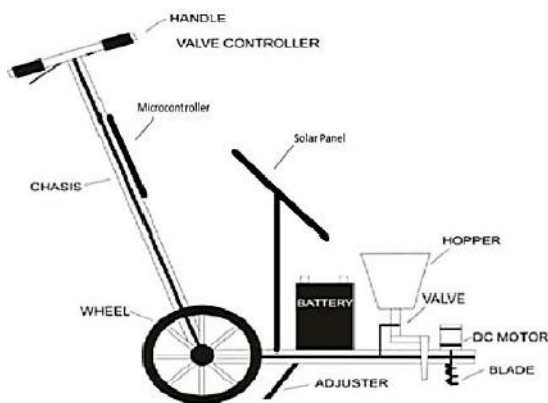
### A. Solar Power Seed Sowing Machine

This solar powered seed sowing machine basically works on the 'vertical discontinuous work principle'

which refer to the vertical movement which can be followed by an individual body in an agriculture field and implements its discontinuous action in relation to the horizontal line of work<sup>[5]</sup>. First a hole is drilled with the help of drill land bit. This runs with the help of motor. This is directly connected to the DC battery. This is directly connected to the solar panel through which it gets charged. This motor is controlled by microcontroller with help of which it can be started and stopped and it can control the clockwise and anticlockwise motion of the motor. For dropping the seeds using hopper which is mounted behind the motor and level arrangement is provided on handled when the leaver is pressed seed will be drop automatically from hopper travel into a pipe attached to it and drop in hole. An adjustable iron plate is fitted inside of machine. Which will collect soil and covered the land which is drilled. In this way seed sowing is done with this machine.

**Drawbacks:**

This machine is operated manually and performs only one operation i.e. seed sowing. System is bulky and in rainy season as the absence of sun the machine will not operate.



**Figure 1.** Solar Power Seed Sowing Machine

**B. Backpack (knapsack) sprayer**

One type of backpack sprayer is a compressed type air sprayer with harness that allows it to be carried on the operator’s back<sup>[4]</sup>. Another type of backpack sprayer has a hand operated hydraulic pump that forces liquid pesticides through hose and one or more nozzles. The pump is usually activated by moving the leaver. A mechanical agitator plate may be attached to the pump

plunger. Some of these sprayers can generate a pressure of 100 pounds per square inch (PSI) or more. Capacity of both these types of backpack sprayer is usually 5 gallons or more.



**Figure 1.** Backpack (knapsack) sprayer

**Drawbacks:**

It is operated manually. In these spraying, the labor has to carry all the weight of the pesticides filled tank which causes fatigue to labor and hence reduces the human capacity.

**C. Solar E-bot**

Solar E-bot means simple eco-friendly agriculture robot, which runs on solar energy. It is a 4 wheeled unmanned vehicle which can move in a linear direction<sup>[2]</sup>. All the operation i.e. weed removing, fertilizer sprayer and pest controller are work independently. The robot employs mobile application system to guide the robot along the rows and perform the task accurately. The sprayer motor pumps the fertilizer from the tank and sprays both the side of field with adjustable nozzles. The solar energy stored in DC battery which is connected to the robot. The microcontroller control or monitor the operations i.e. weed removing, fertilizer sprayer and pest controller and also control the movement or motion of robot by providing RF signal by user.

**Drawbacks:**

Absence of sun or rainy season robot will not work. Due to large size of robot it required more space to perform operations.



**Figure 3.** Solar E-bot

### III. RESULTS AND DISCUSSION

#### 1. Proposed Work

##### A. PV Panel

Solar panel is used to convert sun light into electricity (DC). Solar cell consisting of two layers of semiconducting material (PN type). The working principle of today all solar cells is based on photovoltaic effect means the generation of a potential difference at the junction of two different materials in response to other radiation” A solar cell is a solid state electrical device (PN junction) that converts sun light directly into electricity<sup>[3]</sup>. The process of conversion first requires a material which absorbs the solar energy (photon) and then raises an electron to higher energy state, leading flow of these high energy electrons to an external circuit. Silicon crystal mostly used material for this process. When the solar panel is manufactured, the PV cells are connected together in series. The output voltage depends upon the number of cell in the series and output voltage depends on the efficiency of the cells and size and area of the cell in the panel.

##### B. Battery (Seal Lead Acid Battery):

The battery is used to store electrical energy in the form of chemical energy and time of delivering in the form of electrical energy. This battery use store energy to drive the assembly or system.

#### C. Microcontroller: (89C51):

The microcontroller 89C51 is low power, high performance c-mos, 8 bit controller 40 pins with 4 kb PEROM (programmable erasable read only memory). The microcontroller having four ports namely P0, P1, P2 and P3. Each port having 8 pins i.e.Po1-Po7 similar for all ports. This four ports having 32 pins and they are used as input as well as output ports. In this microcontroller we can write and erase the data or program 1000 times. It has highly flexible and easily interface with computer.

Pin functions:

Pin no.9- Reset.

Pin no. 18 & 19- (XT<sub>1</sub> & XT<sub>2</sub>)

The crystal oscillator is connected across these two pins and generates clock frequency up to 24 MHz

Pin no. 20- Ground.

Pin.no.29-

PSEN (Program Store Enable):

Which holds external ROM program code

Pin no. 30-

ALE (Address Latch Enable):

It is used for de-multiplex the address and data bus.

Pin no. 31-

EA (Enable Access):

It is used for store and erase program from memory.

Pin no. 40-

Vcc (+5v) for operation.

#### 2. Advantages of Proposed System Over Previous Model

- A. Less hardware involve: This proposed system consist of less hardware as compared to the previous model. Hence it is compact as compared to previous system and make less bulky.
- B. Cost efficient: This proposed system has more cost efficient than the previous system this claim is made on the fact that the proposed system does not need the heavy and expensive hardware for implementation.
- C. Perform number of operations: This proposed system is performing number of operations as compared to previous system. The previous system does not perform more than two operations and

proposed system performs more than two operations  
i.e. digging, sowing, fertilizing, spraying etc.

#### IV. CONCLUSION

In this project we have made an effort to overcome some problems in agriculture field and reduce the investment cost and increase the profit and food production. By implementing this project in the field of agriculture we can help the farmers at the initial stage of agriculture i.e. digging, seed sowing, fertilizing and spraying. This project is very useful for the farmers who are intended to do agriculture activity but facing the serious problems.

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# Evaluation of Techno-Economic Aspects of Mechanized Cotton Harvesting Process

Prof. P. S. Nerkar, V. S. Gautam, M. M. Bedekar

Department of Mechanical Engineering, St. Vincent Pallotti College of Engineering & Technology, Nagpur, Maharashtra, India

## ABSTRACT

Cotton is one of the most important crops throughout the history of India and it also plays an important role in social and economic aspects of the Indian society in the present age. Recent technological advances and trade liberalization have made India a major player in international cotton markets. The overall objective of this paper is to assess the competitiveness of Indian cotton producers and potential implications for India as a competitor in the world cotton market if it mechanizes harvesting of cotton. The study reveals that the net income of the Indian cotton farmers will increase considerably with the mechanization of cotton harvesting. In that scenario, the cotton production in India can increase considerably which can impact the international markets.

**Keywords:** Cotton Harvesting, Mechanization, Techno-Economic Analysis.

## I. INTRODUCTION

Cotton is one of the most important crops throughout the history of India and it also plays an important social and economic role in the Indian society in the present age. India has made tremendous gains in the cotton sector in recent times, as it stood second in the world in terms of production, consumption and exporting in 2015-2016. The increasing role of the Indian cotton sector in international markets is a direct challenge to major cotton exporters like the United States especially in fast growing markets like China. In this context, a better understanding of the Indian cotton production system is necessary in order to comprehend its future role in international cotton markets.

Various reasons have been attributed to the existence of low yields of cotton in India: the inadequate inputs, lack of awareness about modern cultivation practices among Indian farmers, lack of irrigation facilities, lack of proper timing of field operations and too much dependence on labor to cultivate cotton. Along with the above reasons, the shortage of labor along with the associated rise in wages in some fast industrializing areas of India is impacting the profitability of the cotton

crop. Within this context, a better understanding of the Indian cotton sector and the impact of mechanization on cotton cultivation are needed to assess India's competitive position in international markets.

The success of mechanization of cotton harvesting depends not only on the availability of suitable harvesters, but also depends upon various other factors. So this paper analyses the impact of mechanical harvesting of cotton on the profitability of Indian cotton farmer as well as the practical feasibility of the adoption of the mechanical harvesting by Indian farmers. In the following section, a brief description of the cotton production and its cultivation aspects, the status of mechanization of farm operations and the status of mechanization of cotton harvesting in India are presented.

## II. METHODS AND MATERIAL

### 2. Cotton Production and Mechanization In India

#### 2.1 Cotton Production in India



Cotton is an important cash crop for Indian farmers. It takes the third place in total acreage planted among all crops in India behind rice and wheat. In the last decade, cotton acreage increased by almost thirty two lakh hectares from 2006 to 2016 as shown in Table 1. Cotton is produced in three zones in India, namely the Northern zone comprising the states of Punjab, Haryana and Rajasthan, the Central zone comprising the states of Maharashtra, Madhya Pradesh and Gujarat, and the Southern zone comprising the states of Andhra Pradesh, Karnataka and Tamil Nadu.

**Table 1 :** Area, production and productivity of cotton in India from 2005-06 onwards

Year	Area In Lakh Hectares	Production In Lakh Bales Of 170kgs	Yield kgs Per Hectare
2005-06	86.77	241	472
2006-07	91.44	280	521
2007-08	94.14	307	554
2008-09	94.06	290	524
2009-10	103.1	305	503
2010-11	114.4	339	517
2011-12	121.78	367	512
2012-13	119.7	370	525
2013-14	119.6	398	566
2014-15	128.1	380	504
2015-16	118.8	352	504

Source: Cotton Advisory Board

The states of Gujarat, Maharashtra and Andhra Pradesh contribute about three quarters of the total production. Top 6 states in india in terms of area, production and yield are shown in Table 2.

Table 2:

Year	2014-15(P)			2015-16(P)		
	Area in lakh	Production in lakh bales 170kgs	Yield in kgs per hectare	Area in lakh	Production in lakh bales 170 kgs	Yield in kgs per hectare
Gujarat	27.73	108	662	27.61	101	622
Maharashtra	41.9	78	316	38.27	77	342
Telangana	17.13	57	566	16.94	58	582
Andhra Pradesh	8.21	27	559	6.63	25	641
Karnataka	8.75	31.5	612	6.12	20	556

Source: Cotton Advisory Board (CAB)

## 2.2 Journey of Cotton Mechanization

Starting from the early 1920s, cotton was still picked by hand and caused a lot of manual labor; people would go day by day picking the flowers from the plants placing them in bags continuing the traditional cotton picking which was in place since long as shown in Fig 1.



**Figure 1.** Manual Picking in 1920

In the late 1930's, as shown in Fig 2, the first one row cotton picker was developed by John Rust but was not commercially sold since the picker proved to be less durable and so the inventor was reluctant to sell many.



**Figure 2.** Cotton picking in 1930

Then in the early 1940's, as shown in Fig 3, the cotton picker was commercially made and sold. The barbed spindles would pick the cotton off the plants and would drop it to the ground this did potentially degrade the cotton but it was mechanical and this meant less labor.



**Figure 3.** Cotton Picking in 1940

In the 1950's, as shown in Fig 4, the original spindle for the cotton picker was re-designed into a more durable and stronger metal, which could pick multiple rows and had a basket to catch the cotton instead of dropping it on the ground.



**Figure 4.** Cotton picking in 1950

From the 1960's to 1980's, various modifications were made in the cotton pickers as shown in Fig 5, keeping the basic concept same. In the 70's the first picker with a driver's cabin was introduced. This ensured the driver's safety and comfort making working on fields a pleasant experience.



**Figure 5.** Cotton Picker with Cabin

The 4-row cotton picker, as shown in Fig 6, was introduced by John Deere in 1980 which increased operator's productivity by 85-95%. This increased the efficiency of cotton picking to a large extent and was welcomed by the farming community.



**Figure 6.** Mechanized Cotton Picker

In the late 90's, as shown in Fig 7, the six row cotton picker had been introduced with a large basket on the back this new picker made cotton picking much faster and easier as the cotton was just tipped into a module builder where it was Pressed.



**Figure 6.** Multi-Row big Basket Cotton Picker

In 2009, as shown in Fig 8, John Deere released the first round baler which picks the cotton, rolls it, places it in a tarp and drops it to the ground. Therefore, less manual labor was needed again and the module builders were no longer needed to press the cotton.



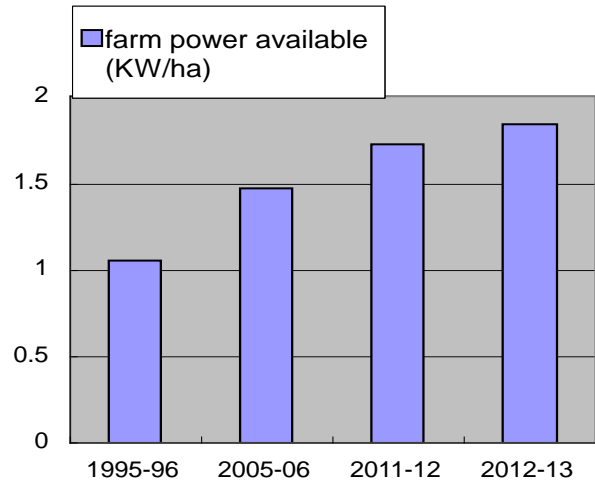
**Figure 8.** Cotton Baler

**2.3 Status of Mechanization of Farms in India**

Farm mechanisation in India stands at about 40-45 percent. This is still low when compared to countries such as the US (95 percent), Brazil (75 percent) and China (57percent). While the level mechanisation lags behind other developed countries, the level of mechanisation has seen strong growth through the last decade. The farm power availability on Indian farms has grown from 1.47 kW/ha in 2005-06 to 2.02 kW/ha in 2013-14. In India, the level of mechanisation varies greatly by region. States in the north such as Punjab, Haryana and Uttar Pradesh have high level of mechanisation due to the highly productive land in the region as well as a declining labour force. The state governments in these states have also provided timely support in promoting mechanisation of farms. The western and southern states in the country have a lower level of mechanisation due to the smaller land holdings prevalent in these regions as well as the land holding being more scattered. As a result, in many cases, mechanisation has been uneconomical leading to the lower development. In north-eastern states, the level of mechanisation is extremely low.

**III. RESULTS AND DISCUSSION**

Operation-wise, the level of mechanisation varies from 42 percent for soil working and seed bed preparation, 29 percent for seeding and planting, 34 percent for plant protection and 37 percent for irrigation. Figure 9 shows farm power availability in indian farms.



**Figure 9.** Farm power availability in Indian farms

In India majority of cotton is hand-picked by human labor spending about 0.9 man-h/kg of cotton and costing almost 10 times than irrigation and two times the weeding costs. Below is the level of mechanization in percentage for cotton.

Crop	Seedbed Preparation	Sowing/ planting /transplanting	Weed and pest control	Harvesting and threshing
Cotton	90-95	50-60	50-60	0

India is lagging behind many other large producers of cotton in mechanization of Harvesting. In the USA, machines harvest the entire cotton crop, whereas in some regions of China, it is estimated that by 2020, about 60% of cotton will be mechanically picked . It is expected that India will soon have to mechanize its cotton harvesting operations as it is facing labor shortages and rising farm wages. It is reported that the labor availability has dropped from 70.3% of the population in 1961 to 48.9% in 2010 and cost of picking cotton from the farm has increased to Rs 10-12 a kg now from Rs 4 in 2007.

Studies have been done on the feasibility of introducing mechanical pickers in India, and most of them have concluded that in order to have a successful introduction of cotton pickers, many other aspects have to come together. The first aspect is about the spacing between the plants in the field. In our visits to the cotton farms in India, we observed that the spacing ranged from 3 feet (inter-row) by 3 feet (inter-plant) to 5 feet (inter-row) by 2 feet (inter-plant), which is much higher than what is

needed for cotton plants to be harvested by mechanical picker. With the above-mentioned range of spacing, the plant population comes to around four to five thousand plants per acre, whereas, from our discussion with industry personnel, it was recommended to have a population of more than 50,000 plants per acre, if mechanical picking is to be done. Secondly, the cotton plant should not be too tall and having many branches, as it will be difficult for the picker to pick all the bolls. Also, the bolls should be well of the ground so that the amount of soil and dirt collected during the picking may be reduced. Studies have shown that the trash content in hand-picked cotton is much less than in the mechanically picked cotton, thereby, creating a need for pre-cleaning of mechanically picked cotton before sending it to ginning mills.

Another important aspect is that all the bolls should come to maturity at the same time, as mechanical picking is expensive to be done multiple times. The plants also need to be treated with defoliants as it is necessary that green leaves should not be present on the plant when cotton bolls are picked up by the machine. The expenditure incurred for mechanical picking also includes the cost of defoliators and their application costs. So in order to have a successful introduction of cotton pickers, farmers need to be educated about the new agronomic practices and awareness has to be created about the costs and benefits involved in the mechanical picking of cotton. The mechanical picking of cotton on a large scale is possible if suitable cotton varieties are introduced along with adequate educational and awareness programs for cotton farmers in India.

### 3.Hand Picking And Mechanical Picking

In Hand Picking, shown in fig 9, the picking is done by hands. Huge amount of labour is required for this process. In this a labour picks the cotton boll manually by hands. This process requires labour hours ranging from 6 to 10 hours a day. Being done by labour the working hours are flexible and also result in low labour productivity. Physical conditions also effect this process as labour being human gets tired and different conditions effect them differently depending on their physical attributes. This process is also time consuming. But this process yields better cotton quality and also in this process the unwanted material is also very low which results in better yield.



**Figure 10.** Hand Picking

While in machine picking the picking is done by machine. Basically a full-fledged machine or a portable picker is employed for machine picking. In this process the machine takes the complete boll or in case of bigger machine the complete plant is taken out for the process. But in this process the fibre quality is not good compared to the hand picking process since in this there is too much unwanted material. This also is expensive as they are complicated machinery and there is also need for a separator chamber to separate the unwanted material from the cotton which also ads up to the cost. But this process is very productive as it's yield is high. This also is an one time investment. This process is less time consumption and there is no time constraint it can work 24 hours a day also.

Hand picking process is more favourable in India and generally practiced because it yields better quality cotton fibre than machine picking and also there is lack of effective mechanization for cotton harvesting and also less knowledge about the mechanical picking practices and farmers is also unaware of recent advancements in this field in India.

The collaborative cotton mechanization is joint efforts of the John Deere India Pvt. Ltd, Bayer Crop science Limited and Bajaj Steel Industries Limited to develop cotton mechanization in India. The project started in 2009 with the import of 2 row cotton picker from Turkey. But this 2 row cotton picker was found to unsuitable and then John Deere started working on single row picker machine and simultaneously started to collaborate with Bayer and Bajaj steel to build the complete ecosystem for cotton mechanization in India.

Currently cotton mechanization project is being operated in 3 cotton growing states such as Punjab, Maharashtra and Telangana. In Punjab project is being run under public private partnership and is also supported by Department of Agriculture, Punjab. Department of Agriculture Punjab provide the seed subsidies to the farmers who adopt cotton mechanization. It is an integrated approach and the objective of this project is to showcase cotton mechanization technologies.

A farmer who is adopting machine picking needs to overcome the issue of high trash % (compared to hand picking) which is common in all countries that have adopted machine picking. Therefore, after machine picking the seed cotton has to pass through high impact pre-cleaners before ginning. High impact pre-cleaner is already developed in India by Bajaj steel Industries. The need of the hour is that ginning mills needs to install these pre-cleaners so that the machine picked cotton can be ginned and baled with high quality cotton without any trash and contaminants.

**4. Selection of Mechanical Cotton Harvester**

In India, efforts are being made to design and develop a commercial cotton harvester to harvest selected cotton varieties sown by adopting common agronomic practices locally for cotton cultivation. The crop parameters for two different planting systems (existing planting system prevalent in India and experimental high density planting system) together with machine performance attributes of mechanical cotton harvesters using different types of mechanisms have been reviewed in this paper. Suitable cotton harvester was selected for both type of planting systems on the basis of attribute coding system.

The main crop parameters which affect the performance of a cotton harvester like row spacing, plant height, plant population and crop yield were selected for the study. Machine performance attributes selected were picking efficiency, trash content, gin turnout, field capacity and field losses. Equal wattage was given to all machine attributes like picking efficiency, losses, trash content, gin turnout and field capacity of the cotton harvester. The spindle type cotton picker was best suited to the existing cotton planting system of India.

For mechanization purpose proper planting system is to be adopted. These are

- i) Existing Planting System (EPS)
- ii) High Density Planting System (HDPS)

**4.1 Machine Performance Attributes For Cotton Harvesters**

Machine performance attributes include picking efficiency, field capacity, field losses, gin or lint turnout and trash content. The coding/grading of machine attributes can be used to select and design cotton harvester from the available harvesters for different planting systems.

Table 3. Shows the range and coding/grading of machine performance attributes.

**Table 3.** range and coding/grading of machine performance attributes

S.N	Picking Efficiency		Field Losses		Gin/Lint Turnout		Trash Content	
	Range (%)	Cod e/Gr ade	Range (%)	Cod e/Gr ade	Range (%)	Co de/Gr ad e	Range (%)	Cod e/Gr ade
1	<=75	1	<=5	5	<=25	1	<=10	5
2	75-80	2	5-10	4	25-30	2	10-15	4
3	80-85	3	10-15	3	30-35	3	15-20	3
4	85-90	4	15-20	2	35-40	4	20-25	2
5	>=90	5	>=20	1	>=40	5	>=25	1

The additional expenditure incurred due to the above practices in order to mechanically harvest cotton using cotton pickers and the additional revenue obtained due to higher yields are given in table 4.

**Table 4.** Additional expenditure and additional revenue due to mechanization of cotton harvesting

Expenditure	\$/acre
Seed cost and labor	110
Defoliant	50
Mechanized harvesting	45
Total additional expenditure	205
Additional revenue due to higher yields	244

**IV. CONCLUSION**

This paper analyzed the impact of mechanical harvesting of cotton on the profitability of Indian cotton farmers as well as its implications on cotton supply in the international markets. The more usage of cotton pickers

may lead to increase in yields and thereby increased cotton production in India, which may put a downward pressure on international cotton prices.

Portable cotton picker can improve cotton harvesting efficiency without defoliation. Labor is fast becoming a bottleneck and important cost factor, therefore manual picking will soon become unviable in Indian cotton production. Collaborative efforts by various organizations have successfully demonstrated machine picking is viable in India. Project farmers have experience 30 to 40% yield increase. Mechanization adoption rate will be driven by development of machine suitable hybrids and continuous support from the government.

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## Adaptive Smart Antenna Using Neural Network (LSMI Algorithm)

Rupali S. Pardhi, Bhagyashri B. Hedau, Megha V. Dhamgaye, Kalyani P. Mohane, Prof. Sonia V. Hokam  
Electronics & Telecommunication, RTMNU/SRMCEW, Nagpur, Maharashtra, India

### ABSTRACT

The adaptive algorithm used in the signal processing has profound effect on the performance of a Smart Antenna system that is known to have resolutions and interference rejection capability when array steering vector is precisely known. Adaptive beam forming is used for enhancing a desired signal while suppressing noise and interference at the output of an array of sensors. However the performance degradation As the growing demand for mobile communication is constantly increasing, the need for better coverage, improved capacity, and higher transmission quality rises. Thus, a more efficient use of the radio spectrum is required. A smart antenna system is capable of efficiently utilizing the radio spectrum and is a promise for an effective solution to the present wireless system problem while achieving reliable and robust high speed, high data rate transmission. Smart antenna technology offer significantly improved solution to reduce interference level and improved system capacity. With this technology, each user's signal is transmitted and received by the base station only in the direction of that particular user. Smart antenna technologies attempts to address this problem via advanced signal processing technology called beam forming of adaptive beam forming may become more pronounced than in an ideal case because some of underlying assumption on environment, source or sensor array can be violated and this may cause mismatch. There are several efficient approaches that provide and improved robustness against mismatch as like LSMI algorithm.

**Keywords:** SL, DOA, LOS, LSMI

### I. INTRODUCTION

In recent years a substantial increases in development of broadband wireless access technologies for evolving wireless internet service and improved cellular system has been observed because of them there is traffic that demands on both manufacturer and operators to provide sufficient capacity in the network. This become major challenging problems for service provider to solve since there exists certain negative factor in the radiation environment contributing to limit the capacity. As the growing demand for mobile communication is constantly increasing, the need for better coverage , improve capacity, and higher transmission quality rises. Thus , a more efficient use of the radio spectrum is require . Smart antenna system are capable of efficiently utilizing the radio spectrums and are promise for an effective solution to the present wireless systems problems while achieving reliable and robust high-speed, high-data rates transmission. In fact, smart antenna

system comprise several critical areas such as individual antenna array design, signal processing algorithms, space-time processing , wireless channel modelling and coding, and network performance.

In order to manipulate the radiation pattern of an antenna structure with software, multiple antennas are required instead of signal antenna. Unlike a signal antenna, which has fixed radiation pattern, the radiation pattern of an antenna array can be quite flexible. The flexibility varies according to the algorithm being implemented in the systems. The most straight forward approaches to generate a flexible radiation pattern is the switched lobe (SL) or the switched beam technique where the antenna array contains a numbers of highly directional antennas. Each of the antenna points are in slightly different direction. The system then analyzes the received signal from each of the antennas and select the one that has the best signal. A more intelligent approaches would be, instead of switching antennas, determine the direction of

arrival (DOA) of the signals. Once the DOA is obtained, the system uses the antennas array to form highly directional beam pointing toward the user. Both methods should provide some advantages over the conventional systems; however the benefit would be minimal if the signals suffer a lot of angular spread where the signal arrives at many different directions in a multipath environment. The situation would be even worse when no line-of-sight (LOS) is present between the user and the base station.

## II. METHODS AND MATERIAL

### Beamforming

Beamforming is a general signal processing techniques used to control the directionality of the reception or transmission of signals on a transducer array. Beam forming creates the radiation pattern of the antenna array by adding the phase of the signal in the desired direction and by nulling the pattern in the unwanted direction. The phases and amplitudes are adjusted to optimize the received signal. A standard tools for analyzing the performance of a beam former is the response for a given N-by-1 weight vector  $W(k)$  as function of, known as the beam response. This angular response is computed for all possible angles.

### Fixed Weight Beamforming

A Fixed weight beam-former as shown in fig is a smart antenna in which fixed weight is used to study the signal arriving from a specific direction. Since it optimize the signal arriving from specific direction while attenuating signals from other directions, thus it is called the spatial matched filter. In the fixed weight beamforming approach the arrival angle does not change with time, so the optimum weights would not need to be adjusted.

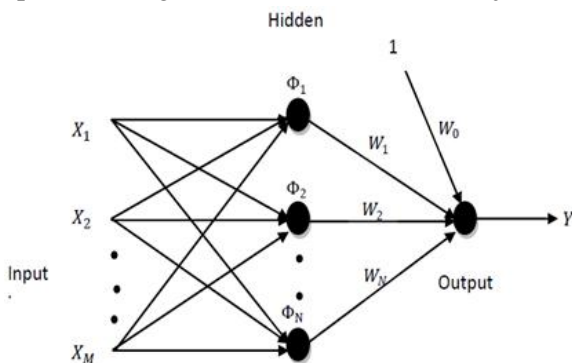


Figure 1. Loaded sample matrix inversion (LSMI) Algorithm

## III. RESULTS AND DISCUSSION

One of the most popular robust approaches is the loaded SMI (LSMI) algorithm, which attempts to improve the robustness of the SMI technique against an arbitrary spatial signature mismatch by mean of diagonal loading of the sample covariance matrix. The essences of LSMI algorithm is to replace the conventional sample covariance matrix by the so-called diagonally loaded covariance matrix.

$$w_{SMI} = \alpha \hat{R}^{-1} a$$

where  $\alpha$  is a diagonal loading factor. So that, we can writes the LSMI weight vector in the following form

$$w_{LSMI} = \hat{R}_{dl}^{-1} a = (\hat{R} + \xi I)^{-1} a$$

So the LSMI algorithm can improve the performance of SMI algorithm in scenarios with an arbitrary steering vector mismatch, this improvements is not significant because LSMI algorithm exploits the presumed steering vector and, therefore, its performance degrades when the norm of the error vector is large. Furthermore, the proper choice of  $\alpha$  represents a serious problem in practical applications because depends on the unknown signal and interference parameters.

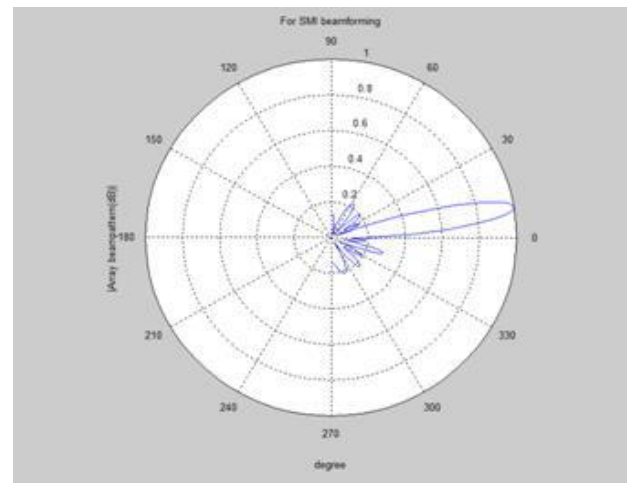
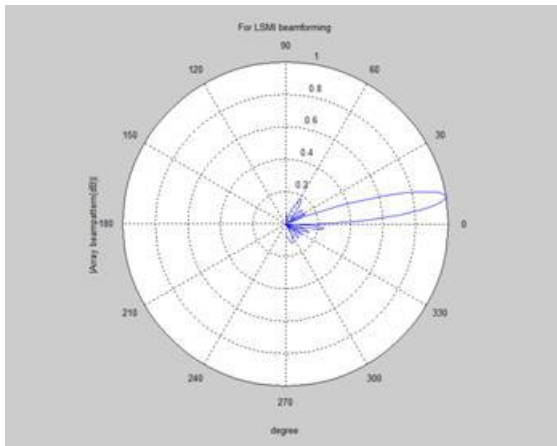
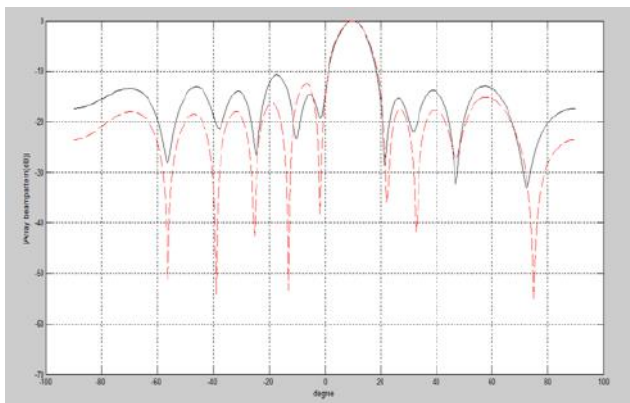


Figure 1. Polar plot of SMI





**Figure 2.** Polar plot of LSMI



**Figure 3.** Output of LSMI

#### IV. CONCLUSION

This paper has presented an efficient method for multiple-beam adaptive beamforming in the presence of steering angle errors. We have illustrated that the performances degradation of an adaptive beam former with multiple beam constraints due to steering angle errors is significant. The proposed method constructs a cost function consisting of the squared form of the projection of the steering vector on the noise subspace and a constraint related to an exponential function of the squared form of the corresponding phase error vector. The resulting minimization problems is highly nonlinear but can be solved through the use of an iterative procedure. In conjunction with a steepest-descent algorithm, the phase angle estimate for all of the signals with specified gain constraints can be obtained simultaneously. The convergence property of the proposed method has been investigated. Several simulation examples have shown the effectiveness of the

proposed method in dealings with adaptive beam forming under steering angle errors.

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# Fruit Detection Using Image Processing Technique

Ketki Tarale, Prof. Anil Bavaskar

Department of VLSI Engineering JIT College of Engineering Nagpur, RTMNU University, India

## ABSTRACT

Agriculture is mother of all culture, due to the increase demand in agriculture industries the need to effectively grow a plant an increase its yeild is very important. In this study, a method is proposed to detect fruits on tree using image processing technique. For counting the fruits, the main problem is variable lighting conditions for the environment in outdoor. The additional problem is the occlusion of fruits by leaves, branches, and the other fruits. In the proposed method these problems are also examined. External appearance is one of the most significant attributes for fruits when consumers decide to choose or reject them, thus packinghouses need to adopt appropriate systems that are capable of detecting the skin defects for fruits before packing them into batches and reaching the end consumers. In this paper we also differentiate the healthy fruits and fruits which are infected by diseases.

**Keywords :** Fruit Detection; Image Processing; Skin Defects; End Consumers

## I. INTRODUCTION

Traditionally, quality inspection techniques of fruits have been manual, but these have been highly inconsistence in accuracy, time consuming, tedious and relatively expensive. Thus, the application of new techniques in fruit quality assessment is necessary in order to minimize wastage because most of these fruits are readily perishable. Furthermore, fruit quality grading is becoming a mandatory condition in recent time, although quality of fresh fruits could be defined differently depending on consumer's preference and final utility, but a standardization to identify the degree of quality in a commodity is necessary for marketing fresh and safe products. Common varieties of tropical fruits sold and consumed widely include oranges, The most time consuming manual process in fruit harvesting is the analysis of fruit state and yield analysis of different fruits like mango, apple, orange, banana and pomegranate this is object. Locating fruits in trees made it easier for analysis and efficient fruit harvesting. An intelligent segmentation and automatic yield calculation of fruits using image processing approach the tree are acquired from real time and simulation using matlab with rail time using digital camera under different

lighting conditions with application software .NET . Fruit images are first filtered to remove noise from environment and then fruit region is separated from its background. Then the resultant image is segmented based on the color and shape. The resultant image can be classified and used for further analysis with help of features selected through image approach. The images are then labeled for detection and counting of fruits. Automatic segmentation and yield calculation of fruit based on shape analysis. The color and shape analysis was utilized to do the segmentation of the fruits in an input sectional tree image. The images used in our work where of different tree images of variety of fruits like apple, pomegranate, orange, peach, litchi and plum. The input color image was first converted from the RGB color space into the L\*a\*b color space coarse detection of fruit region. The L\*a\*b color space has been designed to resemble the human visual perception. The idea was to do the coarse processing of the image so that the fruit were visually well distinguishable and then to use the L\*a\*b color space to segment fruit regions with its perceptually uniform property. (i.e. the colors which are visually similar are close to each other in color space). The edges were detected from the resultant image using Sobel edge detector. These edge points were used for

fitting the nearest circular shape. The number of circles fitted to the input image  $n$  regarding the  $L^*a^*b$  color space can be.

China is one of the largest fruit producing countries in the world. Since the quality of fresh food varies greatly, efficient technologies are needed for assessment of fruits quality in order to cope with the increasing market expansion and segmentation. Since consumers use fruits appearance to make first evaluation of the quality of fresh food, the presence of skin defects seems to be one of the most influential factors in the quality and price of fresh food. this reason, packinghouses demand appropriate systems that are capable of detecting fruit skin defects.so in this paper we can count the number of fruits and we can distinguish between healthy fruits and fruits infected by disease.

## II. METHODS AND MATERIAL

### A. Related Work

#### (1)“Intelligent segmentation & yield analysis of mango fruit using bio-inspired mhs approach” [15]

Siva Kumar et al In this paper the system can further be improved for identifying very dense fruits in the tree and images under bad lighting conditions. Images used in the proposed system are two dimensional images. In future, this can be replaced by three dimensional images. 3D images can give clear and overall representation of tree which avoids the problem of using different sectional images of same tree.

#### (2). “Fruit sorting and grading using fuzzy logic “[16]

author suggest the technique begins with capturing the fruits image using regular digital camera. The features are efficiently extracted from the query image. The color of the fruit determines its class and fruit’s grade is determined by its size. The fuzzy logic technique is used for both classification and grading of fruits, as it also involves decision making by humans. The proposed technique accurately classifies and grades the fruits. The results are good for the five chosen fruits of same color and sizes. This kind of chosen fruits of same color and sizes. This kind of system can be employed in Agriculture Produce Marketing Corporation, etc.

#### (3). “Detection and classification of plant diseases by image processing” [4]

Niket Amoda, Bharat Jadhav, Smeeta Naikwadi , Automatically detection In this research, plant diseased is detected and is also classified. The histogram matching is based on the color feature and the edge

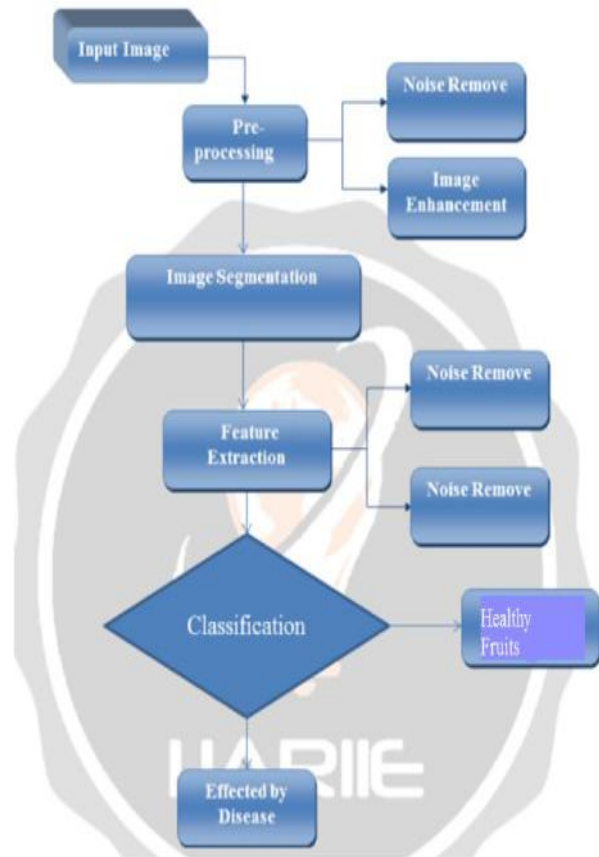
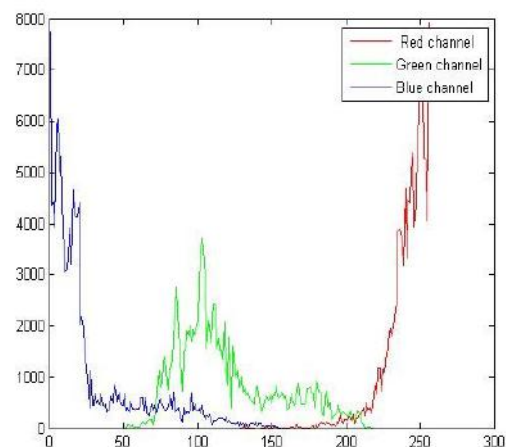


Figure1. Basic Block Diagram



## Colored histogram diagram of orange fruits



**Figure 2.** Real Image Captured Using Camera

### B. Methodology

Here some image processing technique are carried out to detect the number of fruits on trees, and to recognize whether it is good or infected by disease by its external appearance. With the help of block diagram we can understand it more properly

#### 1. Image Acquisition

This is the first step to collect sample images of fruit which are going to be decided the number of fruits present on the tree. All this images are stored as .JPG standard format and resize into 429x322 pixels. The main application of this task is in production system. So for that the environment remain same including white background.

#### 2. Image Preprocessing

The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing. Here there are two approaches used for Image Pre-processing.

- a) Image Enhancement
- b) Noise Remove

#### a) Image Enhancement

Enhancement of the image is necessary to improve the visibility of the image subjectively to remove unwanted flickering, to improve contrast and to find more details. In general there are two major approaches [10]. They are spatial domain, where statistics of grey values of the image are manipulated and the second is frequency domain approach; where spatial frequency contents of the image are manipulated. Although Spatial Domain methods are developed for gray valued images. And it can be applied directly on pixels. Whereas in Frequency Domain methods, operations applied on Fourier transform of an image. Here we used Discrete Cosine Transform method to transform an image from RGB scale to Gray Scale.

#### b) Noise Remove

To remove Noise, in this phase Masking is used. A mask is a filter. Concept of masking is also known as filtering. The general process of filtering and applying mask consists of moving the filter mask from point to point in an image. At each point (x,y) of the original image, the response of a filter is calculated by a pre-defined relationship [13]. All the filter values are pre defined and standards. proposed technique accurately classifies and grades the fruits. The results are good for the five chosen fruits of same color and sizes. This kind of system can be employed in Agriculture Produce Marketing Corporation, etc.

#### 3. Image Segmentation

In this step for Segmentation Partition method is used. Partition clustering algorithm splits the data points into k partition, where each partition represents a cluster [8]. The partition is done based on certain objective function. One such criterion functions is minimizing square error criterion which is computed as,

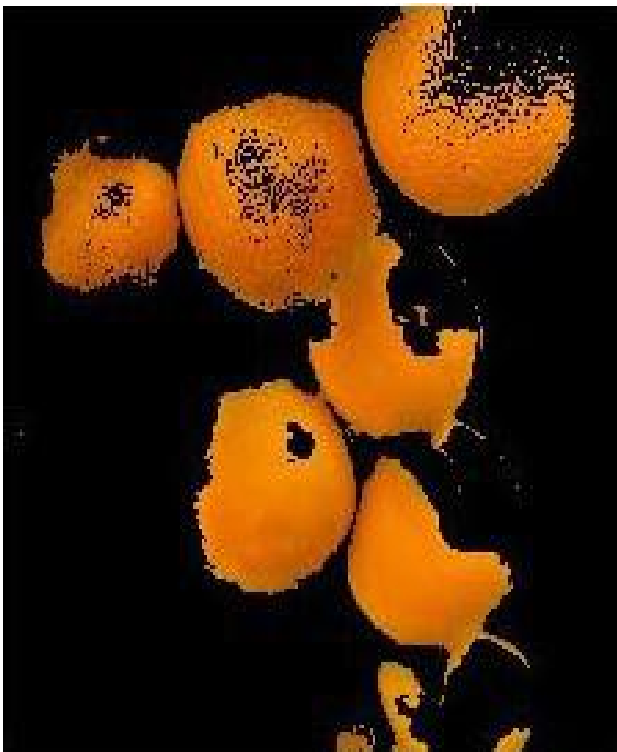
$$E = \sum \sum || p - m_i ||^2$$

Where p is the point in a cluster and  $m_i$  is the mean of the cluster [8]. The cluster should exhibit two properties, they are (1) each group must contain at least one object (2) each object must belong to exactly one group. The

main drawback of this algorithm is whenever a point is close to the center of another cluster, it gives poor result due to overlapping.



**Figure 2.** Image Before Segmentation



**Figure 2.** Image After Segmentation

#### D. Feature Extraction

In this phase, There are two methods are used namely Texture Feature and Color Feature. For Color Feature

color space conversion method is used. For Texture Feature Canny edge detection and Dilation methods are used probe an image with a small shape or template called a structuring element [12]. The structuring element position is positioned at all possible locations in the image and it is compared.

#### Dilation:

The Dilation of an input image  $f$  by a structuring element  $s$  produces a new binary image  $g = f \cup s$  with once in all locations  $(x, y)$  of a structuring element  $s$  hits the input image  $f$ , for example  $g(x, y) = 1$  if  $s$  hits  $f$  and 0 otherwise, repeating for all pixel co-ordinates  $(x, y)$ . Dilation has the opposite effect of Erosion. It adds a layer of pixels to both the inner and outer boundaries of regions [12].

#### Color Feature

It is the main features that are easily recognized by humans in various images. In content based image retrieval color feature is widely used. Most of the images are in the red, green, blue (RGB) color space. There are various color feature based techniques such as color spaces, color histogram, color moment etc. used for retrieval process

#### Texture Feature

##### 1) Canny Edge Detection

When sudden changes of discontinuities in an image are called as edges. Significant transitions in an image are called Edges. Canny Edge Detection is a popular edge detection algorithm. It was developed by John F. Canny in 1986. It is a multi-stage algorithm. Since edge detection is susceptible to noise in the image [14]. So first step is to remove the noise in the image with a 5x5 Gaussian filter. In Gaussian blur also known as Gaussian smoothing is the result of blurring an image by a Gaussian function. It is a widely used to reduce image noise. And after that Canny Edge Detection will be applied.

##### 2) Morphology (Dilation)

Morphological Image Processing is a collection of non linear operations related to the shape or morphology of

features in an image [12]. Morphological operations rely only on the relative ordering of pixel values, not on their numerical values, not on their numerical values, and therefore are specially suited to the processing of binary images. Morphological operations can also be applied to gray scale images such that their light transfer functions are unknown and therefore their absolute pixel values are of no or minor interest. A morphological operation on a binary image creates a new binary image in which the pixel has a nonzero value only if the test is successful at that location in the input image. Morphological techniques

### III. RESULTS AND DISCUSSION

Image processing based on Mat lab is effectively used to determine count of different objects. Traditionally object counting is done manually or may involve costly electronic systems. This can be replaced by proposed algorithm. The developed method is quick and low cost as there are no costly equipment and software. Good accuracy has been achieved in experimental results. It has been observed that for bigger objects the counting accuracy is more. Threshold value is given different for different size of object. Size of disk structuring element has more effect on accuracy. Smaller the object is, less the size of disk structuring element should be. Accuracy can be increased by separating conglutination among the objects

### IV. CONCLUSION

Traditionally, quality inspection techniques of fruits have been manual, but these have been highly inconsistency in accuracy, time consuming, tedious and relatively expensive. Here in this algorithm, automatic counting of fruits using image processing is done and we can differentiate between good fruits and infected fruits. Packinghouses can adopt this system to distinguish damaged fruits from good ones before packing them into batches, therefore the quality of the products can be guaranteed in this stage.

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