Project unchained-a solar powered hat design for blind and deaf humans

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Abstract— Blind & deaf persons suffers a lot to live their regular life while moving, walking or travelling due to the lack of necessary equipment which can make their daily life more comfortable, safe & can assistance them to avoid the risk. To improve that situation, we designed an affordable smart wearable hat, which will allows more independent mobility to move, walk or travel. The solar powered device contains sound alert system, sensors, LED, mini vibratory motors etc. The sound alert system will alert them to avoid unwanted obstacles that may be encountered & vibrating alert feature will benefit from the experience of deafness. It will also alert the other normal people to avoid a visually impaired or deaf person by seeing the light & sound. Micro controllers are used as the control system of this device. It is easy to use and affordable solution to blind and deaf people all over the world.

I. Introduction

We know that there are a millions blind or deaf persons around the globe and most of them use the different cane which the most successful and widely used travel aid for the blind persons. But there are several problems with this old modelled device to use are that users must be trained in its use for more than 3 weeks. Also, the cane requires the blind or deaf person to actively scan & touch the small area ahead of that person. Actually common long canes are mainly intended to detect different objects from the ground to the waistline, both under familiar and unknown environments. To overcome from this pathetic condition, we proposed a digital hat for both blind & deaf people. The digital hat contains ultrasonic sensors & Infrared sensors to detect the obstacle that surround to that person. Another unit of the cap contains an ultrasonic sensor, battery, microcontroller & RF transmitter, which unit can be placed anywhere in the body to detect obstacles of lower side of the body.

II. Literature review

In recent years many researchers, engineers & hobbyists designed different devices & published their research papers. Some notable old research project names are given bellow:

• Pathfinder A handheld device for detecting obstructions in the path of the blind and visually impaired [Project by Kyle Boyace]
• VI-Navi: a novel indoor navigation system for visually impaired people [Project by-Parth Mehta]
• Blind Audio Guidance System [Project by -Brey Danels, Oluakode Ogunmakin, George Agollah, Eric Worley]
• Drishti: An Integrated Indoor/Outdoor Blind Navigation System and Service [Project by- Lisa Ran, Sumi Helal and Steve Moore] etc.

From the above mentioned data we can see that, though there were a number of hardware project work exists but existed devices are not that much user friendly or affordable for both blind & deaf people of any stages of the society.

IV. Methods

The hat contains two ultrasonic sensors in its front part which covers approximately (60^o+60^o) =120^o front area of the deaf or blind people. The sensors will set in the cap in such a way that they will cover the area of under the chest to the area above the head. The main control unit (here we used microcontroller Atmega32) will get the front obstacle distance data from the ultrasonic sensors. Then according to the getting data & code, the buzzer, LED & vibrator will automatically start functioning as output device.

The head-cap also contains two Infrared sensors that will sense the obstacle of left & right side of a blind or deaf people. If the left infrared sensor sense an obstacle in left/right side, then the two sided motor will vibrate & the deaf or blind people will understand that, there is an obstacle in his/her left/right side.

The three different colored LED & buzzer sound will indicate the distance of the obstacle. We can control this part through microcontroller coding. If any obstacle came within 40 cm, then the green LED will ON & the buzzer will produce sound in low level. If any obstacle came within 25 cm, then both the green & yellow LEDs will become ON & the buzzer will produce sound in medium level. Also, if any obstacle came within 15 cm, then both the green, yellow & red LEDs will become ON & the buzzer will produce sound in high level. Though LED lighting will not help a blind or deaf people to avoid obstacle that stays in front or besides him/her, but this output will help the other people(who moves around a blind or deaf people) to understand the position & distance between a deaf or blind people & the obstacle. After sensing the obstacle alert, the shape of the obstacle can be recognized through physical (hand) touch. Therefore, the person does not require moving the cane around to detect barriers or obstacles like they do with the normal cane/stick.

The 'Solar-powered digital hat' also contains enough solar cells in its outer body to recharge its rechargeable lithium battery. This self powered system will ensure the power option of the device & will reduce the effort to give charge to 'Solar-powered digital hat' regularly. The control unit (which stays on the back side) of 'Solar-powered digital hat' also contains a device on/off pitch-switch, a buzzer+ vibration+ LED pitch-switch. These simple pitch-switches will allow a blind/deaf person more comfortable while using the 'Solar-powered digital hat '.

Another unit of the cap contains an ultrasonic sensor, battery, microcontroller & RF transmitter, which unit can be placed anywhere in the body to detect obstacle. The main cap contains a RF receiver, which receives the sensing data from that mobile unit (we placed that on the shoo) & gives the same output.

Flow chart

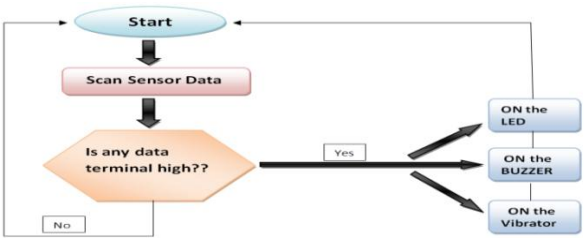

Fig.1 Flow chart of proposed Solar-powered digital hat

Specifications of 'Solar-powered digital hat ' device

Detection range	Detection angle	Transmitter frequency	Sample frequency	Power supply
40-45 cm	110 ° -120°	40 KHz	29 Hz	6-9 VDC

Table (1): Specifications of 'Solar-powered digital hat'

Hardware configuration block diagram:

The hardware configuration diagram of proposed Solar-powered digital hat is given bellow:

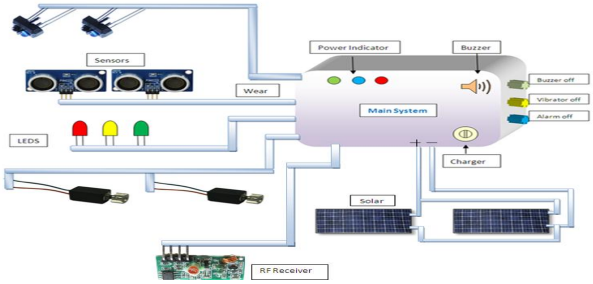

Fig.2 Total hardware configuration connection diagram of proposed Solar-powered digital hat

The prototype hardware configuration of our Solar-powered digital hat is given bellow:

Fig.3 The hardware configuration of our Solar-powered digital hat

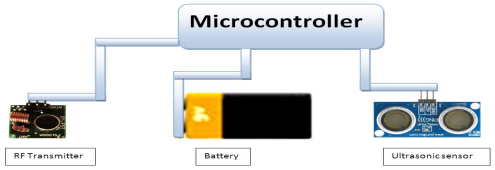

Fig.4 Mobile sensor unit (placed in a shoo) of Solar-powered digital hat

Fig 5: RF transmitter part (placed in a shoo) of our Solar-powered digital hat

Solar Recharging Circuit

The circuit uses a 12 volt solar panel and a variable voltage regulator IC LM 317.The solar panel consists of solar cells each rated at 1.2 volts. 12 volt DC is available from the panel to charge the battery. Where Charge current passes through D1 to the voltage regulator IC LM 317. By adjusting its Adjust pin, output voltage and current can be regulated.

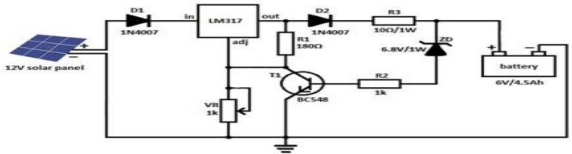

Fig.6 Solar Recharging Circuit

Result Analysis and discussion

On Result Analysis and discussion, the result part presents two important cases here. Those are:

- Any obstacle is detected by front sensor (ultrasonic sensors)
- Any obstacle is detected by side sensors (Infrared sensors)

The MAT lab (real life taken data) Plot of the output distance vs. frequency data by using 'Solar-powered digital hat' is given bellow:

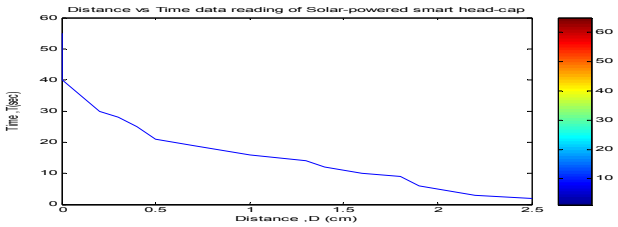

Fig.7 Plot of the output distance vs. frequency data of Ultrasonic sensor module HC - SR04

Survey No	Positive aspects
1	Accuracy related to obstacle detection above the waistline of a human body
2	Satisfaction related to the use of the device and its functions
3	Much helpful & comfortable than traditional cane/stick
4	Adds extra comfort to traditional cane/stick (in some cases, a blind or deaf person did not use any cane)
5	The price of this cap is quite low comparable to that of other electrical devices.

Table (2): The survey data summary collected from participants' answers

Limitations & future work

While doing the design of 'Solar-powered digital hat ' we found that there are some things that can be improved further to improve the total system which will ensure more comfortable movement of a blind & deaf people. In different weather the normal or available sensors may not work properly. That's why we can use more powerful sensors in the hat to provide the detection of obstacles in different situations. To improve road safety of a blind & deaf people, a proper human navigation system can be added etc.

Conclusion

The main target of this 'Solar-powered hat' design is to make a device that will be cost effective and easier for the physically challenged blind & deaf person to use. Permanent and circumstantial physical barriers located above the imaginary waistline can be avoided by using this very useful device. We believe that this device has a great suitable and easy used to blind and deaf than conventional cane/sticks.& will become a real comfortable solution for reducing moving problems of blind & deaf people.

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Facial Expression of Emotion Analysis

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***Abstract*— A facial expression has been surrounding to the field of emotion since its starting. It is mainly related to the biological term where facial expression is compared with matrix. Computer can track human's facial movement such as, eye brow bounce, smile and also sorrowful face. Tracking can be done throw matrix of an image. But it is mainly dependent of the sharpness of image. A person's face can be changed in many patterns. RGB image is used as a sample. RGB is a file extension for an image file created on a Silicon Graphics workstation. RGB files can contain the Run Length Encoding (RLE) compressed or uncompressed images in gray scale or color and also support optional transparency. Adaboost algorithm helps it to sharper for working. AdaBoost is a machine learning algorithm that progress the performance of it. Haar classifier is a digital image features that are used in object recognition.**

***Keywords*— Facial emotion, RGB image, AdaBoost, Haar classifier, Pattern recognition.**

I. Introduction

Human face is a dynamic matrix which changes with human's movement, So facial recognition is one of the critical part. However, facial detection and tracking provides many benefits. Facial recognition is not possible if the face is not isolated from the background. Human Computer Interaction (HCI) could greatly be improved by using emotion, pose and gesture recognition. All of which require face and facial feature detection and tracking [1]. RBG image is used to detect for today's world.

AdaBoost is a machine learning algorithm and can be used in combination with many other learning algorithms to improve their performance [2]. AdaBoost calls a weak classifier repeatedly in a series of rounds t = 1,…,T from a total T classifiers. For each call a distribution of weights D_t is updated that shows the status of examples in the data set for the classification. On each round, the weights of each incorrectly classified sample are improved or diminished. So that the new classifier attentions more on those cases.

The core basis for Haar classifier object detection is the Haar-like features [3]. These features rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The contrast variances between the pixel groups are used to determine relative light and dark areas [2]. Two or three head-to-head groups with a relative contrast alteration form a Haar-like feature. Haar-like features are used to detect an image. Haar features can easily be scaled by increasing or decreasing the size of the pixel group being examined. This allows features to be used to spot objects of numerous sizes.

II. Implementation

The working flow of AdaBoost Algorithm:

1. Set all sample weight equal and find h_1 to maximize $\sum_i y_i h(x_i)$.
2. Perform re-weighting to increase the weight of the misclassified sample.
3. Find the next h to maximize $\sum_i y_i h(x_i)$. Find the weight of this classifier a.
4. Go to step 2.

The final Classifier will be:

$$\mathrm{sgn}(\sum_{i=1}^{T} a_t h_t(X))$$

The Haar Classifier working procedure:

For object detection

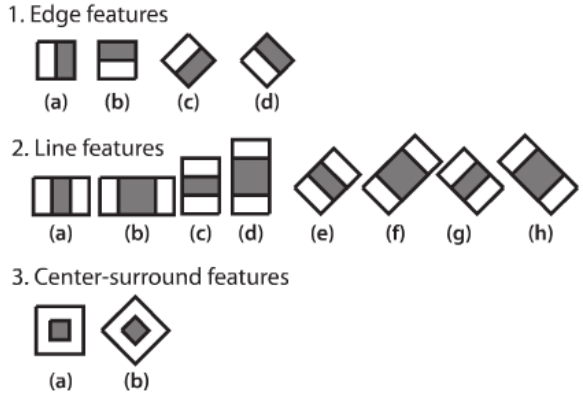

Fig 1: For object detection using Haar-like Classifier.

After detecting face, it locates two eyes and mouth and also captures eyes & mouth location. Then UI creates feature vector using pixel values of eyes and mouth with raster scan. AdaBoost algorithm is used along with OpenCV for face detection and facial feature extraction [5]. AdaBoost algorithm uses Haar Classifiers to detect face from each frame [4]. The system is implemented using Microsoft Visual C++. Link Libraries from OpenCV and Socket has been used to connect the C++ system to Java module.

III. Feature Extraction

For maximum of this projection extract the position of the eyes in the image containing the face. Once get the x and y coordinates where the eyes are located, design the windows in order to enclose the region of interest the eyes.

Fig 2: Face image with eye detection areas

Fig 3: The facial expression of an image.

When the classifier K_t is applied to the pixel (i, j) of the image A, it yields the value val1(t) if

$$\sum_{i=1}^{k}\left(w_1 \sum_{u=i+R_1 y}^{R_1 y+R_1 height-1R_1 y+R_1 width-1} \sum_{v=j+R_1 yx} A_{uv}\right) < norm(i,j).threshold(t)$$

Then it will work and detect image like Fig 1.

Rectangular features are shown in Fig 4.

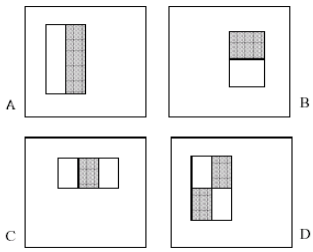

Fig 4: Rectangular features.

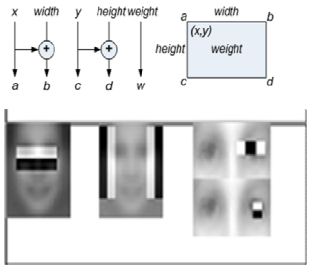

Fig 5: Face detection using rectangle calculation of Haar Classifier

IV. Result and Analysis

Table 1: Performance of Facial Feature Detection

Application	Left eye correct detection (%)	Right eye correct detection (%)	Mouth correct detection (%)
1	72	67	69
2	75	74	78
3	88	83	94

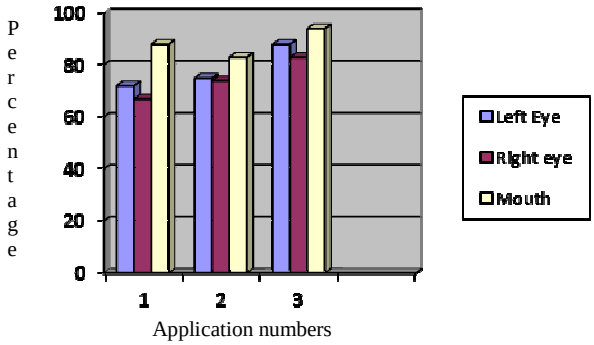

Fig 6: Performance chart of Facial Feature Detection.

V. Conclusions

After researching and calculating the result just identified that proposed detection system is pretty better than other. Here Haar classifier is a weak classifier but with the combination of AdaBoost algorithm it becomes too strong classifier. The graphical representation of result is clearly showed that the proposed method is better suitable for latest generation.

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Iris Recognition through Improvement of Segmentation Method

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***Abstract*— This paper queries iris recognition for face or human identification. Iris recognition is accurate biometric methods for face recognition or human identification. Biometric systems work by first capturing a sample of the feature, such as recording a digital sound signal for voice recognition, grey image or taking a digital colour image for face. By capturing an image of an eye, it can be recognition a face. The performance of iris verification depends on the process of various partitions. It's very important in security field. Iris recognition has become the most important identifier and verifier approaching such as navigation, finance and so on.**

***Keywords*— Biometric recognition image, segmentation, iris localization, iris recognition, CASIA database.**

I. INTRODUCTION

Biometric recognition based on physiological or behavioral characteristics to authenticate the identity of a person. Physiological is the shape of face, hand geometry, finger prints and iris recognition. In general, there are many properties that make an iris ideal biometric method. The first uniqueness features is "no two iris are the same" even between the left and right eye for the same person [1]. In fundamental steps at first, human stands in front of the Iris verification system a selected height while a camera calculates the position of eye. The camera zooms in on the eye and captures a gray scale image which is training images. Then focus on Irish. After focus overlays a circular gird on the training image and identifies where areas of light and dark fall. The training image or eye print is checked against a previously stored in the database. It's so fast that it can be taken two or three seconds for recognition a face. That's why iris recognition technology is becoming an important biometric solution for people identification in access control as networked access to computer application [2]. Iris images have been collected from the CASIA Iris Image Database. The CASIA data set contains 756 images, whereas the results in are based on 2,255 images [3].

II. METHODOLOGY

At first need to image acquisition of eye. Image acquisition in image processing is the action of retrieving an image from a source so that it can be processed. Iris pre-processing includes localization and normalization. Iris recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques in Irish Segmentation and Localization. For feature points in the iris region it makes feature encoding and it will give Iris Template. Then it will try to feature matching. Finally applying algorithm and over all process it can be recognition face.

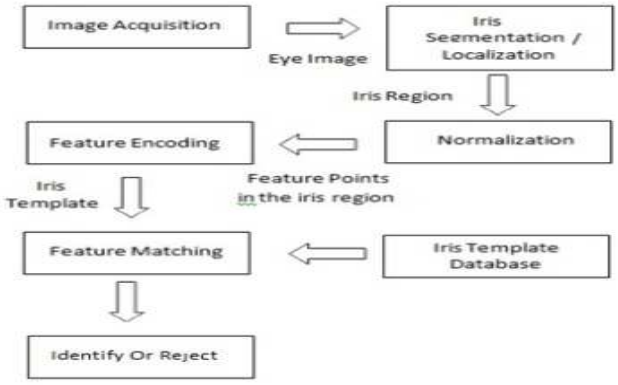


Fig 1: Process of Dingmans's model

III. SEGMENTATION

As pupil is a black circular region. Pupil is detected using a selected appropriate threshold to generate the binary image which contains pupil only.

Fig 2: Capturing Image form Database

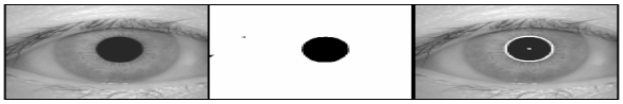


Fig 3: Original & binary image

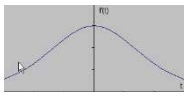


Fig 4: After taking the gradient of this signal

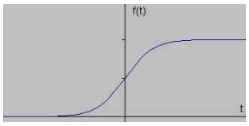


Fig 5: Edge shown by the jump in intensity above

The formula is defined as

$$g(x,y)=|\nabla G_\sigma(x,y)*I(x,y) \quad (1)$$

Where, $$\nabla=\left(\frac{\partial}{\partial x},\frac{\partial}{\partial y}\right) \text{and} \frac{(x-x_0)^2+(y-y_0)^2}{2_{\sigma^2}} \quad (2)$$

$$G_\sigma(x,y)=\frac{1e}{2_{\pi\sigma^2}}$$

denotes a two dimension Gaussian filter of scale σ. Assuming a circle with center coordinate *(xc,yc)* and radius r, each edge point on the circle casts a vote in Hough space. The circular contour of interest is defined as

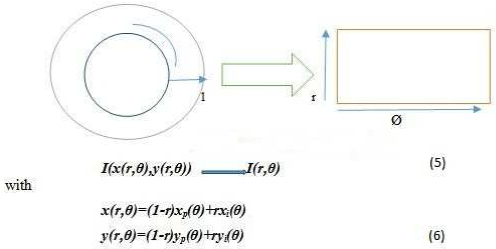
$$(x_i-x_e)^2+(y_i-y_e)^2=r^2 \quad (3)$$

$$((-(x-h_j)\sin\theta_j)+((y-k_j)\cos\theta_j)^2=a_j((x-h_j)\cos\theta_j)+(y-k_j)\sin\theta_j \quad (4)$$

Where $a\,j$ controls the curvature, $(h\,j\,,k\,j)$ is the peak of the parabola and $\theta\,j$ is the angle of rotation relative to the x-axis. The magnitude or edge strength of the gradient is then approximated using the formula, |G| = |Gx| + |Gy|.

IV. Normalization

The normalization process produces iris regions which have the same constant dimensions, so that two photographs of the same iris under different conditions will have characteristic features at the same spatial location [4]. The remapping of the iris region from (x,y) Cartesian coordinates to the normalized non-concentric polar representation is modelled as



with

$$I(x(r,\theta),y(r,\theta)) \longrightarrow I(r,\theta) \quad (5)$$

$$x(r,\theta)=(1-r)x_p(\theta)+rx_i(\theta)$$

$$y(r,\theta)=(1-r)y_p(\theta)+ry_i(\theta) \quad (6)$$

Fig 6: Dousman's rubber sheet model

V. Feature Encoding & Matching

Gabor Intensively for texture analysis filters have been used for Gabor Intensively. Zero DC component can be obtained for any bandwidth by using a Gabor filter which is Gaussian on a logarithmic scale, this is known as the Log-Gabor filter. The frequency response of a Log-Gabor filter is given as:

$$G(f)=ex\left[\frac{-(log(f/fo))^2}{2(log(\sigma/fo))^2}\right] \quad (7)$$

$$HD=\frac{1}{N}\sum_{j=1}^{n} x_j\,(XOR)y \quad (8)$$

VI. Template 1 and template 2

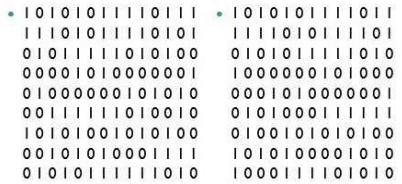


Fig 7: Portion of iris codes

VII. Result and Discussion

Table 1: The table of Identification stage

Captured Iris Images	Non Identical Image	Identical Image
Time	.49ms	.25ms
Time	.41ms	.39ms

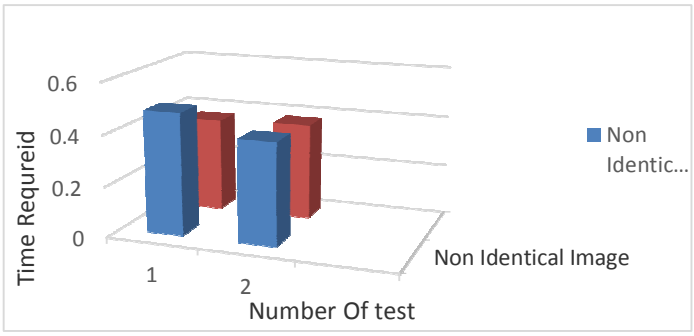


Fig 8: Efficiency between Identical Image and Non Identical

VIII. Conclusion

Iris recognition as biometric technology has greatest advantage such as variability, stability and security. This paper is not giving the ultimate solution but paves the path for approximate solution.

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Speed Variation of a Three Phase Induction Motor with the Change in Transfer Characteristics

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***Abstract*—Simulation study of the three phase induction motor has certainly opened new horizons for performance analysis and operation optimization. In this simulation study estimation of speed variation of a three phase induction motor is based on the observation of changing poles of its transfer characteristics. The validation and speed of such dynamic modeling is demonstrated with the commercial software package, MATLAB/SIMULINK, and previous research papers. Results of this simulation studies showed that any change in poles results gradual increase of the output speed with the increasing order of system transfer function.**

***Contribution*—This paper suggests the technique to determine dynamic parameters of a three phase induction motor by changing its transfer characteristics for stability analysis.**

Keywords—Induction motor, MATLAB/SIMULINK, transfer characteristics, dynamic modeling, speed.

I. INTRODUCTION

Universal adoption of a.c. system evolved the need to devise control strategies for diverse application of three phase induction motors. Hence, an embedded control technology of its speed characteristics can be used to provide high level of performance and can be proved to reduce the system cost. In practice, induction motor drives with field oriented control shows excellent utilization, dynamic performance, higher accuracy in the servo applications and highly reliable operation. In order to predict transient behavior of induction motors [1] studied that anyone of the three reference frames namely stator reference frame, rotor reference frame and synchronously rotating reference frame and can be used. In [2], Dynamic behavior of the machine may be analyzed using rotor reference frame to estimate the machine parameters to proceed with transient modeling. In this paper the dynamic analysis of the three phase induction motors in an arbitrary reference frame has been considered as a standard simulation approach from which any particular mode of operation may then be developed. Calculating the poles using transfer functions approach for a frequency-controlled open-loop induction motor has been studied in [3]-[4].

II. SYSTEM MODELLING AND PARAMETER ESTIMATION

SIMULINK induction machine models are available in literature [5]-[6], but they appear to be black boxes with no internal details. Reference [7] refers to implementation of dynamic model and simulink of induction motor in synchronously rotating reference frame. But, fail in explain the performance of model with normalized variables. In this simulation study, figure 1 shows the extension of MATLAB, SIMULINK which has been used to allow graphical block diagram modeling and simulation of dynamic systems.

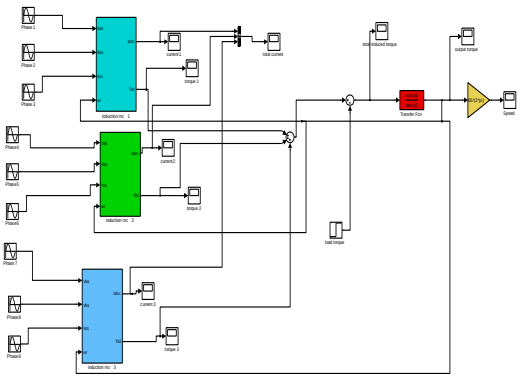

Figure 1: Simulink block diagram model.

III. RESULTS AND ANALYSIS

Simulation of a three phase induction motor in circuit simulator necessitates a system modeling for determining its transient behavior [8].The time varying speed diagrams enables to analyze and choose different characteristics for suitable mode of operation by varying only the transfer function [9]-[10]. Figure 2 and figure 3 shows the speed

curves of the induction motor case analysis for first and second order equation. With the variation in pole for both the first and second order equation speed curve increases gradually up to 1 sec and after that remains constant in 210 rpm. Hence with third order equation, system response becomes more oscillatory and reaches its peak at 400 rpm as shown in figure 4. Such dynamic modeling of this simulation study by varying the transfer characteristics has been shown in table 1.

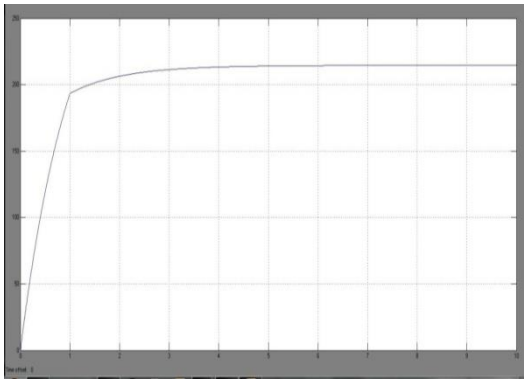

Figure 2: Total speed for the first order transfer function.

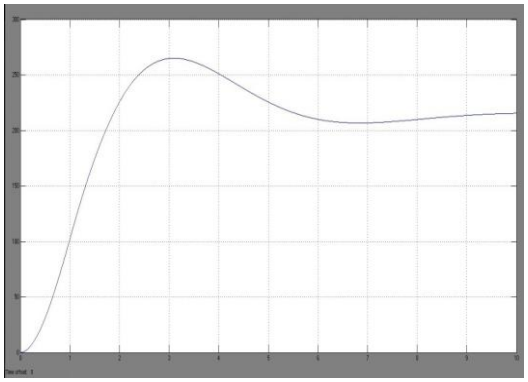

Fig 3: Total speed for the second order transfer function.

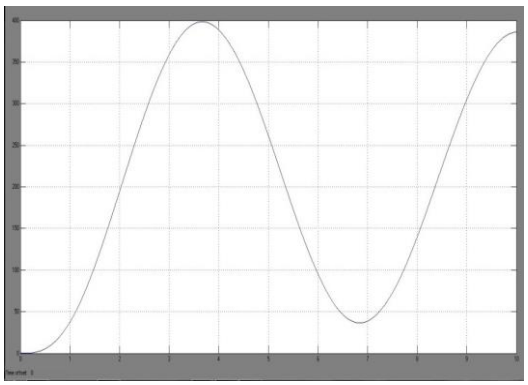

Fig 4: Total speed for the third order transfer function.

Table 1: Dynamic modeling of three phase induction motor.

Transfer function	Average Speed (rpm)
$\frac{1}{s+1}$	210
$\frac{1}{s^2+s+1}$	230
$\frac{1}{s^3+s^2+s+1}$	260

IV. CONCLUSION

In this paper, MATLAB/SIMULINK based modeling is adopted to compare the speed waveforms of a three-phase induction motor by varying its transfer function poles. Unlike many models developed for the induction motor that take into account the variation of the saturation level or the introduction of inductances time derivatives, this model leads to an easy computation by varying only the transfer characteristics. The main advantage of the proposed simulation study using MATLAB/SIMULINK relies on the fact that dynamic response can be demonstrated simultaneously and can be chosen for suitable operation by varying the poles of characteristics equation.

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Performance Analysis of Canny Methods for Various Thresholds

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Abstract— ***Canny's* method is one of the oldest and effective edge detection methods. In this paper, we have investigated the performance of the *Canny's* method, with and without using the hysteresis steps, which is known to be complex in terms of hardware implementation. The performances have been investigated by varying the iteration value of the modified iterative threshold algorithm.**

***Contribution*—Investigate the *Cranny's* algorithm performance with and without the hysteresis steps along with the changing the iteration value of threshold algorithm.**

***Keywords*— Canny, Threshold, Filter, Convolution, Gaussian Filter.**

I. INTRODUCTION

Edge detection techniques attract a huge attention among the researchers within the last few years. They have been used from security purposes to medical diagnosis with a high level of accuracy. Different kinds of edge detection methods have been proposed by the researchers [1]. Whatever be the methods, they try to mitigate the issues like 1) Error rate 2) Localization and 3) Response. Among the different methods, Canny's method for the edge detection is one of the oldest and conventional ones. According to Canny, this algorithm follows several steps to get the desired output. Few steps of cranny's methods are very hard to implement in hardware in respect to the complexity and processing time. If one of the steps of Canny's methods, known as "hysteresis linking" is reducing from the algorithm, the process will be definitely able to reduce the hardware complexity but with the expenses of the desired output quality. In this paper, we will investigate the performances of the newly get edges with the edges are founded from the original Cranny's method [2] [3].

In a broad sense, the section (II) will describe the Canny's edge detection method in a brief. Performance measuring parameters will be shortly described in the section (III). Section (IV) will explain few significant results with the explanation. This paper will be concluded in the section (V) with some concluding argument.

II. CANNY'S METHOD FOR EDGE DETECTION

Famous Mathematician Canny has proposed his edge detection technique in 1986 [4]. He used the derivative tool to analyse the gray scale variation in images to distinguish the edges. Let

$f(x,y) = a$……..(1)

isrepresenting the image, where

$x \in \{0,1,.,M-1\}$and $y \in \{0,1,.,N-1\}$,$\{M,N\}$representthe dimension of the image. Figure (1).shows the basic operation of Canny's methods. Firstly the input image is filtering by a filter kernel for noise removing [5], [6]. The output of this filter is horizontally and vertically convolved with some well-known kernels named as Sobel, Perweit etc. The output of the *Horizontal* and *Vertical*convolution are used to get the Gradient magnitude and Gradient angle values. These two values are used to calculate the Non-Maximal suppressed Gradient values. After the double threshold and hysteresis linking stages, the algorithm gives the final images which show the edges.

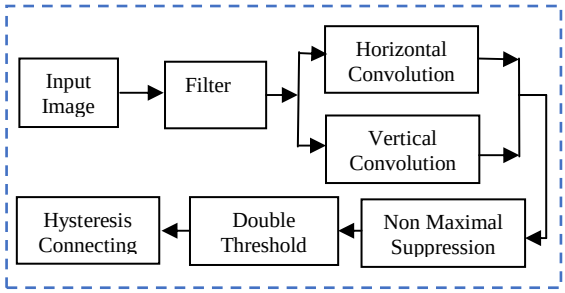


Figure 1. A diagram for Canny's edge detection method

III. THRESHOLD ALGORITHM

Thresholding is an important step for Canny's method. Different kinds of *Threshold Algorithm*s are available for thresholding. Here we use *iterative* based *Threshold Algorithm* which has been described as follows in a brief. Here η_{max}^{k} represents the maximum value at the κ^{th} iteration, which has been finally used for the threshold.

$$\begin{cases} \text{Iteration Number} \leftarrow \text{K}; \\ \text{Maximum value of the gradient} \leftarrow \eta_{\max}^{0} = {}^{\arg}_{\max}\, G(x,y); \end{cases}$$

$$\begin{cases} \text{for } \kappa\text{=1:1:K} \\ \quad \begin{cases} cluster^{\kappa} \geq \eta_{\max}^{\kappa-1}; \\ Average^{\kappa} \leftarrow mean(cluster^{\kappa}); \\ \eta_{\max}^{\kappa} = \left(\dfrac{Average^{\kappa}}{2}\right); \end{cases} \\ end \end{cases}$$

$$Output \leftarrow \eta_{\max}^{\kappa}$$

This thresholding algorithm finds out the maximum gradient values ($\eta_{\max}^{0}$) from the available Gradient values $G(x,y)$. Then divide the whole pixels into two clusters and

taking the cluster $cluster^{\kappa}$ which contain the Gradient values more than the value η_{max}^{k-1}. Then find out the average value of the selected cluster $Average^{k}$and find out $\eta_{max}^{k} \leftarrow \left(\frac{Average^{k}}{2}\right)$. This process runs up to the iteration κ =K.Finally, we get the threshold values as an output of this algorithm.

IV. Parameters to Measure the Edge Detection Performance

The point $\wp = (\rho_{co}, \mathrm{I}_{mp}, \rho_{nd}, \rho_{fa})$ indicates the overall edge performance in the scale $\mathcal{R}^4$[7]. In here ρ_{co} represents the percentage of the pixel that are correctly detected. I_{mp} represents the Pratt's parameter. ρ_{nd} and ρ_{fa} represent the percentage of the pixel that are not detected and the percentage of false alarm respectively.The value of $\wp = (1,1,0,0)$indicates that the edges are perfectly detected and it this point is called the optimal point. The most useful parameters which describe the Edge detection quality is Euclidian distance such as,

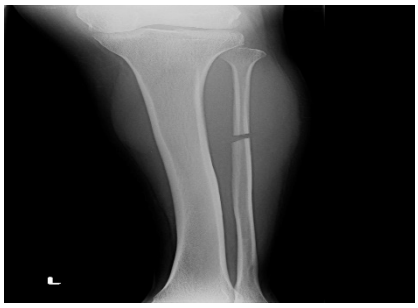
$$\varrho_{e2}^{4} = \sqrt{(\rho_{co}-1)^2 + (\mathrm{I}_{mp}-1)^2 + {\rho_{nd}}^2 + {\rho_{fa}}^2} \ldots\ldots\ldots (3)$$

We have used all these parameters to evalute the performances of our system.

V. Results and Discussion

For the performance analysis, we have utilized Figure 2 as an example. In here we have simulated both the Cannymethod with and withoutusing hysteresis steps using iterativelybased thresholdingalgorithm. This algorithm has been described in the section 2. Following Table 1.Shows the performance of the

Figure 1. This image has been used for our analysis.



κ	ρ_{co}	ρ_{fa}	ρ_{nd}	I_{mp}	ϱ_{e2}^{4}
1	0.7922	0	0.2078	0.7922	0.3600
2	0.7321	0	0.2679	0.7340	0.4640
5	0.6882	0	0.3118	0.6822	0.5401
20	0.6814	0	0.3186	0.6814	0.5519
50	0.6814	0	0.3186	0.6814	0.5519

algorithm with the original Canny's Algorithm.For performance analysis, we have considered (5 by 5) Gaussian kernel for filtering and (3 by 3) Sobel kernel for Horizontal and
vertical convolution.

TheTable. 1 showsthevaluesof ρ_{co}, ρ_{nd}etc. for the various iterationκ. This table gives some interesting assumption. As we increase the number of iteration the values of all the parameters except $\varrho_{e2}^{4}$are increased whereas the values of ϱ_{e2}^{4} are degraded,this think indicates that as we increase the value of the iteration the system become worse. The table also shows that whether the value of iteration increased or decreased, the value of ρ_{fa}remain 0 that means thereare no erroneous edges have been detected. When the number of the iteration is 1, which indicate that modified algorithm directly use the threshold value which have been used for Canny's method, the system gives the best result. Now the best Euclidian distance in$\varrho_{e2}^{4} = 0.3600$and the value of

$$\wp = (0.7922, 0.7922, 0, 0.2078)$$

which occurs when$\kappa = 1$. As the number of the iteration increases all the parameters' values become constant. This results was obvious. Because as the iteration value increased, the value of η_{max}^{k} become almost constant.

VI. Conclusion

To implement the hysteresis step of Canny's algorithm is more complex, in this work we have made the simulation without using the hysteresis with some modification of threshold algorithm. The best performance we get is $\wp = (0.7922, 0.7922, 0, 0.2078)$. In future, we need to improve the threshold algorithm to improve the performances of the measurement parameters. Incorporating Fuzzy methods as well as Neuro Fuzzy methods may improve the Canny Algorithm performance while we not using the hysteresis steps.

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Table 1. Shows the performance results.

A short review on Edge Detection Techniques

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***Abstract*— The importance of the imaging field has increased in the recent past. The related warehouse like methods and tools for the image management, diagnosis technique and their corresponding instruments has also increased [1]. Over the last hundred of years, the field of the photography and imaging has grown as a result of advanced in imaging innovation. Researchers have spend thousands of hours to extract the valuable information from the images. Among all the other feature extraction techniques, edge extraction from the images gained tremendous attraction now-a-days. This paper will give a short review about the current status of edge detection techniques along with the procedure of a basic edge detection method.**

***Contribution*— This paper gives a literature review on state of the art of edge detection techniques.**

***Keywords*— Edge, Gradient, Canny Methods, Wavelet, Fuzzy logic, Active Contour Model.**

Introduction

Among the different signal processing areas, image processing has raised its strong footprint in now-a-days. Capturing, receiving and transmitting of the images have gained an enormous importance among the researchers in the recent past. Instruments like X-Ray, MRI, cameras etc. are used to capture the targeted areas. Image processing techniques are used to extract the information from the available data gathering from the images captured by the instruments. Among the different feature extraction techniques, edge detection is one of the prominent issues. Calibarately this edge detection technique is used to detect the bone fractures also. In a broad horizon, three types of edge detection techniques are available such as 1) Derivative operation based 2) Template matching based. 3) Mathematical model based. Whatever be the methods, all the edge detection technique try to optimize the following issues such as, 1) Less error Rate 2) Localization and 3) Response.

This paper gives a very short review on various edge detection techniques. In a broad sense, section (II) gives a procedure for edge detection technique from image. Traditional Edge detection methods are described very shortly in section (III) whereas section (IV) describes the different mathematical tools which are currently used for edge detection. This paper concluded at the chapter (VI).

I. PROCEDURE FOR EDGE DETECTION

A significant change in features such as colour or brightness of images may be considered as edge [2]. Edge detection technique is the most commonly used operation in image analysis. Figure1. shows a basic and very simple description of edge detection procedure.

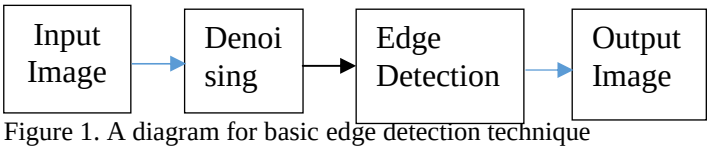

Figure 1. A diagram for basic edge detection technique

At first stage the image is denoised using different kinds of common filters depending on the noise attitude and characteristics. The most commonly used noise removal filter is Gaussian Filter. After denoising, the processed image is sending through an edge detection methods. And finally we get the output image which represent the edge only.

II. TRADITIONAL EDGE DETECTION TECHNIQUE.

In the traditional methods, like Canny, Sobel etc. [3] use the concept of derivatives and gradient. The derivative operation explain the rate of change of a function. If an image is represented by $f(x,y)=a$, and the derivative of this function describe the change of the gray levels of that image. As image is a two dimensional matrix and while we calculating the edge, we need to consider the variation of the derivative in to all directions. Gradient operation properly describe the variation of the gray scale at all the directions such as,

$$\nabla f(x,y)=\left(\frac{\delta f}{\delta x},\frac{\delta f}{\delta y}\right) \quad (1)$$

where, ∇ represents curl operation. As image is not a typically defined function and it has discrete values. So we can represent the differential equation as

$$\frac{\delta f}{\delta x} \approx f(x,y)-f(x-1,y)=\nabla x \quad (2)$$

a difference equation such as, Similarly 4y can also be defined. Gradient magnitude of a pixel can be represented as

$$\nabla G=\sqrt{\nabla x^2+\nabla y^2} \quad (3)$$

and the edge strength direction can be represented by Gradient Angle such as

$$G_{\angle}=\arctan\left(\frac{\nabla y}{\nabla x}\right) \quad (4)$$

Every gradient based edge detection methods use horizontal and vertical derivatives. Using these two derivatives, each

method calculate the values of ∇x , ∇y , ∇G and $G_{\angle}$. Using previous parameters and some other techniques, traditional methods find out the targeted edges.

III. DETECTION OF EDGES USING DIFFERENT KIND OF MATHEMATICAL TOOLS

Fourier Based Edge Detection Fourier transform gives the frequency domain information of a signal such as images. It filters the image from the frequency domain perspective. Suppressing the low frequency by Fourier methods give the edge information. The problem of this methods is that it requires padding of extra 0's which increases the complexity as well as memory size of the processors. Frequency domain filters require prior knowledge to filter out the unwanted information. Donald G Bailey proposed self-filtering method to analysis the image pattern in frequency domain [4].

Fuzzy logic Edge Detection Fuzzy logic has been introduced by famous scientist Lufti Zadeh in his paper [5]. Fuzzy is a mathematical tool which used to utilize human knowledge or daily experience in to a numerical or structural framework. Noise removal, thresholding, edge detection and many more aspects, Fuzzy logic was first time introduced by Cheung, K.F. and Chan, W.K. in [6]. For edge detection from the images, these authors introduced Fuzzy-One-Mean Derivative Filter (FOM-DF) and used for robust edge detection incorporating with Gaussian filter. Yan-Hwang proposed Fuzzy Sobel method, where they apply fuzzy logic concept to characterize the image to find out the edges.

Waveletr based Edge Detection Wavelet is a mathematical phenomenon, which have some special properties and was proposed by Alfrad Harr in 1909. Fourier transform only gives the frequency doamin information of the object. Whereas, wavelet transform gives the frequency domain as well as time domain information. The maxima of the wavelet transforms modular can be used to detect any irregularity within the images. If we able to find the local maxima of an image it is equivalent to find out the edges from that images. This concept was proposed on the basis of wavelet transform by the authors Stephane Mallat and Sifen Zhong at their work described paper [7]. M-band wavelet transform and an energy operator has been used to analyse the edges of an image which is proposed by the author Turgut Aydin etal. in 1996 at their work [8]. Javed Musevis etal use extended Otsus's thresholding methods along with the wavelet transform to extract better edge information from the images [9].

Active Contour Methods Active contour model extensively used by the researchers to find out the boundaries of the targated objects like tracking object, after the proposed seminal paper by Michael Kass etal in 1987 [10]. One problem of this method is that sometimes it may leads towards the incorrect solutions. To overcome of this problem, R.Bellman proposed Gradient Vector Flow (GVF) method [11].

Law's Methos Texture is an important feature that help to segment the images into some Region of Interest (ROI). In the paper of M.Rachidi etal.tThey use Law's mask to analyse edges of ROI [12]. Synthe etal use Law's method and there observation is that, Law's feature provide more accurate edge classification than some other untrained trials [13].

IV Conclusion

Edge detection techniques can be used for various aspects. From biomedical image processing to fruit separation in the industries, the edge detection techniques are used with high class precision. Keeps these aspects and importance of edge detection in mind, this paper gives a very short literature review about the edge detection methods. Readers will clearly understand which mathematical tools are used for image processing in recent days.

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Time Response and Sensitivity Analysis of Force Sensing Resistor for Repeatable and Reliable Palpation Measurement

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Abstract **-Two thirds of the world's population, particularly living in the least developed countries (LCDs), lacks the quality healthcare necessities, due to economic inequality which leads to geographic maldistribution of healthcare resources. A significant part of primary medical examination is "Palpation "in which doctors touches and presses onto different anatomical sites for diagnosis, for which no equivalent solution has come up so far for telemedicine. The challenge of present work is to give the remote doctor an experience of virtual palpation in real time through development of appropriate hardware and software technologies.In this article, we present study results of time response sensitivity measurement for force sensing resistor (FSR) 400 by Interlink technologies, which has the potential to measure palpation accurately. This sensor can be installed and used in LDCs, suitable for diverse group of users and aims to make available to the populations of developing countries at affordable cost.**

Keywords- **Force Sensing Resistors, Biomedical Systems, Time Response, Palpation, Tele Medicine.**

I. INTRODUCTION

Soft tissue stiffness generally assessed by the subjective method of manual palpation in clinical practice [1].Palpation involves the highly developed sense of touch in a human body, here, of the doctor. It has to be done by the doctor him/herself as the feedback has to be personal. The doctor can feel the position, size and shape of internal organs inside besides assessing their mechanical properties, like softness or hardness, elasticity etc. Thus a doctor relies on sensations from the finger tips to perceive a wide variety of anatomical structure and pathologies[2].The project focused on a double solution in the short term giving at least some vital information to the doctor. In this proposed project sensors will be attached to the fingertips of a trained technician at a rural Centre who in turn will try to have an assessment of the outcome in real time through appropriate displays on a PC monitor or on a smartphone, in order to decipher medically significant information. Theobjective of this study to design the test vehicle and detailed analysis of the Time response sensitivity for FSR 400 by interlinks technologies for palpation measurement.

II. METHODS

Time response by FSR 400 was measured using the data logger, a compact device developed by Department of Biomedical Physics and technology of Dhaka University. This device could measure output voltage for various applied force using Jig for pressure calibration.

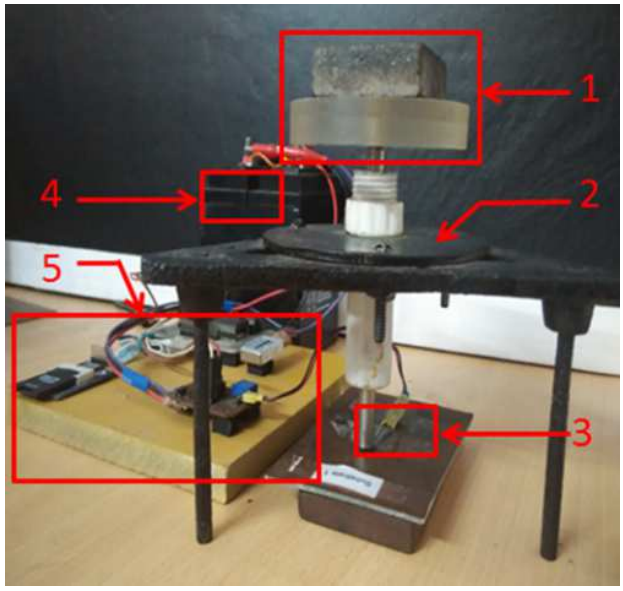

Figure 1: Experimental setup, 1.Weights; 2. Jig for pressure calibration; 3. Force sensing resistor FSR 400; 4.Power supply; 5.Data Logger.

Figure 1 (5)show the data logger mainly composed of Microcontroller and op-amp data acquisition, Lithium battery for power supply, converter and HD card for data storage. Main parts designed for application and measurement acquisition. The force was applied to the sensor surface using the jig for pressure calibration. Time response measurements were acquired using the test vehicle described above. FSR 400 was aligned with the jig and a fixed weight of 135 grams of the jig applied on polymer thick film sensor surface for 30 seconds. After 30 seconds another 200 grams, that means total (135 grams + 200 grams) =335 grams of weight applied on the sensor surface. This process continues for few cycles. The output voltage for applied force was measured and recorded in the data logger. Another 5 trials using same test vehicle was measured for 135 grams and 335 grams for 10 seconds each to understand the transition better. Positive 6volt was used for power supply.

III. FINDINGS AND ARGUMENTS

Time response measurement is a major challenge due to various constrains such as time, experimental setup, available number of samples etc.[3][4][5].

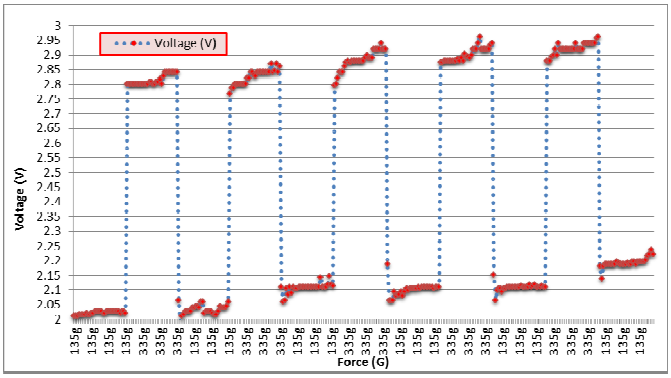

Figure 2.Force Vs Voltage, sensitivity measurement for FSR 400 force sensor by Interlink technologies

The statistical analysis was carried out using Microsoft Excel. A graph in figure 2 shows the data distribution acquired using the test vehicle. Values in figure 2 showed an increase of voltage with increase in weight and follow the same trend for the rest of the experiment.

TABLE 1
OUTPUT VOLTAGES FOR VARIOUS TRIALS USING DIFFERENT TIME PARAMETERS

Time (Sec)	Output voltage (V) (Trial 1)	Output voltage (V) (Trial 2)	Output voltage (V) (Trial 3)	Output voltage (V) (Trial 4)	Output voltage (V) (Trial 5)
1	2.802	2.788	2.797	2.875	2.88
3	2.802	2.802	2.822	2.88	2.88
5	2.802	2.802	2.841	2.88	2.9
7	2.802	2.802	2.861	2.88	2.9
9	2.802	2.802	2.88	2.88	2.919
11	2.026	2.016	2.109	2.109	2.119
13	2.026	2.026	2.143	2.109	2.114
15	2.026	2.041	2.109	2.109	2.109
17	2.021	2.041	2.119	2.104	2.109
19	2.026	2.06	2.119	2.109	2.109

As can be seen in the graph, a very sharp and sensitive characteristic of the sensor was observed in figure 3.It shows, within a second of time the output voltage come to its original value after preloading with a specific amount of weight. This part of the experiment was carried out in five trials and the time response was similar for all the trials.

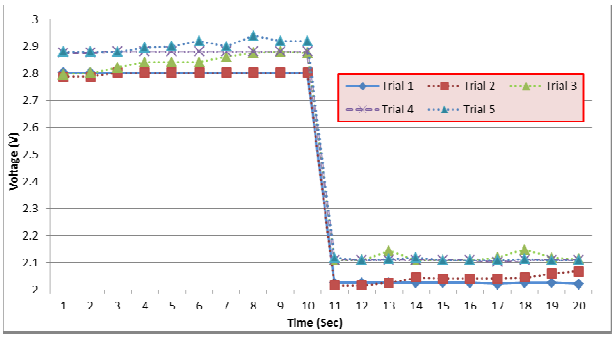

Figure 3.Time Vs Voltage, sensitivity measurement for FSR 400 force sensor by Interlink technologies

IV. CONCLUSIONS

Measuring the mechanical properties of biological tissue is a complex problem. In the current study, FSR 400 appears to be very sensitive for multiple cycles and has the potential to use in the fingertip for palpation measurement. This study is one step of the studies to follow, which should be carried out with various anatomical structures for palpation measurement.

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Realization of a Personalized E-Learning System architecture based on the defined role of learners.

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***Abstract*— In web-based learning system personalized service is important to provide learning recommendations to learners. This paper proposes a personalized learning environment where learners get the facility to achieve their learning objects by technological supports and suggestions. The framework for personalized learning recommender system is obtained based on Learner's Interest and Need which aims to help learners find learning materials they would need to read. Our approach uses student's logs in Moodle designed course to generate user profile database. This e-learning system could automatically guide the learner's activities and intelligently generate and recommend learning materials that would improve the learning system.**

***Contribution*— Create a framework for Personalized E-learning System based on learner's interest and need.**

***Keywords*— Personalized; Learner's status; Learner's Feedback; Personal Preference; Recommendation Process.**

I. INTRODUCTION

The personalized learning environment is an online learning environment where learning system automatically guide the learners [1]. Personalization is a paradigm entails mainly from the search tools in which users can filter out irrelevant search results according to their preferences that changed traditional learning behavior and presented a new situation.

Higher education provides a convenient and efficient learning environment and practical utilities at anytime and anywhere. This way, it has created a problem of information overload. As a result, Internet users are unable to find the information they require. Most of the search engines provide uninteresting & irrelevant search results. To prevent this unwanted result we focused on Item Response Theory, IRT is a robust theory in education modeling [3]. Item Response Theory usually holds the Computerized Adaptive Test (CAT) domain [3] to select the most appropriate items for examinees based on individual ability. The CAT efficiently shortens the testing time and the number of testing projects. CAT permits finer diagnosis at a higher level of resolution. The proposed system prevents the learner from becoming lost in the course materials by providing personalized learning guidance.

It filters out unsuitable course materials to reduce cognitive loading [1] and providing a fine learning diagnosis based on an individual's user profile. We use content management system Moodle [7] for the realization of the personalized E-learning framework. We implemented feedback agent as a plug-in for the Moodle. We used Moodle usage data to enhance the learning styles of students.

II. SYSTEM REVIEW

Researchers have proposed many personalized learning models. In [2], authors proposed an information pushing service based on the learning style of the user obtained from user interaction across the multiagent environment. In [3], proposed a system which especially taking care of both course material difficulty and learner ability to construct personalized learning system. In the area of Artificial Intelligence in Education, personalized system forms student modeling based on the weakness or expertise of learner over the given course materials in intelligent tutoring system [5]. In this paper, we have proposed the contribution as a framework for the personalized learning system in which the learning system reflects the role of learner and instructor in the learning process. Then we define the organization of the paper. In section 3, we have proposed the system architecture and learning process which define the roles of the students and instructor. Next subsequent sections discuss the components used and the result of this system, and finally we discuss the conclusion and future works.

III. METHODOLOGY

The methodology of Personalized E-learning system is as below:

A. *System Architecture*

Fig. 1. shows the steps of system architecture.

- Register new users and store the user activity in the user database as shown in Fig. 3.
- Identify user/learner's registration status.
- Collect learner's information and search depend on learner's query.
- Stores learner's visited pages.
- Select recommended course materials based on individual learner's interest and ability.
- Collect learner's feedback.
- Modify the learner's profile by analyzing the feedback result.
- Expert panel forms the expert suggestion by forming expertise with all learning resources and pass the data to record the recommended course materials.
- Display the list of recommended courses.

B. *System Properties*

Fig. 2. shows system properties of the learning process.

- A user profile that provides user's details.
- Feedback agent provides user's requirement depends on their interest and need. Course recommendation process provides course ID to the course session database after analyzing the feedback result. We provide an intelligent prediction model generation of a student with support vector machine and clustering [4]. This classification algorithm classifies the course material whereas clustering provides grouping of the learner.
- Recommended course materials display to the users via the interface.

C. Details of learner and instructor role

Learner in the digital library will register and browse for course resources prepared by instructors, make online testing and actively participates and collaborates with other learners and instructors.

Instructor Role in the Pedagogic process: Create and assess learning objects, conduct and publish a test online, search learning objects, evaluate learner performance and collaborate with other instructors or learners.

IV. Result Overview

This system provides an automatic way to get feedback from learners that are very useful to their learning process. It could guide the learner's activity to form a personal suggestion where recommended course materials depend on individual learner's personal preference, learning experience and need. The Personalized system motivates learners and also helps them to learn more effectively and efficiently. Personalized learning realizes e-learning systems by catering educational experience that suits needs, goals, abilities or interests on a particular learning topic for a learner [5] [6].

A. Personalized E-learning System Architecture

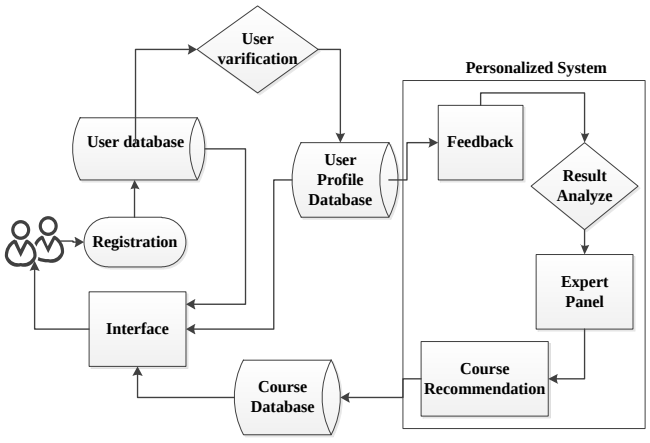

Fig. 1 Personalized E-learning System Architecture

B. Working flow of learning process

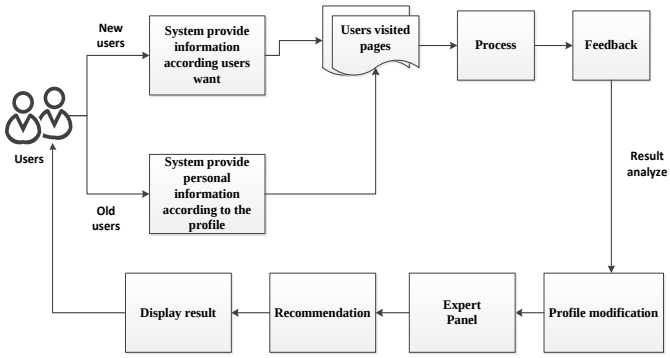

Fig. 2 Learning Process

C. Learner Database

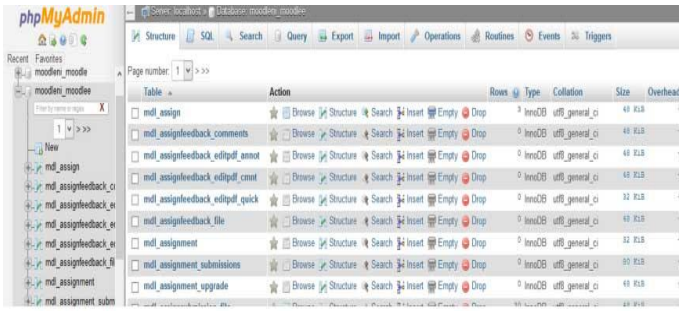

Fig. 3 Different table for learner database

This paper thus proposes a framework Personalized E-Learning System based on learner's interest and need. It provides course materials according to learners visited documents and their responses. We provide the Role and action of learner and instructor in this framework.

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Incorporating face annotation scheme to help user search photo in personal photo frame application

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***Abstract*— In recent years, there is growing trends to form a personal space with the social community by keeping and tagging photos. In this research, we have developed a particular photo frame system, namely, PFS. PFS maintains individual windows of photos and support photo search by drawing the visual content on Canvas. We employed face detection and recognition in image annotation to annotate and search pictures in a flexible manner. Experimental evaluation of a small-scale image query returns precision for useful search formulation.**

***Keywords*— Personal photo frame, Image annotation, image search.**

I. INTRODUCTION

In recent years, increasing presence of a user in space like facebook and twitter drives people to maintain personal photos in digital spaces in Web 2.0. 0 user in the social space finds growing resource to share their experience and keep all the profile for their memory. Moreover, many research projects and commercial products have deployed the IT evolution of processing powers and modern sensing devices, analysis and rendering equipment and technologies. The widespread use of these phenomena has created a strong urge for digital content annotation techniques [4] in applications like Facebook and Flickr. Given an arbitrary image, the face detection determines the faces presents in the region of interest in the photo and returns extents of each face in location and sizes given that it exists. This automatic recognition is one of the challenging tasks with the object class detection in which, the task is to search the locations and sizes of varieties of objects in digital images pertain to a given class. In this paper, we have deployed a platform for Photo Frame system (PFS), that allow the user to manipulate and search photo based on the facial appearance. The aim of this research is to help users maintain a personal window of photos and to design and develop a system that conforms user-friendly user experience maintaining usability.

II. RELATED WORKS

Image auto-annotation research pursues some techniques that find a correlation between low-level visual features and high-level semantics [6]. These face annotation functionalities ensure efficient and effective search in personal photo collection in photo sharing sites in which the uploaded images invites automatic annotation. The search based face annotation paradigm aims to tackle the automated face recognition task by exploiting content-based image retrieval [5]. Recently some efforts aside commercial attention capture user's search intention by visually allowing them to describe the image content and layout on a particular query canvas [4], [6] [7]. In our system, we provide the annotation facility and photo search in a flexible manner estimating face attributes and face similarity.

III. SYSTEM OVERVIEW

We solicit here to make an application based on the existing annotation algorithms in the automatic and manual form. The efficient face annotation scheme recognizes the faces and annotates them properly. An implementation of a canvas ensured graphical manipulations like draw, type, scale and drug for interactive searches. From the query interface, we match a positional query with minimal lagging to access the desired window quickly. Our system consists of Browse panel to browse the windows; Search Panel to search photos and Mode Panel to manage people appeared in a photo in Manual and auto-annotation mode. We have integrated face detection and recognition technologies and facilitates user to experience the exploration by providing rich, user-friendly experience for search and query.

A. Face Annotation

Face annotation plays a significant role in our system. A face annotation tag incorporates names for identifying and training any person for the face recognition. To this end, we seamlessly connect face annotation with user's contact address. We currently utilized the Google Contacts Data API to maintain the relationship between faces and people in our system. In this paper, confidence in face detection for image annotation is ensured through color based facial classifier with cascaded HAAR classifier devised by Viola and Jones to reduce false positive [1]. This adoption of fusion scheme allows us to combine geometric feature based Adaboost classifier with color based facial region likelihood classifier. The frameworks work in image level, feature level, and scoring level. Some area of interest areas that are not detected by the Adaboost classifier in HAAR cascade classifier are forward to an ANN classifier to check if it is a profile face [3]. The advantage of adopting this scheme overcomes the false region generated by the similarity in geometric components and produces a likelihood facial map in the rectangles. In this

color scheme, we use skin-similar region and shape based detection calculation to form profile-view faces.

B. Indexing and Drawing with face position on canvas

In our system, we scaled off the picture by indexing it with the width and the height and then tags it with <user, location> tag. In such a tag, user is user name and location is the face position, such as the x and y coordinates from the left-top edges of the photo.

Haar features can be the centroid coordinates of each annotated face that are further calculated to support a fast interactive search based drawing of people positions. Since every photo has a different size, all pictures in the framework are divided into 4×4 blocks (16 rectangular regions). We call this rectangular part as "blob" in our system [6]. Furthermore, a user can manually annotate the blob and extends the number of blobs to cover up the whole face. However, users would be interested in an approximate position of a face in a photo, rather than an exact location of the face. Therefore, we take into account the region containing the centroid to match a positional query quickly and efficiently.

Pursuant to the earlier discussion, a fundamental issue is to support the user to form search intention. Currently, the user can formulate their plan by drawing blobs onto the canvas while tagging. The user can bring the canvas to specify the regions of face appearances and add a tag for the person in the registered list in contact API. The user can also drag and scale the areas to change positions and the sizes of the face and correspondingly system frame changes accordingly to form search intention automatically.

Fig. 1 PFS front end for image annotation.

By default, the query canvas is segmented into 4×4 regions analogous to photos indexed. This segmented region is called "tiles" in our system. This "tile" holds the centroids of the "blobs" (rectangular part of the image) whenever a user draws the position of the face appearance on the canvas. Although the canvas interface is convenient to represent users' search goal, sometimes user make an error of drawing face positions what they are likely to find. It is worth pointing out that the user can outline a spatial position with which user can adjust the desired accuracy level.

IV. Result Overview

Toward the end, in this paper, for the performance evaluation we have kept 250 faces in 525 daily photos in the dataset. Then we manually create seven separate queries listed in Table 1. We then ask 20 subjects to do the evaluation by showing them the questions with top 5 results retrieved by our system, and ask them whether the retrieved result is relevant to the query.The ratio of a number of tags in the annotated image to the total number of tags retrieved in every image search defines the Precision [6]. For a given semantic descriptor, positional query corresponding to the center returns the highest precision .70 whereas the top left and top right returns the accuracy of around .63 and .62. In image auto-annotation. In image auto-annotation, the total correct annotation rate is 80% making the fusion scheme useful. Observation shows that unsuccessful detection of the profile-view faces is segmented, and shape likelihood evaluates segmented blobs. Correspondingly the possible blobs are forwarded to the profile view face classifier trained by a small database set. In a word, this fusion scheme leads reduced false region and hence increases the number of undetected blobs as annotated image. It shows that the spatial position of the centroid that has the highest accuracy of the search empirically, whereas the centroid position increases search relevance. We are currently planning more aesthetic aspect of the image and employing the ranking algorithm in image automation [8].

V. Conclusions

We have described the development process of a photo frame system with an intuitive, user-friendly interface and in manual and auto-annotation mode. Our system is simple and easy not only to maintain personal memories by also to search photos. By drawing the position with tags, we seamlessly connect spatial information with people in photos and enable more flexible photo lookup, according to the user's intention.

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UCPS-Tree: An Efficient Approach of Mining Frequent Patterns in Uncertain Data Stream.

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***Abstract*— Discovering frequent patterns from uncertain running database is a challenging field of data mining, but its demand is uprising because of its huge applications in telecommunication, web application, market basket data and automation system. This paper proposes a prefix-tree structure, called UCPS-tree (Uncertain Compact Pattern Stream tree) which efficiently mines the most recent frequent patterns from streams of uncertain data. Experimental results indicate that proposed UCPS-tree facilitates less running time and saves memory consumption by compressing nodes over other FIM algorithms developed in the field of uncertain data stream.**

***Keywords*— frequent pattern, uncertain stream, UCPS-Tree, Frequent item set mining, Data mining.**

I. Introduction

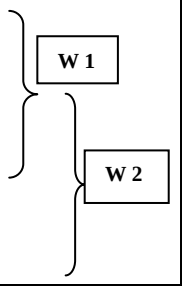
Data Mining is a systematic procedure aimed to explore useful information from large databases. Uncertain data stream is a data source (i.e., web clicking stream, geospatial data, dynamic tracing of stock exchange data, sensor network data etc.) where data are uncertain, continuous and infinite in nature. Here we do not have the chance to perform multiple data scans as once the streams flow through, we lose them. Hence, we need some efficient techniques to capture the important contents of the streams and hence we need exact algorithm to handle such challenges to mine frequent patterns. Tree based structure is a simple but yet powerful technique to handle this issue. Very few algorithms SUF-Growth [1], UDS-MBP and UDS-FIM [3] are developed to mine FIM in Uncertain stream. However, they provide poor compactness in tree structure. Therefore, in this paper, we propose a novel tree structure, called UCPS-tree (Uncertain Compact Pattern Stream tree) which is basically based on CPS-Tree[4] and CUFP-Tree[2]) that constructs a compact prefix-tree structure with a single-pass over uncertain stream data and provide the same mining performance as the FP-growth technique.

II. Methods

Our proposed UCPS-tree uses the sliding window mechanism to capture the recent data of uncertain stream. To facilitate the window sliding and tree updating, each window W is decomposed into a number of equal-sized non-overlapping batches of transaction called b. Let the window slides batch by batch. Each batch constitutes of 3 consecutive transactions and each consecutive two batches forms a window. The UCPS-tree follows the CUFP-tree construction mechanism to insert transactions into the tree.

TABLE 1: Transactional Database

Batch	Transactions	Items with Existential Probability	Window
1	T1	a :0.123,c: 0.855,d: 0.578	
	T2	b : 0.657, c: 0.488	
	T3	a : 0.256, b: 0.821,d: 0.656	
2	T4	a : 0.235,b:0.506,d:0.23	
	T5	a: 0.526, b:0.33,c:0.212	
	T6	a : 0.48, c: 0.92	
3	T7	a : 0.713,b: 0.675, c: 0.875	
	T8	a: 0.121	
	T9	a : 0.236,c:0.588	

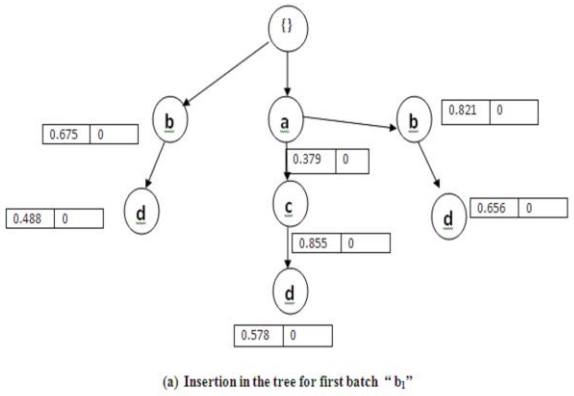


A. UCPS-tree construction

At first, the current window W is scanned, sum of expected support count are calculated for each item. The items whose sum of expected support satisfy the predefined minimum threshold value are kept in a list called header table H according to their corresponding expected support descending order. Then the database is scanned for second time, when each transaction are sorted according to items in Hand inserted in the tree in CUFP [2] manner. But when the first batch is complete, the tree is compressed and dynamically reconstructed as in CPS-Tree [4] before the mining process. The corresponding batch id is maintained in an array in each node .The final UCPS-tree after construction and restructuring phases is shown sequentially in Figure 1 and 2 for dataset in Table1, with window size W= 2 batches and b= 3 transactions. The final tree is shown in Figure 3.When each window slides we update the UCPS-tree by deleting the expired batches and inserting the new ones.

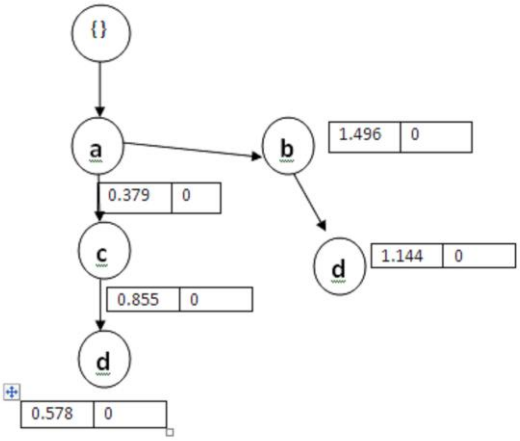
B. Mining of UCPS-tree

Once the UCPS-tree is constructed on current window, we use the bottom-up FP-growth mining technique to generate the exact set of recent frequent patterns. The mining operation is highly efficient due to the frequency-descending tree structure.



(a) Insertion in the tree for first batch "b_1"

Figure 1: Insertion of batch 1st batch "b1"



(b) Compression of the tree for first batch "b_1"

Figure 2: Compression of batch 1st batch "b1"

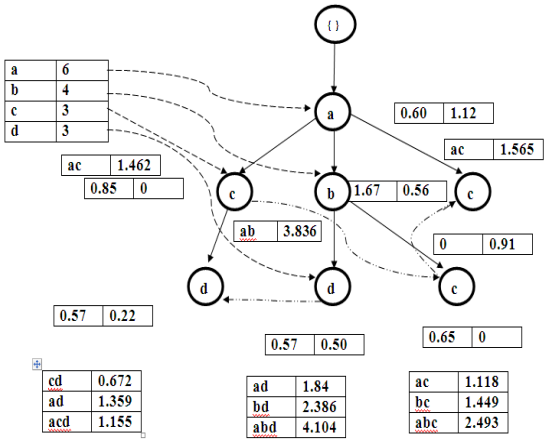


Figure 3: Final UCPS-tree for the whole database

FINDINGS AND ARGUMENT

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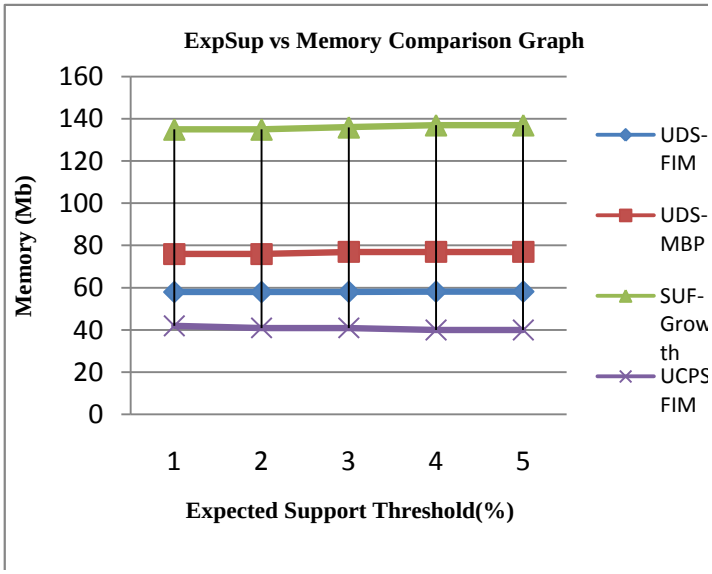
We compare performance of our CPS-tree with those of the UDS-FIM, UDS-MBP and SUF-Growth on the basis of runtime and memory consumption. All programs are written in Code blocks 10.5 using C++ language and run with Windows 7 on a 2.6 GHz CPU and 4 GB RAM. Runtime includes tree construction, tree restructuring (for UCPS-tree only) and mining time. Several real life and synthetic datasets are used. The results on memory consumption on "connect" datasets are shown in Figure 3. It is clear from the figure that the total number of nodes of the UCPS-tree requires significantly less memory compared to that of other. The reason is that UCPS-tree's dynamic tree restructuring phase which enables it to obtain more compact prefix tree structure. The runtime comparison also shows that the algorithm outperforms other algorithm in overall execution time as the tree obtains frequency-descending tree structure.



III. CONCLUSIONS

Conclusions should include (1) the principles and generalisations inferred from the results, (2) any exceptions to, or problems with these principles and generalisations, (3) theoretical and/or practical implications of the work, and (5) conclusions drawn and recommendations.

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Learning to assess and classify daily physical activity using cell phone accelerometers

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***Abstract*—Human Computer Interaction research (HCI) is concerned with the design and evaluation of real life projects that involve human interaction in particular context he is doing activity. In recent years, people use smartphones to gather context information on various activities and model the activity of Daily Living to recognize activities. To meet this objective, we employed machine learning techniques to solve practical problems of HCI design and evaluation. With this view, in this context, we describe in this work an Activity Recognition database, built from the recordings of 24 subjects doing Activities of Daily Living (ADL). The paper then aggregated this time series data into examples to make it fine grained for supervised classification. Experimentation carried out on 10-fold cross-validation, and leave-one-subject out a strategy over naive Bayes classification eventually traces activities finer accuracy.**

***Index Terms*—Data Mining, activity recognition, predictive model, accelerometer, sensors. algorithms.**

I. Introduction

Human-centered computing is an emerging research field that aims to understand human behavior and integrate users and their social context with computer systems. We describe in the paper an activity recognition systems that tracks user activity. In such a system, we first collected accelerometer data from twenty-four users in the low-level sensing module. The system lets the user performing activities such as strolling, running, ascending, descending, Relaxing (sitting inhaling), and Relaxing (standing exhaling). We selected these movements, because, most of these actions involve repetitive motions and we believe this should also make the actions easier to recognize. In the feature selection and processing module, we then aggregated this raw time series accelerometer data into examples using WEKA data mining tools [6]. Our work makes several contributions. One contribution is that we demonstrated how raw time series accelerometer data can be transformed into examples. We presented a list of features in this article through data collection and feature mapping, that can be used by conventional classification algorithms.

The rest of this paper is organized as follows. We discuss related work in Section 2. We describe our activity model and describe the process for addressing the activity recognition task, including data collection. Next, in section 3, we go on for data preprocessing, and data transformation to start with experimentation with the test bed data and with several known supervised learning algorithms. Toward the end, in Section 4, we conclude the work and write our future aspirations with the system.

II. Related Works

Automatically recognizing human activities such as walking, jogging, in a home setting allows many applications in areas such as intelligent environments [1][2] and healthcare [5]. Human Activity Recognition (HAR) aims to identify the actions carried out by a person given a set of observations of him/herself and the surrounding environment. Recognition can be accomplished by exploiting the information retrieved from various sources such as environmental [1] or body-worn sensors [2][4][5]. Interesting works reported in the literature over the years, concerned, among other aspects of training-based generic classifiers like Nave Bayes [3], decision tree [2]. Moreover developments such as k-nearest neighbor (kNN) used in [2], and Support Vector Machine (SVM) used in [4,5] are popular.

III. Research Methodology

In order to collect data for our supervised learning task, it was necessary to have a large number of users carry an Android-based smart phone while performing certain everyday activities. The data collection was controlled by an application Actitracker [7].

In all cases, we collected data for 5 minutes, that gives us 30 thousand examples of raw data for every user activity. While collecting test data, a researcher who knows how the system works may perform an activity in a manner favoring the recognition system. We address this bias problem by using subjects completely unaffiliated with any of the researchers.

Next, after data collection, we generated informative features based on the 30 thousand raw accelerometer readings, where each reading contained an x, y, and z value corresponding to the three axes/dimensions.

Our experiments consist of two major tasks: Data preprocessing and Data classification. Both tasks are described follow:

In order to collect data for every 10 second segment, we divide the collected 30 thousand raw data in 3 equal bins. Each of these bins contain approximately 1000 of raw data samples. Firstly, we added 3 temporary attributes (bin_col_x, bin_col_y, bin_col_z) for every axis By using these attributes, we determine the range of values for each axis (maximum-minimum), divide this range into 10 equal frequency bins, and then recorded what fraction of values fell within each of the bins. Secondly, we generated the following attributes We generated a total of forty summary features, although these are all variants of just six basic features. These features are: Binned Discretization: we here divide the range into 10 equal bins, Mean value of the accelerations: Average acceleration value distributed at three axes, Standard Deviation of the

acceleration, Average absolute difference records duration of action, Average resultant acceleration due to RMS of the acceleration value. Once the data set was prepared for 24 users, we go forward to the next task with data classification.

A. Data Classification

Data Classification is a form of data analysis that can be used to induce models from the training set describing important data classes or to predict future data trends over test data by finding the accuracy. If the accuracy is considered acceptable, the rules can be applied to the classification of new data tuples. We used three classification algorithms from the WEKA data mining suite [6] to induce models for predicting the user actions: C4.5 decision trees (J48) and Naive Bayes. In each case, we used the default settings. We use 10-fold cross-validation [6] for all experiments as a measure for finding accuracy and all results. The attribute evaluator CfsSubsetEval was run on the data using the BestFirst search method. CfsSubsetEval[6] considers each feature's specific predictive ability to produce a subset of features that will provide a similar degree of classifier accuracy.

IV. Result Overview

TABLE I
SUMMARY OF CLASSIFICATION ACCURACIES PER CLASS BASED ON J48 CLASSIFIER ATTRIBUTE SELECTION APPLIED WITH THE FIRST 5 FEATURES

Class	LOO CV	10-fold CV	ROC area
strolling	94.1.8%	93.1%	.936
running	96.8%	95.6%	.970
Asc_up	66.7%	62.8%	.530
Dsc_dow	62.7%	59.6%	.541
Relax_inhale	91.7%	90.5%	.918
Relax_exhale	88.9%	87.9%	.838

Table I summarizes the classification results per class using the two cross-validation protocols, namely the "leave-one- -out" cross validation (LOO CV) and "10-fold" cross validation (10-fold CV)[6]. Because of the imbalance problem mentioned above, only the aggregate accuracies were given. The classification accuracies using LOO CV and 10-fold CV were 88.5% and 87.1%, respectively. The accuracy using 10-fold CV was lower than that using LOO CV, simply due to that the training dataset in the former case was smaller. In addition, the standard deviation of LOO CV was relatively large, possibly resulting from the imbalance in types and durations of activities performed by each subject, which is typical with activity data collected from everyday life.

From the tables, it can be clearly seen that both running and strolling achieved high accuracies as those classes have separate characteristics in generating acceleration among the five activities. Classifier can correctly classified above approximately 90.00% of the transformed data set. Subsequently, we can point out that the "Ascending up" and "Descending down" activities have the similarly true positive rate of approximately above 60%, since these were the only activities that were difficult to recognize.The classification accuracies of Ascending up or Descending down appeared moderate as here the diversity and complexity of the movement should be responsible for its relatively low accuracies. Strolling & Running generates very large accelerations at a certain frequency, whereas Relaxing (inhaling) and Relaxing (exhaling) produces very low non-periodic acceleration signals hence they bear the same accuracies.

We can view it with another parameter like RECEIVER OPERATING CHARACTERISTICS (ROC) Curve, which is denoted as AUC (Area under Curve)[9]. Ranking based evaluation metrics are used increasingly in machine learning and data mining community when dealing with imbalanced data[8]. When the data are imbalanced, cost-sensitive methods must be considered as well. The area under the curve (AUC) indicates the performance of this classifier; the larger the area, the better is the Algorithm. AUC in Table I shows that how the number of correctly classified positive example (TP) varies with the number of incorrectly classified negative examples (FP). Correspondingly, for the two actions, Ascending upstairs and Descending Downstairs, TP and FP are nearly equal which means their ROC areas are less than other activities and consequently accuracies are low.

V. Conclusion and Future Work

In this paper, we have aggregated the raw time accelerometer data into examples, in which, each example is labeled with the WEKA software tools for the activity that occurred. We then built predictive models for activity recognition using supervised learning algorithm. The experimentation eventually leads to finding the accuracy to meet our hypothesis that transformed data can lead to better accuracy. The NB classifier with attribute selection provides a classification accuracy of around 80% on a variety of 5 classes, with 5 features after attribute selection, in addition with DT for the attribute reduction of features. In addition, these activities can be recognized quickly, since each example is generated from only 10 seconds worth of data. The data were collected in the naturalistic environments without researchers' intervention. In future, system must recognize interleaving activities and deployment of intelligent agents could unobtrusively prompt the user for new activity models.

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An Enhanced Solution for Electric-Power Theft

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***Abstract*—Science and technology with all its miraculous advancements has fascinated human life to a great extent that imagining a world, without these innovations is hardly possible. Electricity is generated through many ways. It is synchronized on a single bus bar of the grid for transmission. Before utilization of electricity, it passes from certain phases. It is first generated, step upped in transformer deck, passed from switch yard for transmission through power lines. After transmission it is distributed for utilization to the customers. Electric power is lost while being transmitted and distributed when it passes through transformers and is distributed in small capacity lines. Technical losses occur on account of structure and characteristics of network while Non-technical losses occur due to the stealing of electricity. Power theft is responsible for about 70% of this losses on electric sector. The extent of the theft will depend upon a variety of factors from cultural to how the power utility is managed. For all that, no any permanent solution for this major issue has ever been proposed. We propose an applicable and enhanced solution for this impassable problem. In our research, we developed an Electric power theft solution based on three stages using PWM (Pulse Width Modulation) technique along with smart metering technology integrated with Back Wave Conversion System. The proposed solution is an implicit and a workable approach towards the Electric power theft, as for conditions all over the country.**

***Keywords*— PWM, Transmission, Distribution, Utilization, AMI, Back Wave Conversion.**

I. INTRODUCTION

Electricity is core part for the development of the country. In Bangladesh 69% of total population are experiencing electric facilities. Electricity consumers are of three types, a) Commercial consumers, b) Industrial consumers, c) Residential consumers. Commercial consumers are those who uses transmission voltage within 50kV. Industrial consumers are defined as those that can accept and use electricity at transmission voltages of 60 kV and higher. Residential consumers are who use household establishments that consume energy primarily for heating, lighting, air conditioning, refrigeration, cooking and other regular household works. However, the generated electric power not may be fully utilized if cannot be efficiently and effectively distributed. Electric power is lost while being transmitted and distributed when it passes through transformers and is distributed in small capacity lines. Systems with long transmission lines risk a higher amount of loss than shorter line systems. Also, the quality of the lines and transformers can affect efficiency of transmission and distribution. There are two types of losses in electrical power distribution network "Technical losses" and "Non-technical losses". Technical losses occur on account of structure and characteristics of network while Non-technical losses occur due to the stealing of electricity. Power theft, defined as a conscience attempt by a person to reduce or eliminate the amount of money he or she will owe the utility for electric energy. Electric power theft takes place in a variety of forms and thrives with the support of people from different walks of life: utility staff, consumers, labour union leaders, political leaders, bureaucrats, and high-level utility officials. It is a silent crime if any person avoiding legal right abstracts or diverts electricity. Finding efficient measurements for detecting fraudulent electricity consumption has been an active research area in recent years. Electricity stealing is a long term problem; however each power supply department has own huge investments of manpower and material, the phenomenon of defending stealing electricity has increased and not abated and the method of electricity stealing is continuously improved. The behaviour of electricity stealing not only makes the power industry suffering huge financial losses but also threatens the main power supply security and reliability. Electric-power theft is an uncontrollable problem in third world countries like Bangladesh. There are about 45.2 billion BDT of losses annually in Bangladesh. This losses means the masses would have to pay extra 45.2 billion BDT in terms of electricity tariffs. In other words, the innocent consumers pay the bills of those who steal electricity. Power theft is responsible for about 70% of this losses on electric sector. From a business perspective, electricity theft results in economic losses to the utility. The consequences of theft in the worst case systems are important to the viability of the services provided. The combined losses in some systems have severe impacts resulting in utilities operating at a loss and must continually increase electricity charges. Locked into a culture of inefficiency and corruption, the electricity utilities will face difficulty delivering reliable service. Four kinds of theft are prevalent in all power systems; Fraud, Stealing electricity, Billing irregularities, Unpaid bills. Fraud is when the consumer deliberately tries to deceive the utility. A common practice is to tamper with the meter so that a lower reading of power use is shown than is the case. Moreover, electricity theft can be arranged by rigging a line from the power source to where it is needed bypassing a meter. In Bangladesh this practice is quite common in poor residential areas where those wanting electricity may not have lines allocated and may not be able to pay if they were connected. This act is defined as Stealing electricity. Billing irregularities can occur from several sources. Some power organizations may not be very effective in measuring the amount of electricity used and unintentionally can give a higher or lower figure than the accurate one. The unintentional irregularities may even out over time. However,

it is also very easy in some systems to arrange for much lower bills to be given than for the power actually used. On other purpose, every electricity distribution system has chronic non-payers. The very rich and politically powerful who know that their electricity will not be cut regardless of whether they pay or not. They leave a huge amount of electricity bills unpaid over years. The extent of the theft will depend upon a variety of factors from cultural to how the power utility is managed. For all that, no any permanent solution for this major issue has ever been proposed. We propose an applicable and enhanced solution for this impassable problem based on three stages.

II. Approach

On our research, we developed an Electric power theft solution based on three stages,

- Transmission stage,
- Distribution stage,
- Utilization stage.

On our first stage of electricity distribution, we propose a Pulse Width Modulation (PWM) based signal converting process. A transformer in distribution substation firstly steps down the electricity which is being transmitted through the city. Then signal conditioning circuit strengthens this electricity. Then the signal conversion system converts the sinusoidal signal into square wave signal. On distribution stage, distribution transformer steps down the electric power. Then it is supplied to consumers through single or three phase connections. An adjustable rating circuit breaker is proposed to be installed on every connection. This will help to restrict every consumer to use loads beyond the provided limit. If any consumer attempts to use load over the limit, the circuit breaker would trip and disconnect the consumer from the supply. On utilization stage, we propose installation of Smart Metering technology in spite of using traditional meters. Back wave conversion based Smart Meters will produce accurate electric signal.

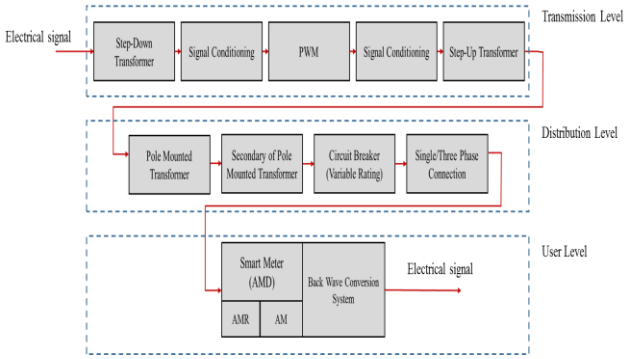

Fig. 1 Block Diagram of proposed solution

III. Solution on Transmission Stage

Electricity is transmitted to load centres using transmission lines. The distribution system then distribute this electric power to the city through feeders. On our proposal, we installed a signal conversion system based on PWM technology. This system will convert sinusoidal waves into square wave signal. Consumers won't able to use extra loads beyond their limits due to incompatibility between signal shape and electric operable system [1].

A. Pulse Width Modulation:

Pulse width modulation (PWM) system is the conversion of sinusoidal time-varying signals into a pulse sequence which have constant amplitude and frequency. On PWM, each pulse width is proportional to amplitude of that time varying signal [2].

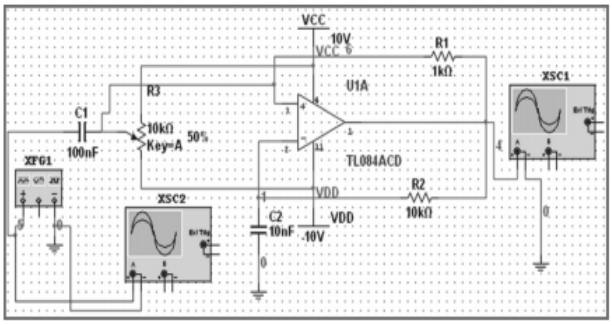

Fig. 2 Simulation circuit on Transmission Stage

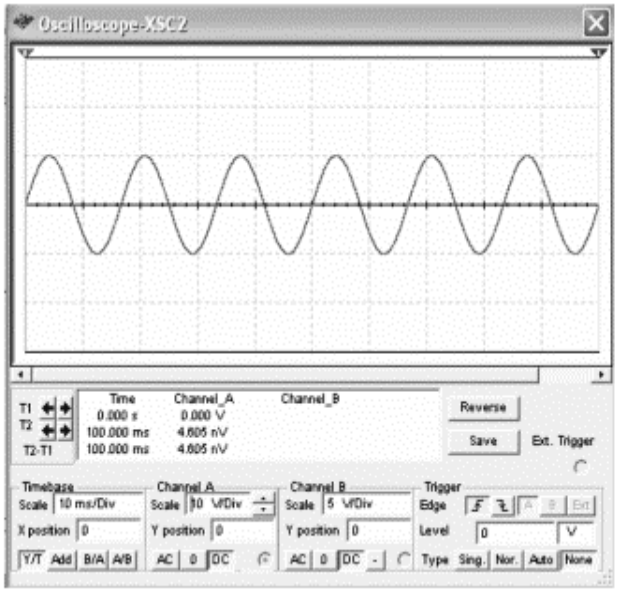

Fig. 3 Electrical sinusoidal input signal

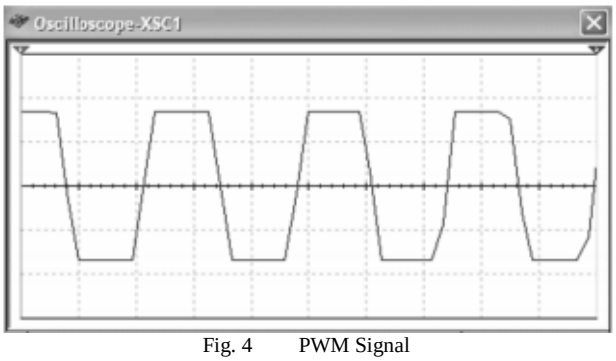

Fig. 4 PWM Signal

IV. Solution on Distribution Stage

On this stage, PWM signal lines are transmitted to the pole mounted substation. Then distribution transformer steps down the signal into utilization voltage. Distribution transformer supplies electric power to every consumer using three phase-four wire system. This load is distributed according to single phase and three phase connections then. Installation of adjustable rating circuit breaker is proposed on this stage of distribution. Rating of the circuit breaker would be set with respect to load requirement of each consumer. When a consumer exceeds the limit of load, the circuit breaker would trip and break the electricity link for the respective consumer [3,4].

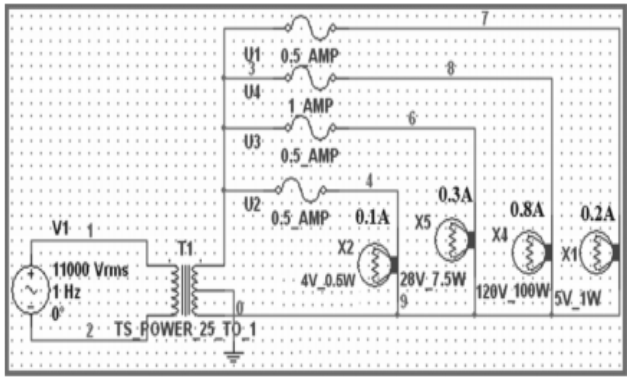

Fig. 5 Simulation circuit on Distribution Stage

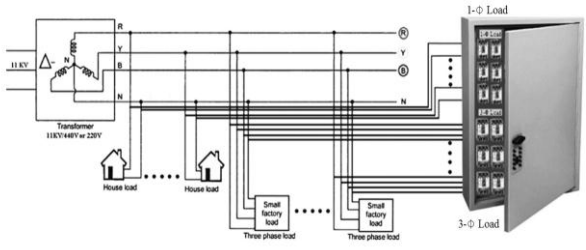

Fig. 6 The Practicable Layout on Distribution Stage

V. Solution on Utilization Stage

After distribution system conventional electric meters are now being used to deliver electricity to the consumers. On this stage, our proposal is to replace these conventional electric meters with smart metering technology. These Smart Meters are integrated with back wave conversion system. Use of this efficient smart metering technology produce actual electrical sinusoidal signal which is compatible with electrical appliances.

A. Smart Metering Technology:

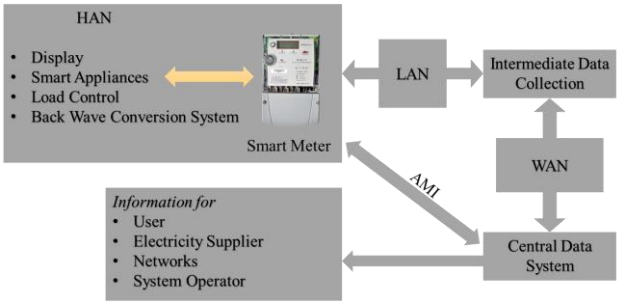

Fig. 7 General layout of AMI

Smart metering technology has attracted concentration around the globe in recent years [5]. A number of countries have already started deploying it. Many other have set target to it [6,7]. Smart Meter can provide "two way communication" between the consumer and the power supplier [8]. At present, bill is the only information a consumer receives regularly. Consumers also get this bill months after they have consumed the electricity. This bill also may be a guesstimate [9]. Smart Meter provides,

- Real time energy usage information.
- Consumer enabled manage and monitoring system.

Smart Meters are one of the AMI (Advanced Metering Infrastructure) ingredient [10,11]. This infrastructure allows the meter to connect electric power supplier, other market actors. This meters can also be coupled to appliances in the home using Home Area Network (HAN) [12]. Fig. 10 shows AMI network connection verities. Differentiating by communication level, the AMI can be categorized by two ways,

- Automated Meter Reading (AMR)
- Automated Metering Management (AMM) consumer.

B. Back Wave Conversion System:

Back wave conversion system produces actual electrical sinusoidal signal. It comprises of two circuits,

- Integration amplifier "Integrator".
- Wave shaping network "Diode function generator".

Op-amp based "Integrator" network produces integration of input Pulse Width Modulation (PWM) signal. "Diode function generator" is a wave shaping circuit which produces sinusoidal signal with combination of diodes and resistors [13].

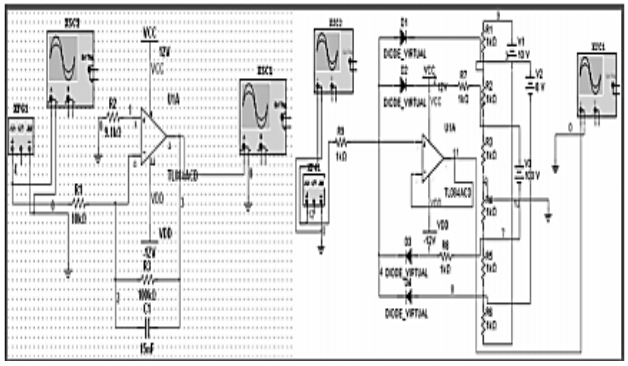

Fig. 8 Simulation circuit on Utilization Stage

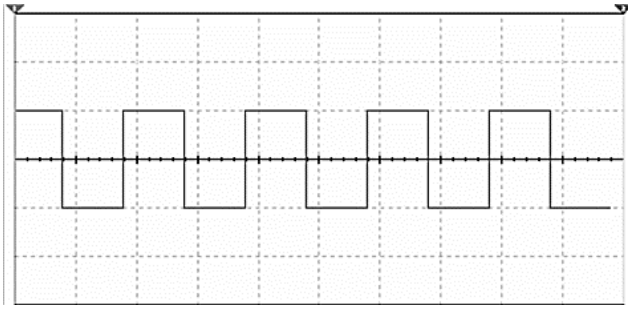

Fig. 9 Square wave input signal

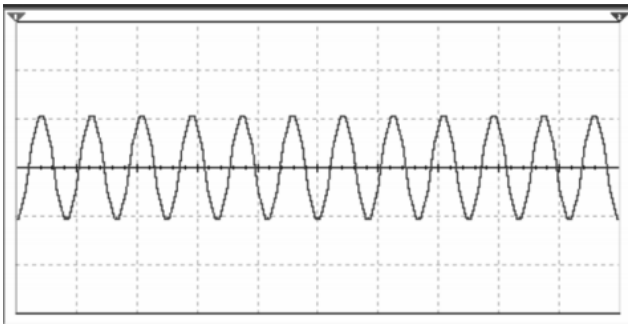

Fig.10 Electrical sinusoidal output signal

VI. Conclusion

Electric power sector in Bangladesh is suffering from record level line losses. Our proposed solution of electric power theft based on three stages is practicable as well as applicable. The proposed solution has been simulated on Multisim v-12.0.1 with faithful results. At Transmission stage the required PWM Signal is obtained by op-amp design application, and the width is proportional to the amplitude of any one of the inputs i.e. DC Reference Voltage and Amplitude Varying Sinusoidal Signal. At Distribution stage as the consumer who steals Electricity exceeds the load limit provided by Utility Company, the Fuse gets blown out and the respective consumer is disconnected from Electrical Power. On User stage the PWM signal is obtained back into Electrical operating signal by Back Wave Conversion System so that consumer may operate appliances safely. If the existing Electric Power System is devised with the proposed solution, due to saving from power theft, the dependence on huge future investment on alternate energy solution may be avoided. In a nutshell, by taking this approach Pakistan may be able to get rid- off from Electricity shortage.

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An Optimum Solution to Generate Energy from Waste Materials; Bangladesh Perspective

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***Abstract*—The main objective of the study was to generate electricity from waste material. At first we have taken different types of waste materials as like dustbin waste, domestic waste, clinical garbage, farm waste etc. Then these wastes will be separated into two types, a) Metal Waste, b) Non-metal Waste. Non-metal waste also separated into three types, a) Organic, b) Inorganic and c) Burnable. Cow dung, poultry waste and kitchen garbage, human waste are types of organic waste. And burnable waste like plastic, papers, polyethylene, polyvinylchloride (PVC). Only organic wastes can produce biogas. So on the first stage of our renewable energy plant, we used organic waste materials to generate electric energy. We put organic waste into a reserve tank under surface. This tank worked as a digester for wastes and produced biogas. Then this biogas was used in a electricity generator. This generator produce electricity on our first stage. On the reserve tank we left liquids left-over which we used on second stage of our plant. On this stage this liquid material used in Microbial Fuel Cell (MFC) to produce electricity from it. Inorganic waste materials consists of burnable and non-burnable products. We used burnable waste materials on steam generator to produce electricity from it. It will be an optimum solution for power crisis of developing countries like Bangladesh.**

Keywords—MFC; waste to energy; organic waste; in-organic waste; WCSG.

I. INTRODUCTION

Bangladesh is a developing country. It is going to be a developed country but it has some crisis that need to be progressed. Electricity is one of the biggest factors of the development. But the generation of power in our country cannot meet our demands. From a statistic we can say only almost about 10% houses of rural areas have got the electricity. The power stations are not capable of generating electricity for every house though many new power stations are added recently. Our power generation is mainly depended on natural gas. But the regretful fact is that within 2020 this source will likely be depleted. So we have to think about renewable energy source and the sources are sunlight, wind, rain, tides, and geo thermal heat, biodiesel, biofuel etc. Here in our paper we have discussed how we can use waste resources and microbial fuel to generate energy that can eradicate the crisis of electricity.

II. WASTE RESOURCES

All the items that people do not have any use or they discard the items forever is known as waste. These wastes can be found from our nearest sources. These sources are Household and domestic garbage, Industrial and chemical waste, poultry waste, clinical waste, Municipal waste, Hazardous waste etc.

A. Household and Domestic Waste

Waste that is formed from the domestic properties like residential properties, hospital and nursing home and also from the educational premises is known as domestic waste.

B. Industrial and Chemical Waste

It is really hard to define industrial waste. Waste that is found in the factory after production is known as industrial waste. [1] Industrial waste can get from manufacturing or nonmanufacturing process.

C. Poultry Waste

Poultry waste is a huge source of waste nowadays. Poultry waste means the waste of the domestic fowl like as chickens, ducks turkeys. Manure of the above domestic fowl is used as waste. Layer manure is obtained 136 gm. at 75% moisture and Broiler manure is obtained 40 gm. At 25% moisture. For the years 2006-2010, 2011-2015 and 2016-2020 respectively the projection of poultry manure is based on annual the growth rates of birds of 5, 4 and 3%.

D. Clinical Waste

Poultry Waste from medical, dental, nursing, veterinary, investigation, treatment, care, blood collection that cause infection to people is defined as clinical waste. Human or animal tissue, excretions, pharmaceuticals or drugs, syringes, needles or so many things that could be hazardous to people is also known as clinical waste.

In Bangladesh getting energy from waste is economically profitable. The energy that can get from waste will be helpful to eradicate power crisis. Here we got a statistics of waste generation and disposal in Dhaka city.

The composition of that waste is listed in Table II [2].Recycling industry wastes raises a total of 436 t/d [10] of material recovery as shown in the Table III. The amount recovered is the amount of waste to be managed by Dhaka City

Corporation (DCC). Composting contributes very little to the waste reduction although the compostable waste has the largest portion among generated wastes.

TABLE I: LIST OF GENERATION AND DISPOSAL IN DHAKA CITY

Item	Parameter
Estimated Generation	Domestic waste: 2250 t/d Business waste: 1,250 t/d Street waste: 300 t/d
Generation Rate	Domestic waste: 0.45 kg/d/person (Domestic+Business+Street) waste: 0.62 kg/d/person
Calorific Value	All waste average: 650 to 950 cal/kg
Bulk Density	All waste average: 0.35 t/m3
Share of disposal volume by dump site	Matuail: 70 % Berri Band: 26 % Uttara: 4 %
Total disposal volume at three dump sites	Wet season average: 1,600 t/d

TABLE II: COMPOSITION OF SOLID WASTE IN DHAKA

Materials	Quantity (%)	
	Residential	*Commercial*
Food Waste (Organic)	84.37	79.49
Paper / Cardboard	5.68	7.22
Textiles	1.83	1.59
Plastics	1.74	1.48
Glass / Metals and construction debris	6.38	10.22

TABLE III: ESTIMATED VOLUME OF RECYCLED WASTE IN DHAKA

Material	Estimated generation	Estimated recycled waste (t/d)	Recycle rate	Contribu-tion to waste reduction (b/3200)
Plastic	124	103	83%	3.2%
Paper	260	168	65%	5.3%
Glass	46	24	52%	0.8%
Metal	27	41	-	1.3%
Compo stable	2211	6	0%	0.2%
Others	99	94	95%	2.9%
Total	2767	436	-	

As a Result 3,054 t/d is expected to be collected in 2015. The cumulative disposal volume is estimated at about 9 million tons by the end of 2015 [2].

The Study Team conducted waste generation source surveys in dry and wet seasons to obtain the unit waste generation rate of domestic waste and business waste. The average waste generation rate from domestic sources proved to be 0.34 kg/c/day [2].

III. WASTE TO ENERGY GOAL

Converting waste into energy is a powerful solution to the issue of climate change, because it substitutes fossil fuel and restrains methane emissions. The government has adopted the "Measures concerning Waste Resource and Biomass Energy" and its implementation strategy and has actively facilitated waste-to-energy initiatives, such as the production and development of refuse-derived fuel (RDF) generated from inflammable waste and biogas from organic waste. Per capita waste generation estimates range between 0.29 and 0.60 kilograms per person per day, depending on the individual's level of income (higher income individuals tend to generate more waste).[6] In 2007, the amounts of energy generated from inflammable waste and organic waste were 3,840,000 tons/year and 7,850,000 tons/year, respectively. Moreover, 3,054 t/d of wastes is expected to be collected in 2015 and cumulative disposal volume is estimated at about 9 million tons by the end of 2015. [7] Only 1.5% (58,000 tons/year) of inflammable waste and 2% (160,000 tons/year) of organic waste were recycled as energy sources. However, the government is devising policies to increase the percentages of recycled inflammable and organic waste to 47% (1,820,000 tons/year) and 26% (2,040,000 tons/year), respectively, by 2014. Furthermore, the government will collect and use 77% of unrecovered heat generated from large and mid-size incinerators, and 91% of usable landfill gas by 2014.

To maximize the waste-to-energy effect in the future, we have plans to expand and centralize waste-to-energy facilities and to create an environmental energy town in every district. As a part of our project, an experimental complex with natural power and a bio-energy model equipped with a RDF generator and boiler, a biogas converter for hazardous sewage, energy converter for sewage sludge, and a landfill gas processing facility are to be constructed in one of the world's largest metropolitan Dhaka. It is expected that 43% of waste that can be converted to energy, which will be processed in Bangladesh in the future. Moreover in our proposed system waste-to-energy

will be highly efficient in harnessing the untapped sources of energy from a variety of wastes. [8][9]

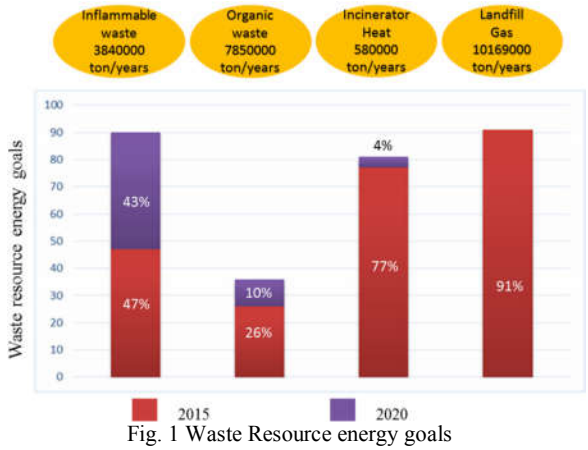

Fig. 1 Waste Resource energy goals

IV. System and Method

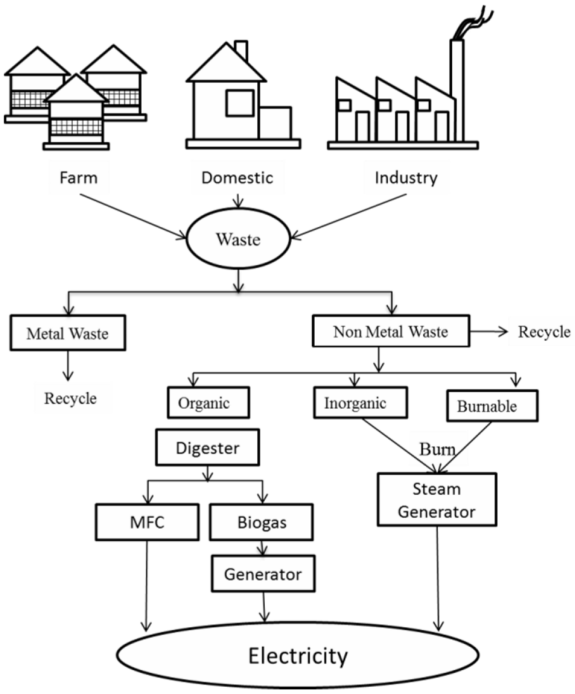

Fig. 2 Block Diagram for the proposed system

Firstly we had to collect waste material from household waste, industrial waste, farm waste like poultry waste and clinical waste. Then we separated those wastes into two parts- metal and non-metal waste. We got metal waste for recycling and the non-metal waste to generate electricity. Non-metal wastes were divided into three parts- organic, inorganic and burnable.

A. Organic waste

The Now we put organic wastes into digester to get biogas. After that we connected gas generator with biogas through a pipe line and biogas was the fuel for the gas generator that produced the electricity. On the bottom of the digester we got some semi liquid or plasma materials from which we can also able to generate electricity by using a MFC (Microbial Fuel Cell).

B. Microbial Fuel

In the early twentieth century the idea of using microbial cells in an attempt to produce electricity was first conceived. In 1911, M. Potter was the first man who performed work on the subject. [4] Microbial fuel cells (MFCs) are bio-electrochemical transducers that produce electrical energy from microbial power. Rectangular (15 x 15 cm) acrylic container was taken as a cell. Then semi liquid or plasma 140 gm. mixed with water 90g and 20g micro-organisms were blended. Then the mixed sample placed in a container. Carbon fiber was used for both anode and cathode. The cathode was placed on the top and anode was placed inside the sample. A data logger was connected with both the anode and cathode and a fix resistance (53 Ω). To separate the anode and cathode a filter paper was used. The data logger was used to get the data of the voltage and temperature in every 15 minutes interval. After 60 days we analyzed the collected data and the laboratory room temperature was 250C. Figure 1 illustrates the schematic diagram of the laboratory test for MFC. [5] Electrode output was measured in volts (V) against time. The current I in Amperes (A) was calculated using Ohm's law, I= V/R, where V is the measured voltage in volts (V) and R is the known value of the external load resistor in Ohms. From this it is possible to calculate the power output P in watts (W) of the MFCs by taking the product of the voltage and current i.e. P= I x V. Current density was calculated using I = V/aR, where a is the electrode surface area.

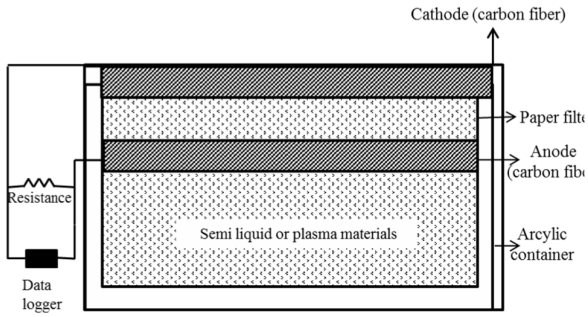

Fig. 3 Physical configuration of MFC

C. Inorganic and burnable Wsate:

With the inorganic and burnable waste we got power using these wastes as fuel for steam generator. At the beginning of the

experiment we took the waste in a combustion chamber and in the chamber we got air for reduction. The waste being burnt produce heat which was used to warm the boiler. A turbine was connected to the boiler. From the boiler we got steam and the molecules of the steam moved because of heat and expand from high to low pressure which created kinetic energy. This kinetic energy rotated the turbine and it was connected to a generator. We got power from the generator. Then steam with low pressure returned to them boiler again after being cooled by cooling condenser. Then the process repeated continuously and generates power.

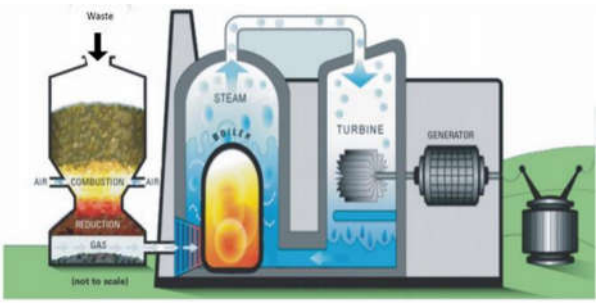

Fig. 4 Waste Combustion Steam Generator

V. Results

A. MFC:

We have achieved up to 1.5 watts per meter square of electrode surface area. Using a continuous flow of MFC, we have recorded values around 15.5 watts per cubic meter of semi liquid or plasma materials flowing through it. And it could produce around 0.8 megawatts per day which is enough to power about 500 homes

B. Steam Generator:

From 100 joule of fuel energy we generated 35 watts of electrical energy in our plant. We got 100 joule of fuel after burning about 400 kg waste materials. We have some system losses and finally we got 35 watts of electrical energy.

C. Gas Generator:

It is a successful process. 1200 kg organic waste materials can produce 230 cubic meter bio gas which can generate 20 KW Electricity. Natural

VI. Conclusion

The organic waste of Bangladesh can be recycled as Bioelectricity generation. “Waste to energy” this project can play a necessary role in electricity scarce countries. Recycling in Bangladesh may be expensive but if the organic waste is used to generate electricity, the process would become cost effective and popular. The plasma or semi liquid by using MFC is a good way to green electricity generation.

Acknowledgment

Special thanks to Dr, Syed Faruque Ahammed and Dr. Ratan Kumar Nondy for their kind help.

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Autonomous Line Follower Robot Using Microcontroller PIC16F676

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***Abstract*— The PIC16F676 controlledAutonomous Line follower robot is a mobile device that detect and follow predefined line with installedIR sensors. Transmitted data instructs proper commands and path to be followed by the robot. It is designed and tested to encounter real life problems.The following paper proposes a new model for line follower robots built using PIC16F676 is aunique model. It is able to detect its path in the real time operation time, reasonably faster compared to line follower robots of similar types, operational model build with economic and available components in the local market. The circuit design for this new model is absent in all the other existing models. The technical and mechanical issues and problems also have been investigated properly for future improvements and modifications.**

***Contribution*— TheAutonomous Line Follower Robotusing Microcontroller PIC16F676has been solely conducted by the authors under their supervisor's guidance andbased on an original design by the authors and extensively researched and verified not any replicationof any previous models using the same components, design and circuit layout.**

***Keywords*— Line follower robot, Microcontroller, PIC16F676.**

I. INTRODUCTION

The Project titled "Autonomous Line Follower Robot Using Microcontroller PIC16F676" has been designed and submitted to the Faculty of Engineering, American International University-Bangladesh (AIUB) as part of the final year project on 2012 by the authors and has been accepted satisfactory.

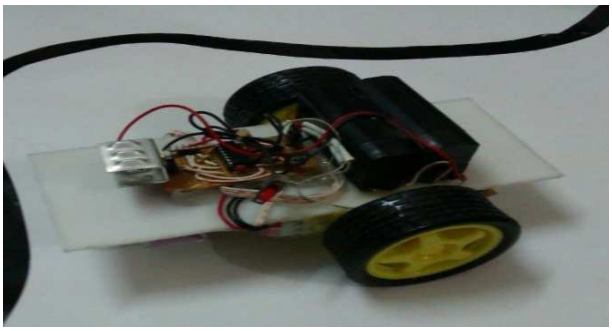

Fig. 1: The designed Autonomous Line Follower Robot

Microcontrollers are economic and its ability to store and run unique programs makes it extremely versatile. That allowed us to perform functions based on predetermined situations (I/O line logic). The microcontroller behave like neural circuit controller. Microcontroller allows a designer to implement higher complex designs with fewer equipment cost. Within many available models of microcontrollers on the market, our priority have been to select the lowest cost and most available devices.

II. PROPOSED LINE FOLLOWER SYSTEM:

The proposed design can be described in multiple types as following:

The microcontroller sends instructions to theLM323 comparator after processing the data sent from the sensors. The comparator gives voltage to the geared DC motors according to the inputs. The comparatorinitiates positive voltage to motor pins and gives negative voltage to other.Based on the signals it receives from its five IR sensors, the robot has there is three states offunctional modes. They are as following:

a) Left Rotational Mode(Move Left): The right motor is turned on and the left motor is turned off.
b) Forward Driving Mode(Move Forward):Both of the motors are turned on and rotate forward simultaneously.
c) Right Rotational Mode(Move Right): The left motor is turned on and the right motor is turned off.

A. Electronic design:

The components needed for the electronic circuit design includes IR emitter and detectors, resistors, DC geared motors, motor driver IC's and microcontroller. The microcontroller used here is PIC 16F676 and LM323 motor driver IC to give instructions to the motors.

B. Block diagram:

The overall operation the robot consist of five separate blocks which are, Power Supply block, Line Follower block, Controller block, Motor Driver Circuit block and the IR sensors. The power source used is a 12V DC rechargeable battery. This 12V supply is directly given to the motors used but for the operation of the IC's 5V supply is needed and thus we connect a regulator to the output of this 12V battery.

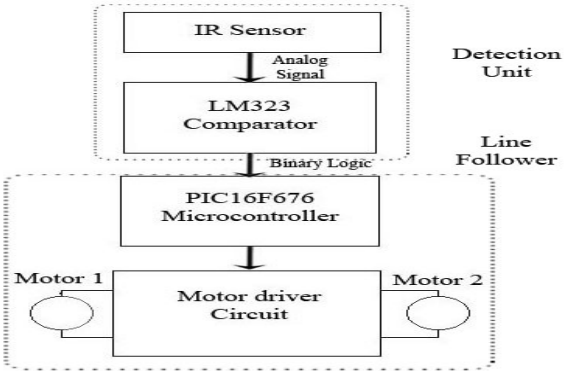

Fig: Block diagram of the proposed system

III. Detection Unit

A. Sensors:

The Infrared (I/R) sensors are consisting of five pairs of emitters and receivers mounted below the device to track the line.

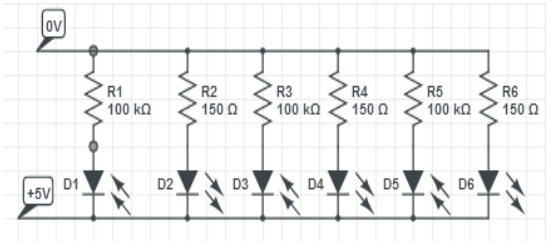

Fig: Emitter and receiver operation

B. Basic Operation

I/O emitter: The infrared emitter functions as the input unit and receives the incoming signal and converts it into infrared signal and keeps on emitting on the surface. As the dark surface absorbs the infrared ray while lighter surface reflects it.

I/O detector: The infrared detector detects the reflected infrared signal returned from the surface and converts it back into electrical signal. The detector identifies the missing signals as the following line and machine aligns to follow the line based on algorithm.

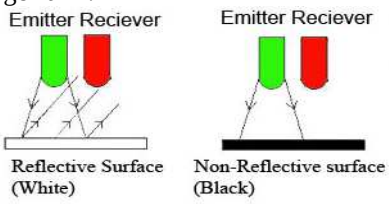

Figure: Emitter and receiver operation

IV. Line Follower

Proposed model of robot is built with designedPIC16F676, LM323, IR sensors placed upon a PCB board mounting. The robot is uses two motors wheels and consists of IO sensors on the bottom for detect black tracking line; output of comparator, LM323 is low and for bright surface high output. Microcontroller PIC16F676 controls the gear motors and LM323 comparators control the motor drives.

A. Basic design Requirements:

The line follower is a self-manoeuvring device that follows a line drawn on the floor. The path can be a visible black line on a white surface (or vice versa). The basic operations of the line follower are as follows:

- The optical sensors mounted under the robot detects black lines.
- The PIC 16F676 has been predefined with logic input program to determine its changing path and revolve itself to realign accordingly.
- Controlling the motors according to direction during a rotation and realign with the aid of the rotating ball in the front.

B. Basic operation:

The basic operations of the robot are as follows:

- Capture line position with IR sensors mounted underneath the robot. For this a combination of IR emitter and emitters are used. The line sensing process is detected by the microcontroller.
- Aligning the robot to the moving line two motors and a free moving governing wheel have been used.

V. Designed System

The designed circuit had been implemented as following.

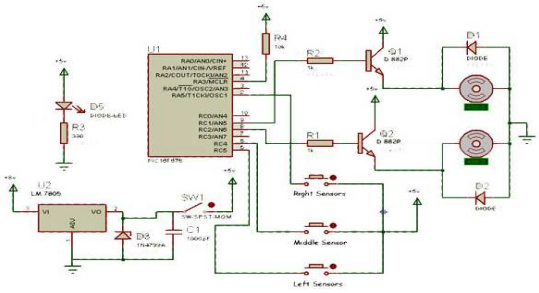

Fig: Circuit simulation of the proposed system.

VI. Performance

The line follower robot has been tested and found to be functional in an acceptable limit. Due to the limited capacity of the IR the detection is not too much successful in grey or abysmal coloured surface with mixed colours.

VII. Discussions

Industrial require efficiency and speed, especially in big factories which produce thousands of materials required to have different materials and objects from one place to another regularly. Development of the proposed technology in industrial level would reduce monotonous labour work and cost effectively. This low cost system should allow the valuable human resources to be employed in more useful purpose rather than weight carriers.This kind of robot can also be used for repetitive transportation system, assistive applications, fire service rescuer and so on.

VIII. Conclusions

This paper proposed the development of microcontroller based robotics for a smarter industrial environment. The proposed modelis a low cost hardware system. The microcontrollerprogram ensures high accuracy timing, high independency and constantly successful in performing data interchange with the industrial computer. Additional mounted devices such as an obstruction detection unit can make the current model into a more smarter and effective one.

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Opportunities and Challenges of Nuclear Energy in Bangladesh

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***Abstract*— Energy demand in Bangladesh is increasing day by day. Now a day, Bangladesh is facing energy crisis. A large amount of population even now does not have access to electricity. At present the demand is fulfilled by gas, coal, oil and hydro based power plants. But real scenario is that all these power plants are not meet our growing demand. Again the gas, coal and oil reserve is not enough. According to Global Energy Network Institute, Bangladesh has small reserves of oil and coal, but potentially has large natural gas reserve. As alternative sources renewable energy like solar, wind, tidal, geothermal, nuclear energy etc may be used to generate electric power. This paper describes the opportunities and challenges of nuclear energy in Bangladesh, which can be used for electric power generation.**

***Keywords*—Power demand, renewable energy, nuclear power, future plan of Bangladesh.**

I. INTRODUCTION

Energy is the driving force behind all economic activities and one of the most crucial strategic issues for the sustainable development of a country. Energy demand in Bangladesh is increasing day by day. Now a day, Bangladesh is facing energy crisis. In Bangladesh, there are many natural resources such as coal, gas, petrol. The main and the cheapest source of energy in Bangladesh is Natural gas. It is an important source of energy that accounts for 75% of the commercial energy of the country which is likely to be depleted by the year 2020 [1]. Then Bangladeshis people will be faced some problem. People have a large unsatisfied demand of energy, which is growing by 10% yearly [2]. To solve the energy crisis we can use nuclear energy to generate power. This paper focuses on the opportunities and challenges in the usage of nuclear energy in Bangladesh.

II. PRESENT STATUS OF POWER GENERATION IN BANGLADESH

Bangladesh is a fast growing developing country. A booming economic growth, continuing industrialization and development has increased the demand of electricity day by day. At present the demand of electricity is very high in Bangladesh and it is increasing day by day. In this country only 74% people are now being facilitated with electric supply, leaving the rest 26% people into darkness[3].To keep the wheel of development rolling and active, this large mass needs to be brought under electric coverage. Power Plants are being commissioned on a regular basis to meet up demands, but with the booming population and the hard endeavor for industrialization the need for electricity is also booming. According to Bangladesh Power Development Board (BPDB) [3],

Access of Electricity	74% People
Per capita consumption of Electricity	340 kWh
Installed Capacity(up to May 2015)	11,203 MW
Maximum Generation (20/05/2015)	7,747 MW
Maximum peak demand	8,500 MW

III. NUCLEAR ENERGY AND ITS ADVANTAGES

Nuclear energy is the energy released from the nucleus of an atom. When nuclear reaction occur weather fission or fusion, it produces large amount of energy. This energy can be released as heat from a chain reaction in a radioactive element such as uranium. The major advantages of nuclear energy are[4]-

1. Lower Greenhouse Gas Emissions.

2. Nuclear energy is very powerful and efficient than other alternative energy sources.

3. Nuclear power is reliable. It does not depend on the weather.

4. The main reason behind the low fuel cost is that it requires little amount of uranium to produce energy. When a nuclear reaction happens, it releases million times more energy as compared to traditional sources of energy.

IV. NUCLEAR POWER PLANT IN BANGLADESH

In 1963 the Ruppur site was selected for the establishment of the first nuclear power plant of this country. In 2001 Bangladesh adopted a national Nuclear Power Action Plan. On 24 June 2007, Government of People's Republic of Bangladesh announced plans to build a nuclear power plant to meet electricity shortages. In May 2010, Bangladesh signed a civilian nuclear agreement with the Russian Government.. In February 2011, Bangladesh reached an agreement with Russia to build the 2,000 megawatt (MW) Nuclear Power Plant with two reactors, each of which will generate 1,200 MW of power. The nuclear power plant will be built at Ruppur, on the banks of the Padma River, in the Ishwardi sub district of Pabna, in the northwest of the country. The RNPP (Ruppur Nuclear Power Plant) is estimated to cost up to US$2 billion, and start operating by 2021 [5].

V. FEASIBILITY OF NUCLEAR POWER PLANT IN BANGLADESH

Bangladesh has to take measure on following security issues:

1. Nuclear power stations require major investment to construct, but their relatively low running costs over a long operational life help to make them one of the most cost-effective generating technologies. So, we have to manage huge amount of capital for implement nuclear power plant in Bangladesh.

2. Though nuclear based power plant is a secured one but some accident has been occurred in recent years. Such as Fukusima power plant disaster, Cheronobil power plant accident. As Bangladesh is densely populated country, if such accident occurs then radiation effect causes a disaster to our nation. So, proper steps should be taken regarding this matter.

3. Ruppur power plant is near Padma River. Farakka Barrage makes this river nearly dead. So, appropriate measure should be taken for cooling system of power plant reactor. If India opens all the gates simultaneously then it may cause a heavy flood in this zone. So, it may also taken into consideration that excessive flood will not cause any harm to our plant.

4. International threat will also be considered into account. It is known in the history that when Iraq, Syria wanted to installed nuclear power plant, Israel bombard on these plants to ensure no rise of nuclear power in Middle East. India is a super power in this zone and already gains atomic energy. So, Bangladesh has to gain potentiality to challenge these international threats. Present policy of government of Bangladesh is that whole responsibility nuclear power plant is of Bangladesh atomic energy commission.

5. Bangladesh is a grazing land of various foreign detective branches. So, Bangladesh has to take steps to endure all security regarding this matter and to stop theft of technology for terrorist activities.

VI. CONCLUSIONS

From above discussion, it may conclude that nuclear power plant is an excellent solution to our power hungriness. There is lot of challenges to implement nuclear based power plants. We have to prepare ourselves considering all threats and security issues.

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Acute Myeloid Leukaemia Subtypes Prediction System Based on Adaptive Neuro-Fuzzy Inference System (ANFIS) Approach

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Abstract— **This work represents a novel use of soft computing technique in biomedical science. The proposed technique involves designing and implementing an acute myeloid leukaemia (AML) subtypes prediction system based on adaptive neuro-fuzzy inference system (ANFIS) approach. The dataset of 600 possible cases (patients) of acute myeloid leukaemia was used as the main database. After training the system with 540 input/output dataset of patients having AML-M0, AML-M1, AML-M2, AML-M3 and AML-M4 types of leukemia, it was tested with 60 dataset for validation. The method was implemented to predict these five types of acute myeloid leukaemia based on the characteristics of four complete blood count (CBC) parameters namely: Leukocytes, Haemoglobin, Platelets and Blasts of the patients.**

Contribution **— This work may be helpful to the haematologists in predicting different AML types of AML patients precisely and effectively in a very short amount of time.**

***Keywords*— AML, Fuzzy Inference System, Leukocyte, Blasts, Leukaemia, Membership Function, Epoch.**

I. Introduction

Medical decision making becomes a very difficult activity because experts who have to make decisions, can hardly process huge amounts of data. Physicians usually suffer from an absence of good, accurate analysis of these laboratory data [1]. They need a tool that would help them to make good decision. A soft computing technique for example an adaptive neuro-fuzzy inference system would prove to be very useful in this case.

Acute myeloid leukaemia (AML) is a group of neoplastic blood disorders characterized by the proliferation and accumulation of immature hematopoietic cells in the bone marrow and blood [2]. In 1970s, a group of French, American, and British (FAB) leukaemia experts divided AML into subtypes, M0 through M7, based on the type of cell from which the leukaemia develops and how mature the cells are [3]. Among the eight FAB subtypes, the system is designed to predict first five subtypes which are common in different ages. These subtypes are AML-M0, AML-M1, AML-M2, AML-M3, and AML-M4.

Many studies have been introduced to develop cancer diagnosis systems by using intelligent computation. For example, multivariable nonlinear regression neural network was used to diagnose and predict blood disorder and cancer [1], a neuro-fuzzy approach was used for diagnosis of preoperative ovarian cancer and breast cancer [4], [5], [6]. ANFIS was also successfully applied in other areas of medical science.

II. Methods

A. Adaptive Neuro-Fuzzy Inference System (ANFIS)

Adaptive neuro-fuzzy inference system embeds the fuzzy inference model within the framework of an adaptive network and uses Takagi-Sugeno fuzzy inference technique to combine fuzzy logic decision making capability with artificial neural network's learning ability [3]**.** ANFIS computes initial membership functions by training itself with training data, afterwards adjusts membership functions using either a back propagation algorithm or a hybrid-learning algorithm (a combination of back-propagation and least- squares method) to minimize error measure.

B. System Development Using ANFIS

To design the network, MATLAB fuzzy logic toolbox was used. Different membership functions that were used during the course of network training are listed below:

a. Gaussian curve membership function:
$f(x;\sigma,c) = e^{\frac{-(x-c)^2}{2\sigma^2}}$

b. Generalized bell-shaped membership function:
$f(x;a,b,c) = \frac{1}{1+\left|\frac{x-c}{a}\right|^{2b}}$

c. Triangular-shaped membership function:
$f(x;a,b,c) = \max(\min(\frac{x-a}{b-a}, \frac{c-x}{c-b}), 0)$; where x is a variable and σ, a, b, c are called premise parameters.

From the blood tests of AML patients, it is seen that for all types of AML mentioned above, significant changes occur in the amount of four haematological parameters from their normal ranges. These parameters are: Leukocytes, haemoglobin, platelets and blasts [7]. They were taken as input parameters to the system. The output was any one of five types of AML.

The initial fuzzy-inference system (FIS) was generated using the training data with grid partitioning method. For each type of membership function (MF) mentioned above, the number of MFs was three for each input variable. The output

membership function was chosen to be linear. The generated FIS was then trained using hybrid optimization technique at different epochs.

III. Findings and Argument

By choosing the number of membership function as three for each input variable, a total of 81 rules were generated. The following table shows the performance of various membership functions listed above:

TABLE 1
TRAINING ERRORS OF DEVELOPED SYSTEMS

System	Membership function	Epochs	Training error (RMSE)
ANFIS.1	Gaussmf	30	0.041682
ANFIS.2	Gaussmf	50	0.041379
ANFIS.3	Gbellmf	30	0.045994
ANFIS.4	Gbellmf	50	0.042127
ANFIS.5	Trimf	10	0.057602
ANFIS.6	Trimf	30	0.047242

From the table-1 it is clear that, minimum training error (in terms of root-mean-squared error (RMSE)) is obtained by Gaussian membership function at epochs of 50. The ANFIS automatically generated the following membership functions by analyzing the data fed to it for training:

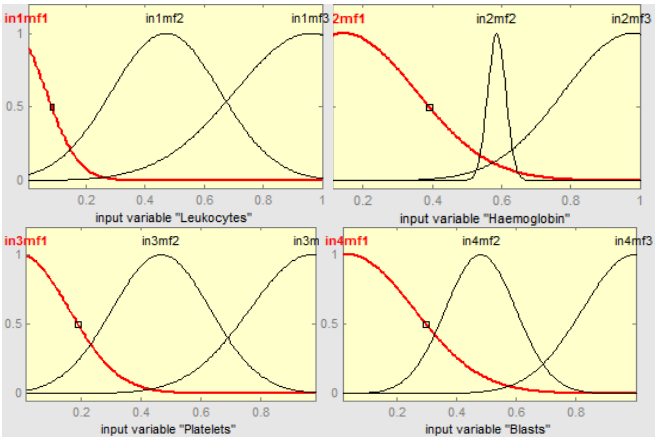

Fig. 1 Changes of input membership functions after training.

To test the output of the trained system with new dataset, input parameter values were given to the rule viewer and the output value for the corresponding combination of four inputs was instantly generated at output part of the rule viewer. A part of the rule viewer can be shown in fig. 2.

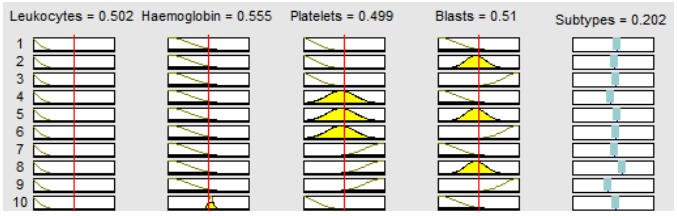

Fig. 2 Rule viewer window of the developed system.

The neuro-fuzzy approach used in our network is data-driven. In this case the fuzzy rules were generated directly from the input-output dataset. The neuro-fuzzy model learns the salient features in the data and automatically adjusts the system parameters in order to meet a specified error criterion [3]. The following table shows the test error (in terms of mean-squared error (MSE)) of the ANFIS:

TABLE 2
ANALYSIS RESULTS FOR FIVE AML SUBTYPES

Subtypes	Observed case	Predicted case	Prediction failure	Test error (MSE)
AML-M0	14	12	2	0.0566
AML-M1	14	14	0	0
AML-M2	14	14	0	0
AML-M3	14	13	1	0.0635
AML-M4	4	2	2	0.0506
Total cases = 60; Total prediction failure = 5				
Accuracy = 92%.				

IV. Conclusions

An Adaptive Neuro-Fuzzy Inference System (ANFIS) based methodology was developed for acute myeloid leukaemia subtypes prediction purpose. The system successfully predicted fifty-five out of sixty AML patients. Further accurate result may be obtained with data having less noise and using various combinations of membership functions and optimization techniques at various epochs.

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Feasibility study of Enterprise Resource Planning (ERP) in context of a developing country like Bangladesh

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***Abstract*— The aim of this paper is to find out the obstacles, limitations and successes factors to implement an enterprise resource planning system (ERP) into the business sector of a developing country such as Bangladesh. This study attempts to find out the optimized way to implement an integrated information system in such way where the probability of success will increase and the system will be more adaptable for the new users. ERP is competently adopted and efficiently run in the business environment of developed countries such as in USA or Europe, could this systems be absorbed and effectively operate in a country such as Bangladesh without first making some modifications to accommodate socioeconomic and other cultural differences.**

Keywords- Enterprise resource planning, Integrated information system, Developing country, obstacles and limitations, Bangladesh.

I. INTRODUCTION

ERP is the acronym of Enterprise Resource Planning. It integrates internal and external management information across an entire organization, embracing finance/accounting, manufacturing, sales and service, etc. The success of the system is fully dependent on how the workers utilize it. This means they must be properly trained, and a number of companies have attempted to save money by reducing the cost of training. One of the biggest problems with ERP is that it is hard to customize. Very few companies can effectively use ERP right out of the box. It must be modified to suit their needs, and this process can be both expensive and tedious. Even when a company does begin changing the system, they are limited in what they can do.

The ERP software is that integrates departments and functions across a company into one computer system. A successful ERP system implementation can shorten the production cycle, increases accuracy of demand for materials management & sourcing and leads to inventory reduction. Moreover it can be used as a primary tool for re-engineering.

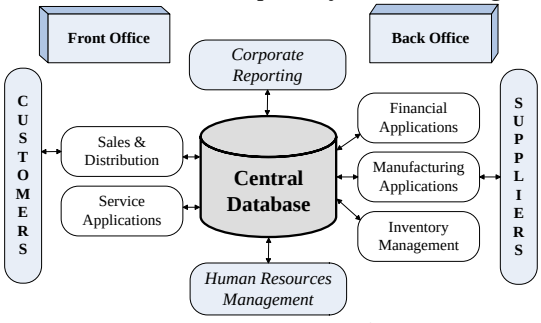

Figure 1: Overall concept of ERP[1]

It runs off a single database, enabling various departments to share information and communicate with each other. ERP software is multi-module application software that integrates activities across functional departments, from product planning, parts purchasing, inventory control and product distribution to order tracking. The overall concepts of ERP are shown in Figure: 1.

II. CASE STUDY

At present in Bangladesh, companies can use ERP to support organizational structures that were not previously possible or to create a more disciplined organizational culture. The working force or the employees in the country are not technologically sound enough to get adapted with ERP at this moment, which is a great constraint in ERP investment. But effective measures like training, organizational development, proper management and education can be helpful in the development of the digital firms in the country.

At present there are several companies in the country using ERP. It has become an increasing trend among the large companies. Some familiar companies in Bangladesh using ERPs are:

- Linde Bangladesh Ltd. -"SAP"
- Aktel Telecom – "SAP"
- Grameen Phone Telecom - "Oracle"

Most of the companies are using small parts of ERP and they are not getting the advantages of it. Gap analyzing is one of the important parts of ERP life cycle. In this step, the gap between the standard system and the proposed system have been analyzed. Based on the report authority should take necessary steps.

III. LIFECYCLE OF ERP

Implementation begins with the understanding of the critical goals and objectives of the business Enterprises in running of the businesses and focusing on the process of streamlining the business processes which are being planned to get integrated technologically.

The normal lifecycle of an ERP Implementation Project shall consist of the following milestones, [3]

- Business Process study
- pre-implementation Taring
- Requirement analysis
- GAP Analysis
- Master data preparation and management
- project plan
- installation of software

- customization of forms & reports
- System test
- Migration of historical data
- End User taring
- Test environment
- Go-live
- post-implementation support

There are different types of ERP for different types of business solution. [4]

IV. Major Drawback of ERP Implementation

There are few major reasons for why companies get bogged down or fail in implementing ERP. [5]

- Lack of Top Management Commitment
- Inadequate Requirements Definition
- Poor ERP Package Selection
- Inadequate Resources
- Resistance to Change
- Miscalculation of Time and Effort:
- Misfit of Application Software with Business Processes
- Unrealistic Expectation of Benefits and ROI
- Inadequate Training and Education
- Poor Project Design and Management
- Poor Communications:
- I'll-advised Cost Cutting:

V. Organizational Culture of Bangladesh

A company who implements an ERP system has to change its business processes to the ERP best-practice processes. The change both impacts on the customer's organizational culture (i.e. the ways that things are done in the organization) and is constrained by it [2].

It should be kept in mind also that a copycat approach of a western version of implementation will not be helpful due to the contextual issues like economic growth, business environment, culture, IT maturity, and telecommunication infrastructure etc.,

The difference of cultures between Western countries where ERP systems are developed and Bangladesh where these ERP systems are implemented makes culture an important determinant of implementation success. In a developing country such as Bangladesh, management does not rely on information much even though information systems have been implemented. They will rely more on extrapolations from experience, and intuition. The main decisions are generally made by top management, which would reduce the need to exchange information between managers. Thus, the less inclination of management to rely on systematic information from ERP system output will distress related stakeholders who could be negatively affected by their leaders' behaviour. This may be one of the major reasons explaining why more failures to ERP success in Bangladesh than Western counterparts. Till now a major part of an organization are run manually in most of the organization.

However, Western countries put more emphasis on individualism and ERP system solutions represent a perfect integration/cooperation within and across different functional areas in an organization. Thus, the higher level of the collectivism one organization has, the more difficult to obtain cooperation, which will negatively affect ERP implementation.

VI. RECOMMENDATION

To decrease the risks the organizations may introduce a phase where the local vendor will develop a semi integrated automation system, which will help the user to be well known about the automation. And also this process may help to find out the master data. This phase will help to determine the proper time of ERP implementation with minimal risk and cost.

Those local vendors may help after implementation phase. local software firms would have got the opportunity to demonstrate their IT expertise. Even if they are not at par with SAP or Oracle, but some recognition and assistance from corporate houses like them would surely increase the brand image of Bangladeshi software solution providers.

VII. CONCLUSION

Many global leaders on ERP systems are targeting large, medium and small firms either directly or through their local partners. Many locally developed firms also exist in the competition to claim their stake. However, for both the vendors and users, there remains a huge opportunity to learn from the previous mistakes made in the developed countries so as to achieve successful implementation.

Learning about the critical factors from the experience of developed countries and adjusting them to the regional and cultural context, rather than adopting them in 'a copycat' fashion would produce more success stories of achieving competitive advantage using the ERP systems in Bangladesh.

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Mobile Applications as a platform for Interactive Education

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***Abstract*— Interactive participation and group discussion has become an important part of a digital class room. Those discussions may include drawing, sharing images, and writing short notes. Generally we use pen and paper in this regard which is quite annoying, noisy, and becomes harder to express their opinion when the number of group member is more than four. Educational institutions all over the world have started providing mobile applications (apps) to ensure that their all stakeholders, students, teachers, etc. are getting the right information by using the best technology. This mobile application will provide a virtual platform to make your group discussions more friendly, efficient and fruitful. This discussion could be with teachers where the student can share their problems and solution without disturbing others from their seats.**

***Keywords*— Mobile applications, Android device, wifi, interactive Education, digital class room.**

I. INTRODUCTION

Traditional learning system is changing to fulfil the demands of interaction and use of new technology. Mobile learning / distance learning are the current focus of Educational Engineering. A technology based environment will act as a catalyst to change the educational environment. Where a teacher can easily interact, share, and get feedback form student via an electronic gadget like mobile phone or Tab. Multimedia content helps the students to get the real view and idea to understand critical topics like, "How a computer works?". It could be used more than as a tool that helps learners to access audio/video lectures, send text messages, quizzes, chat, short notes, and so on. [1]

Students can get their resources/ class notes anywhere they want through the mobile phone. And also with the help of Internet any student can also participate in their class from a long distance with the permission of teachers.

II. BENEFITS OF MOBILE BASED INTERACTIVE EDUCATION

Mobile based application could be beneficiary for students, teachers, and also for the administration. [2]

A. Benefits of Students

It supports multimedia contents that will help students to understand a topic more easily. Students can ask their question and also discuss it with others. The interaction part is the most important part of this mobile application.

B. Benefits of Teachers

This type of technology will let teachers to get closer to the students. They can find out the problems of students and provide solution. And also same multimedia content could be used several time and those content are very helpful for students. Teachers can also track the performance of students very easily through this application.

C. Impact on educational system:

This mobile based education system could change the environment of class room. Students will be more active by participating and sharing their knowledge. Also the administrator could monitor the overall system and performance of every individual.

III. FEATURES

This application is an alternative of traditional Note pad, where it could be used without any help of pen and paper. There are many applications to provide this type of environment but this application will also provide the facility to share your opinion with others by using the same application at real time.

This application will help you to create an environment where all students can discuss fluently without disturbing others. Confidential conversation could also take place anywhere, where distance and number of people is negligible.

The Admin/Teacher can maintain the accessibility of user/Student to ensure that, only the authorized person can participate according to his/her role in this conversation. Someone could have only read others comments, others may have permission to write on the page. Only who have the right passkey they can join this conversation with the permission of Admin.

The Most important part of this application is, it could change the traditional educational system through ensuring the interactivity and equal participation of each student with teachers. Students will get all notes of Teachers through this application and also s/he can point any problem to teacher for better understanding.

Another important part of this application is, it supports diagrammatic presentation. It includes various tools to draw

diagram and import images to make the conversation more alive and understandable.

- Sketch with different colours.
- Write text on the shared pages.
- Sketch on top of an image.
- Modify other sketch with permission.
- Save sketch with discussion.
- Draw with different brushes/ shapes.

IV. User Interface

The most important part of this application is, it will work as a platform that will let teachers and students to interact with each other. Here are few user interfaces.

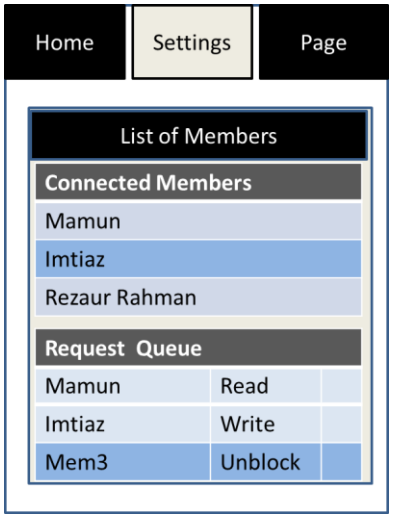

Fig. 1: List of connected members/Students

Students can join with an interactive session with the permission of teachers. Fig 1 shows a list of members and the queue of new requests. They require the permission. Teacher will decide who will get what permission. Teacher have to provide this permission to every new students through a page shown in fig 2.

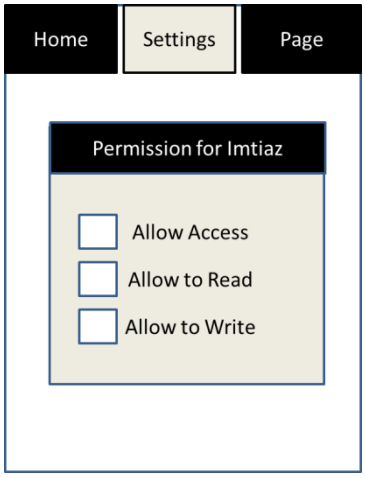

Fig. 2: Access permission for students

Through a common page (shown in fig 3) teachers and students can share their comments/ feedback. Normally teachers will use this page to provide their lecture and answers. Students can also write on this page with the permission of teacher.

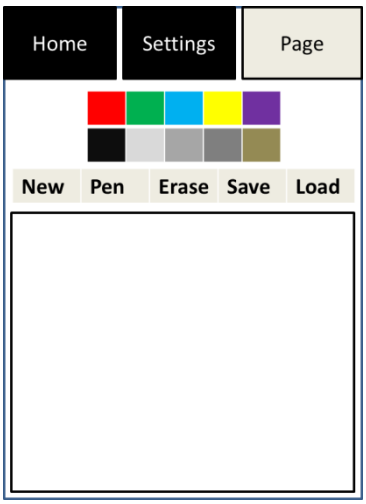

Fig. 3: A common pages to share notes

V. Application Development

As Android is the most popular and open source mobile operating system, here this application will be developed for Android. One device will communicate with others through wifi. The range of wifi is suitable for a class room. [3] A device, (Device of teacher) have to act as server to host and maintain a session.

VI. Conclusion

Digitalization is changing our life style day by day. We have been adapted with it and the end result is very fruitful. But in reality, many schools and colleges forbid the use of mobile phones and on the other hand somewhere some teachers have to force the students to use devices in their classes. Mobile applications can improve the environment but verbal lecture are obvious.

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Hybrid Cache Management Architecture to manage web content over Intranet, in context of digital class room

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***Abstract*—In this age of digitalization and globalization the appeal of better facility to enrich our knowledge is become one of the major issues for computer scientist. Many research and technology have been introduced and each of those has their own advantages and limitations. The concept of digital class room is being upgrading day by day. Intranet with hybrid architecture will help to manage web content by improving the knowledge sharing capabilities of digital class room. Based on the secondary information by literature review, this paper is aimed to propose few feasible strategies to improve the performance of a digital class room by using browser caches and proxy server, where the browser cache will be accessible by other user. This paper will also focus on the present architecture and challenges of current system that are needed to be resolved.**

Keywords—Digital class room, Intranet; browser cahe; distributed cache; Web Traffic, cache management, Force update.

I. Introduction

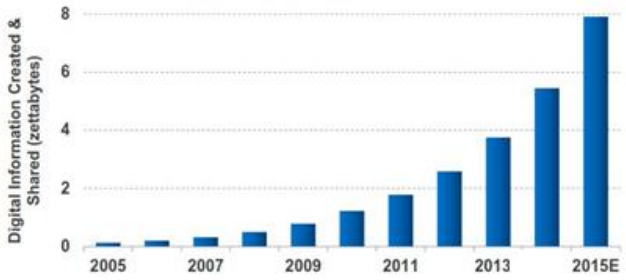
Web traffic is the amount of data traveled on the internet and those data are sent and received by the visitors of a web site. The internet has already become giant networks which have to control a huge amount of web traffic. This huge web traffic may causes slowness of the entire system. The amount of Global digital information created and shared will be double within next two years according to the current growth rate of web traffic (Figure 1)[1].

Web traffic is acquired from the access log of web data. It assumes simple and static Web pages, and once Web pages are identified, other contents can be derived, such as the number of embedded objects, total page size, total page time, and inter-arrival time.

II. Introduction to Intranet

An intranet is a network of computer that uses Internet Protocol technology to share information, operational systems, or computing services within the networked computer of an organization. The objective of intranet is to organize each individual's desktop with minimal cost, time and effort to be more productive, cost efficient, timely, and competitive. Intranet has access to Internet but not vice-versa.

The main difference is the Bandwidth. Most of the time internet seeks for bandwidth, where Intranet could provide ten times bandwidth. So that rich graphical and multimedia contents could be used on this Intranet.



Note: 1 Zeta byte= 1 trillion Gigabyte
data of 2014 and 2015 are estimated

Fig1: Global growth rate of web traffic

But figure 1 shows popular web sites have been browsed more frequently. [1].

III. Web Caches

A "Cache" is used for the temporary storage of Web pages on your hard disk. Every web page retrieve from the server for the first time, if anyone request for the same page again, then the browser at first checks its cache memory. Then the browser attempt to read the page from its "cache", instead of spending the extra time and network traffic to download it again.

This browser cache helps to avoid a network round trip and is typically 100 to 1000 times faster than downloading the file over a broadband connection.

IV. Digital class room

Digital class room is a wide term which includes digital content, multimedia, Knowledge sharing and so on.

1. Class contents: Browsed content are text books, class notes, assignments, tutorial and any content referred by the teacher.
2. Types of contents: Usually web contents, Pdf, Doc, video tutorial, and images files are browsed in class room.

3. Frequency of Contents: Most of the time same contents is browsed more than one times by almost all students.
4. Online examination: Online examination is become a vital part of a digital class room.
5. Digital library: Digital contents getting popular day by day. Digital library is become essential to manage those digital contents.
6. User account: Each student could have a limited memory space on server to store their files.
7. Request for internet access: Student may request for internet access to browse or download for web contents. That content would be shareable to other students.

V. PROPOSED SOLUTION

A. *On request internet service*

Student may request for access the internet to download or browse a web contents. If those file is not in the local server and the content is not restricted then the student will get permission to access the internet. Once the data is being downloaded on the local server and another student request for the same content, then the content will be served from the local server.

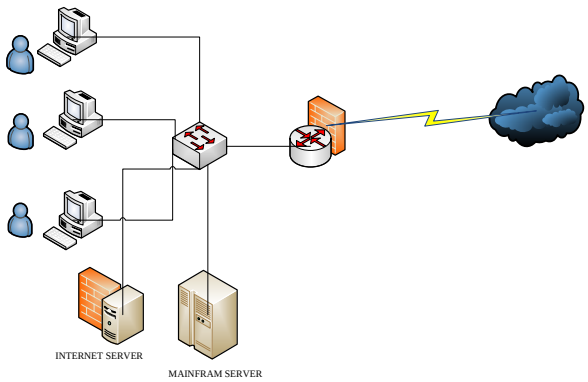


Fig 2: integrated local server with browser cache

B. *Local server*

All class contents will be locally hosted on local server. Teachers are the contributor of those contents. Figure 5 shows how each request of students will check by the local server and if the content is available then it will server from it. Neither student has to wait for the permission of accessing internet.

C. *Shareable browser cache*

Browser caches are stored in user computer. Those caches could be share with others that will reduce the network traffic load. The proxy server's load will be distributed among user's computer. Proxy server/ local cache server have maintained a log of cache content and their source (user computer). More details on [3].

A Browser plug-in called "cache manager" could be integrated for this cache management purpose. Those file being distributed could be divided into segments called pieces. Those pieces will also ensure the data security of that content. With Cache manager, the task of distributing the file is shared by those who request for it and the container of that cache.

D. *Requesting for a Web page*

Cache manager (a plug-in of browser) will communicate with a proxy server to find other computers live on the network that contains the cache.

The proxy server connects both computers to start the process of sending or receiving cache.

If you continue to run a browser that has the cache manager plug-in others can receive cache file from your computer;

The transfer of cache will handled by a protocol (a set of rules), such as FTP (File Transfer Protocol) or HTTP (HyperText Transfer Protocol).

VI. CONCLUSION

Technology is being developed day by day and making our life easier than ever. Different technology is being introduced to share knowledge with others. Students of developing countries seeking for updated teaching materials on their class room. This Digital class room with intranet and hybrid architecture of cache management will change the environment of learning and sharing. On-demand internet services are cheaper to maintain and easier to use. Also this architecture will reduce the internet traffic and distributed cache will also distribute the load of local server.

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Conservation of Electrical Energyby Deploying Dedicated Software to Computers & Devices

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***Abstract*—Every day billions of computers and servers as well as portable devices like phones and tablets consume electrical energy in a severe manner. That is why a cloud connected universal software dedicated to energy savingcan reduce the consumption radically. This submission focuses on the possibility and workflow of the software which is intended to be a change maker in energy consumption scenario.**

***Contribution*— Our research work is focused to reduce the carbon footprint of the computers and computing devices of the whole world.**

***Keywords*— energy-saving, computing, carbon-footprint, software**

I. Introduction

Conservation of energy is a key factor toprotect our environment. Global warming, climate change and depletion of resources are happening because of over-consumption of energy while most of it are wasted because of inefficiency of systems. We use electrical energy for almost everything. In the 21st century, computers (personal, mainframe, server) and handheld devices uses 24% of the total global electric energy of 18.47 trillion kW h/yr(kilowatt hours per year).

The proposal is, a specially designed software can optimize cloud connected devices to save energy by adjusting appropriate settings in real-time. As computers and handheld devices run quite a number of programs simultaneously, some of those codes use resources hugely. The intention of this article is to explain the structure and work-flow of the proposed universal software which will include server load sharing, work-load monitoring, CPU-GPU optimization, display brightness adjustment and application of more green settings. These steps could result in less carbon footprint of the entire computing community.

II. Methods

At first a global energy saving rules need to be updated to apply new energy saving software and settings. A special algorithm designed by mathematicians and computer scientists will be the core of the deployed software which will be applied to the devices. A cloud end be used to deploy new settings and balance energy needs globally. As the new standard would be applicable, the program will be by default installed in computers, servers, smartphones, smart-cars etc. The key parts of the system are described below.

A. Energy Saving Algorithm

The program will collect energy usage data from the operating system of a device. If internet connection is available, it will collect necessary information from the cloud to balance between performance and energy saving. If the user permits, the software will check for connected idle hardware to the device like printers, modems and external drives to disable those. Another part of the system generates settings by geo-locations. For example, if the devices of a certain region draw more power rapidly, a report will be sent to the administrators for system anomaly.In servers and data centers with proper permission, the program will find duplicate data and consolidate them. An inter-server connectivity will redirect data requests to proper servers to reduce server uptime. For example, same viral videos uploaded in many severs can bean example of waste of resources.

B. Target Devices

After ensuring the exactitude of the software, it will be ready for deployment to the following devices.

- Personal Computers (including Windows, OSX, Linux, Chrome OS based systems)
- Servers (including Apache, Linux, Windows, OSX Server based systems)
- Handheld Devices (including smartphones, tablets, palmtops, navigation systems running Android, iOS, Windows)
- Smart Cars
- Smart Home Automation Systems
- Corporate Data Centers

C. How Energy will be Conserved

The software will conserve energy in the following ways.

1. by ensuring the power supply certificates
2. by entering power-saving mode
3. by switching off the device (if necessary)
4. by disabling unnecessary tasks
5. by disabling wireless hardware
6. by checking for power hogging programs
7. by ensuring antivirus installation
8. by redirecting to proper servers

(Computer Energy Saving Guideline, 2014)

III. FINDINGS AND ARGUMENT

A. *Why Use A New Standard*

A new standard is inevitable for global energy consumption because every device and operating systems use separate standards and few of them may not be actually green. That being the case, a new standard will help to unify the whole energy saving standards. A dedicated standardisation like ISO will be able to set the energy saving parameters of the proposed program

B. *Suitable Structure of the System*

The system will be monitored and maintained by the following structure to prevent any kinds of security breaches and mishaps. There will be a global kills witch if anything seriously goes wrong.

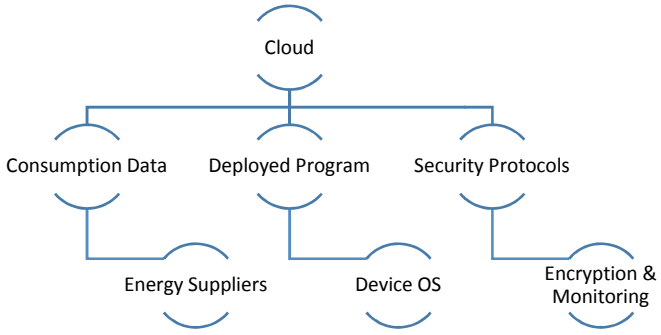

Fig. 1Suitable structure of the system

C. *Possibilities*

Before the energy crisis grasps the world and brings the technologies to ground, we must think of clean energy sources and set energy saving guidelines. So a dedicated and universally accepted cross platform software for conservation of energy can be critically helpful. African energy crisis is forcing them to struggle as the world is progressing forward. (Wikipedia, n.d.) The growth of smartphone users will be 2 billion within 2016. (Emarketer Survey, n.d.) A typical server uses about 454W energy. (Jonathan G. Koomey, FEBRUARY) So this concept can be a major breakthrough if the energy conservation systems.

IV. CONCLUSIONS

The global technology scenario is leading the users to put a part of their life in the cloud. So it is inevitable that access to computers will be a necessary human right. So green computing is very necessary to keep our earth liveable. That is why such solutions can make the computing scenario greener. The urge for a dedicated energy management software should grow if the security of the central cloud is ensured to be extremely strong.

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A nobel model of hybrid renewable energy for sandwip

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***Abstract*— In Bangladesh power crisis is a regular and acute problem. Bangladesh is blessed with renewable energy resources all over the country and it is high time to utilize these resources to generate electricity. So a hybrid power system utilizing renewable energy resources can be a partial solution to the energy crisis. Having a large coastal area containing tidal, wind and solar resources, a hybrid system, utilizing all these resources can be a better option to solve energy crisis in coastal area of Bangladesh. This paper proposes a detail design and cost analysis of a hybrid power system utilizing solar, wind and tidal resources with a diesel generator backup and using the pricing of the available batteries and Solar Panels in the Sandwip island of Bangladesh. The simulation and analysis is performed on a highly recognized renewable energy research tool called 'HOMER' considering the electrical demand of sandwip.**

Contribution*— *simulation and analysis of a hybrid renewable energy considering sandwip demand and resourcs.

Keywords*— *Renewable energy; Solar Energy; Hybrid Energy; HOMER; Wnd energy; Cost Analysis.

I. INTRODUCTION

Bangladesh is facing an enormous power shortage, causing haphazard in all spheres of life. The major part of the electricity comes from conventional power sources such as Coal, Gas, Oil, Diesel etc. As a consequence of the electricity shortage and the continuous emitting of large amount of carbon which is responsible for the so called Green House Effect causes natural disasters. Only 10% of the rural areas are connected to the national grid. Due to the soaring price tag of power transmission and distribution, there are many remote areas and islands which are not linked to grid and the possibility in the near future is minimum. But it has large renewable resources which can be properly utilized for electricity generation in the off grid areas [1].

A recent studies showed that electricity from the solar -wind based hybrid system can be supplied to the remote area in Ethiopia [2]. Dalton et al. also analyzed the feasibility of a cost effective standalone hybrid renewable system using HOMER software.

II. WIND ENERGY IN SANDWIP

Sandwip is enriched with Solar and wind resources too besides Ocean current resource. The long term wind flow of Bangladesh (specifically in islands and the southern coastal belt of the country) indicate that the average wind speed remains between 3 to 4.5 m/s for the months of March to September and 1.7 to 2.3 m/s for remaining period of the year. But during the summer and monsoon seasons, (March to October) there can be very low-pressure areas and storm wind speeds of 200 to 300 Kph can be expected. Wind turbines should be strong enough to withstand these high wind speeds. Wind velocity changes with increase in hub height. As the data of 20 meter height was available we used the following equation to determine wind speed at 45 meter height [3].

$$\frac{Vz}{Vref} = \left(\frac{h}{href}\right)\alpha$$

Where, Vz = average wind speed at height of h meter. Vref = average wind velocity reference height of 25 meter. h = the height where the velocity of wind is to be calculated (m) href = reference height (m), α = dimensional constant. It varies from 0.1 to 0.4. Using the value of velocity we can easily calculate the potential energy of a specific location by given formula, $P = 0.5 \times p \times A \times v_3 \times c_p$

TABLE I
MONTHLY WIND VELOCITY AT 45M HEIGHT FOR SANDWIP.

Month	**Velocity (m/s)**
January	4.09
February	3.11
March	7.28
April	9.75
May	2.66
June	4.59
July	6.38
August	5.19
September	6.06
October	4.84
November	4.41
December	4.13
Average Speed	5.25

III. Solar Energy in Sandwip

Bangladesh is blessed by extensive solar radiation. She receives an Average daily solar radiation of 4-6.5 kWh/m2 [11].

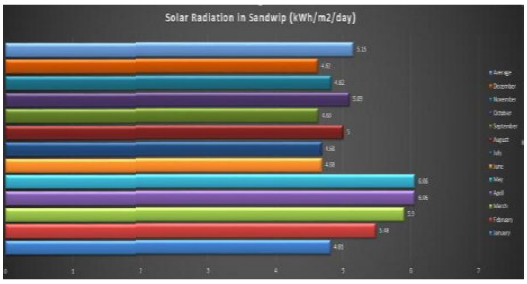

Fig. 1 solar radiation of Sandwip.

IV. Simulation of Hybrid Renewable Model

We have simulated this whole system with the help of HOMER as told earlier by creating a Hybrid model.

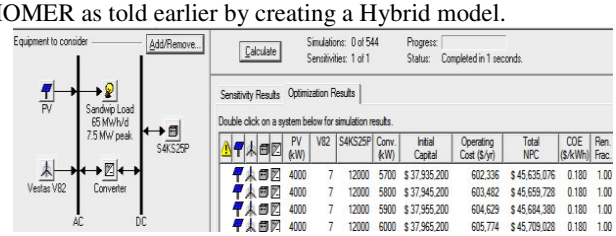

Fig. 2 Simulation model of Hybrid System.

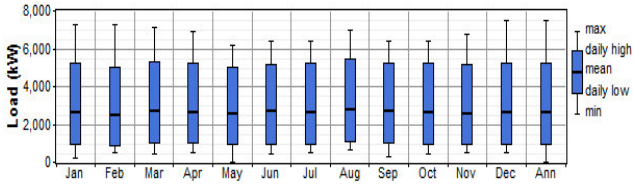

Fig. 3 Seasonal load profile of Sandwip.

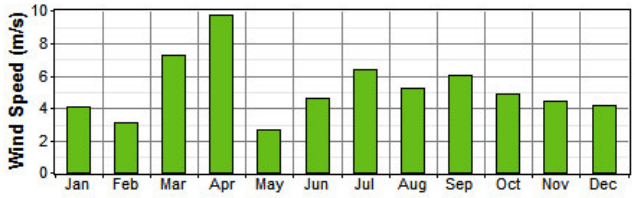

Fig. 4 Monthly Wind speed.

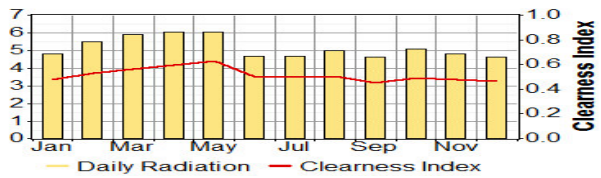

Fig. 5 Global Horizontal Radiation.

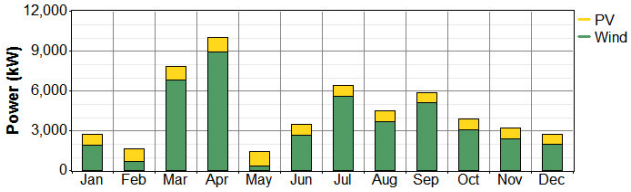

Fig. 6 Monthly average electrical production.

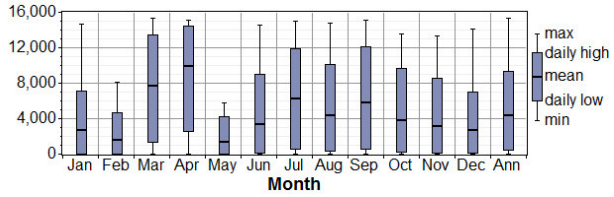

Fig. 7 Monthly combined Renewable output for assumed load.

TABLE III
Cost Summary

component	Total $
PV	8,566,158
Vestas V82	17,503,974
Surette 4KS25P	18,119,638
Converter	1,405,116
Other	40,198
System	45,635,084

V. Conclusion

HRES has the potential and prospect to find a place in the power industry. If solar and wind energy plants are established separately it may not be that much efficient, because for a Standalone PV system in cloudy days it won't produce any power at all, again in case of Standalone wind power plant if the wind speed is below 3m/s it won't produce any power, then again in case of HRES loss in one end will be compensated by the other. But with the conventional power plant technology being well established and continued to be in the main stream, HRES power plants are yet to gain commercial acceptance.

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Hand Motion Detection Using HSV Values

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***Abstract*—This document is very simple model to track hand motion using hue-saturation-value (HSV) of skin color while there is an absence of face or other part of the body. Its basic method threshold the images of the video sequence using HSV value of skin-color. After that finds the shape having biggest area and then finding its contour and Drawing bounding rectangle. Python programming language and OpenCV library function is used for this program.**

***Keywords*— Hand detection, HSV value of skin, Contours, Python, OpenCV**

I) Introduction

There are many ways to detect hand movement from real-time video. Hand gesture detection based on HSV values of skin color is one of the simplest models for tracking hands. This process uses skin color threshold to detect contours of shapes. Hand tracking is widely used as a control parameter for devices [1] [2].

There are many other related works for hand or other moving object detection. JyothiLakshmi P, Dr. K R Rekha, Dr. K R Nataraj used a method by the combination of motion of objects and color of skin for detection hand [3]. Another way is Template matching, which compares the objects' image with some template image, specified before. If any part of the image matches with the template this algorithm will indicate that point as the object. One limitation of this process is that it can track only certain orientation of hands but is not suitable to detect other positions of hand not included on templates. Using a colored glove makes it easy to detect hand. There are many solutions to track specific shape of hands posture. One of the common tracking method is the Canny Edge Detector. This method is basically used for the estimation of posture for a specific region. Joyeeta Singha, Karen Das proposed a method combined of skin color tracking, edge detecting & template matching to track hands [4]. Condensation of algorithm is another approach for tracking hands. It detects & tracks the contours of hands in cluttered environment. Model based hand tracking is a method for 3D hand tracking. A 3D geometric hand model is constructed from truncated cones, cylinders and ellipsoid and is used to generate contours, which can be compared with edge contours and skin color in images [5]. For 3D hand tracking, by the use of multiple cameras, was proposed by Akira Utsumi and Jun Ohya [6]. Tracking 3D hands with single camera by wearing an ordinary glove is the method that was proposed by Robert Y. Wang and Jovan Popovic [7].

Python is widely used programming language. To express concept in fewer lines of code Python is better than any other language. OpenCV is a library function for real-time computer vision. OpenCV interface is supported by C++, C, Python, Java, MATLAB. For real-time tracking program can easily implemented by Python & Opencv library function. Python and OpenCV used to develop the program described here.

II) Method

Using HSV value is a faster and easier method to detect hand motion. Algorithm of hand detection and its movement from a real time video is given on the flowchart in Figure 1.

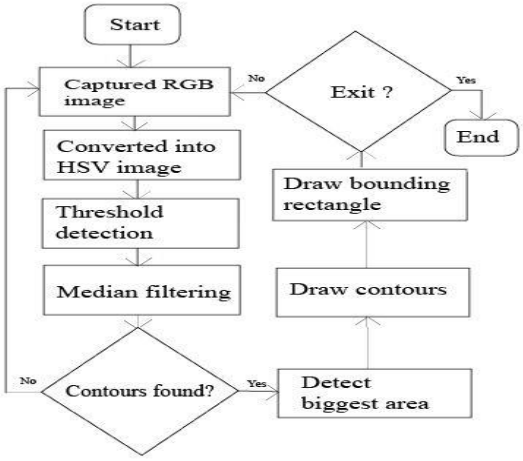

Figure 1: Flow chart of the tracking procedure.

First take RGB picture from Webcam. Figure 2 (A) shows a RGB picture of hand which will be used. HSV image converted from the RGB image using OpenCV library function shown in Figure 2(B). HSV is the cylindrical representations of points of an RGB color model. For threshold color image HSV pictures is used because HSV value is less sensitivity of light. Then using threshold between lower bound value [0, 48, 80] to upper bound value [0,255,255] for skin color [8], binary image is got. Threshold method for image segmentation converts colored image into binary image by replacing each pixel of the image with white pixel if the HSV value of the pixel lies in the range given above, otherwise the pixel value will be replaced by black pixel. Next median filtering method is used for removing noise of the image. This method computes the median of all the pixels under the kernel windows and the central pixel is replaced by median value [9]. This is very effective method for removing salt and piper noise. There have dark pixel on bright region and bright pixel on dark region for salt and piper noise [10].

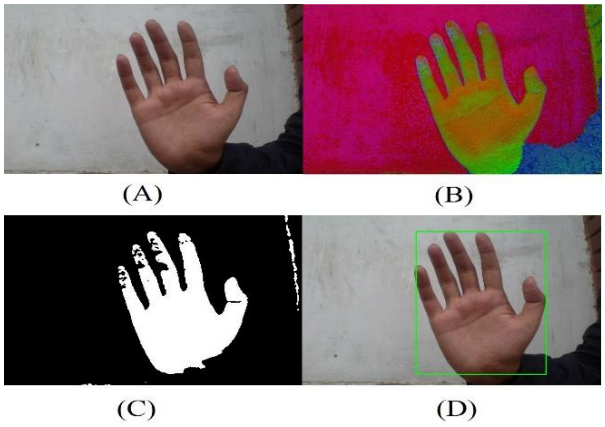

Figure 2: (A) Normal image, (B) HSV image, (C) Threshold image, (D) Final hand tracking.

The threshold image after filtering is shown in Figure 2(C).All contours of the image are found. If no contour is found, it is mandatory to go back to the 1st stage & read next picture. If otherwise happens, then the biggest area in front of camera is found to avoid any kind of distorted part. Contours & bounding rectangle are drawn around the contours which enclosed the biggest area. This rectangle moves with moving hand. Tracked image is shown in Figure 2(D).

III) Result

This program can track hands in complex background. It can track any orientation of hand in real time video sequence. Various orientation of hand in real time video is shown in Figure 3.

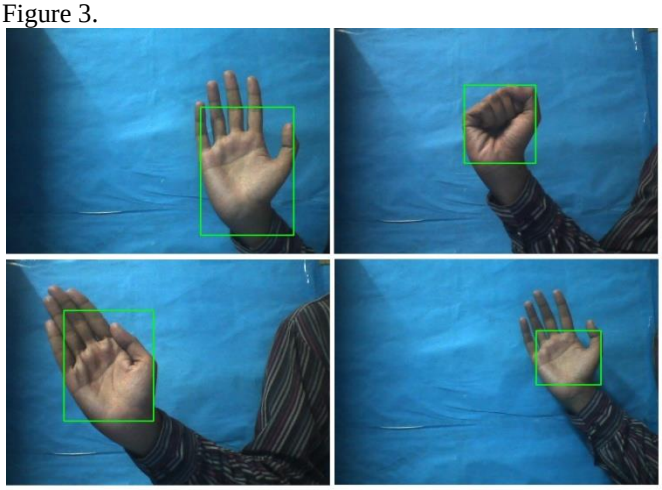

Figure 3: Hand tracked on a real-time video.

This program can successfully track hand in various one colored background as well as complex background. Some pictures of tracked image is shown in Figure 4. Actually this process track skin color so it cannot track hand if the background color will similar to skin color. This method track any kind of skin colored object so if any part of the body such as head come in front of the camera then it tracks the biggest area.

If the area of hand is bigger then head in front of the camera then hand is successfully tracked. Otherwise head is tracked instead of hand. Problems of detection are shown in Figure 5.

Figure 4: Hand Tracking for different background.

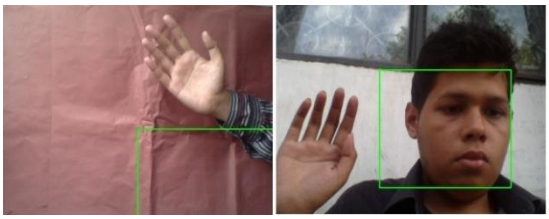

Figure 5: Problems in detection.

IV) Conclusions

The main purpose for developing this program is to use hand motion for robotic controlling. This method used for developing this program is not fully an unique idea .This kind of similar types of method was used before but here this program was developed for our own purposes. This program can successfully track hand in various one colored or complicated background. Some deflections are occurred if the background color is similar to skin color or the face area appears larger than hand in front of camera. Inspite of having some problem this program is still good enough for using various purposes. In future some modification will hopefully be done for perfectly track hand in skin colored background for perfectly controlling anything.

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Preload Characteristics Identification of Force Sensor Resistor for Palpation Measurement in Telemedicine

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Abstract **- Force sensing resistor by Interlink technologies are made of robust polymer thick film (PTF) and exhibit an increase in output voltage with increasing force. FSR 400 has the potential to measure palpation, in which doctor touches and presses onto different anatomical sites for patient diagnosis. This paper presents a novel external preload mechanism and analysis to tests Preloading impact for force sensing resistor to provide more accurate information regarding sensor characterization. The values of various output voltages due to different applied force measured by FSR 400 during the whole experiment. The test results shows that impact of preloading vary with different time span. With the identification of these characteristics, a decisive correlation can be drawn and after adding a factor, FSR 400 can be installed and used in least Developed countries (LDC) for palpation measurements.**

Keywords- **Force Sensing Resistors, Biomedical Systems, Preload impact, Palpation, Tele Medicine.**

I. INTRODUCTION

Tele medicine has an enormous potential for the Low resource countries (LRC).A significant part of primary medical examination is palpation in which doctor touches and presses onto different anatomical sites for diagnosis, for which no relevant solution has come up so far for telemedicine[1]. In this proposed project pressure sensor FSR 400 will be attached to the fingertips of a trained technician at a rural center connected to a doctor in a distant city through internet.FSR 400 has the potential to use in the fingertip for palpation measurement. The objective of this study is to describe the external preloading mechanism and detailed analysis of preloading impact for FSR 400 by Interlink technologies.

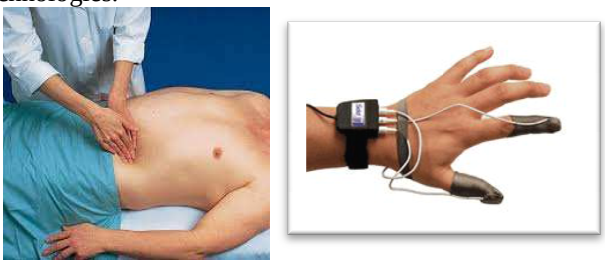

Figure 1: Detection of Palpation for appropriate anatomical structures. In the example shown here, the patients inspires deeply, bringing the liver edge to the examiners fingertips (Left)[2], Proposed Technology (Right)[3]

II. METHODS

The traditional experimental setup consists of jig for pressure calibration, force sensing resistor FSR 400, various weights, power supply and data logger. There are several evaluations to evaluate this experimental setup, such as positioning accuracy, resolution, positioning stability, and efficiency [1] [2].

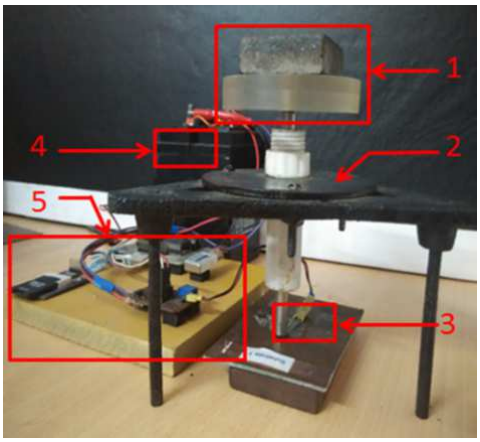

Figure 2: Experimental setup, 1.Weights; 2. Jig for pressure calibration; 3. Force sensing resistor FSR 400; 4.Power supply; 5.Data Logger

The basic function of the external preload mechanism is to push and position the calibration jig into the connection with the FSR 400 sensor surface area. This preload mechanism would provide fine adjustable resolution and a relatively little change of the preload displacement. Output voltage data for a given force was acquired using the data logger compact device developed by Department of biomedical Physics and technology of Dhaka University. FSR 400 was aligned with the jig and a fixed weight of 635 grams was applied on polymer thick film sensor surface for one hour. This part of the experiment named as trial 1.After one hour of preloading the weight was released from the FSR 400 surface. After 30 minute, second trial was initiated using the similar experimental setupwith 635 grams of weight. Trial 3 was performed followed by second trial employing the same setup. For better understanding of the preloading impact, experiment was extended for fourth trial which includes 18 hours of preloading after third trial. Followed by trial 4, fifth trial with

20 hours of preloading was performed for 635 grams of weight.

III. FINDINGS AND ARGUMENTS

Measurement of preloading impact is challenging due to various constrains such as experimental setup, time, number of trials/samples etc[6].The statistical analysis was done using Microsoft excel. Preload impact analysis was carried out using different time parameters for the same experimental setup. Due to extensive data set a partial data was shown in table 1.

TABLE 1
OUTPUT VOLTAGES FOR VARIOUS TRIALS USING DIFFERENT TIME PARAMETERS

Time (Sec)	Output voltage (V) (Trial 1)	Output voltage (V) (Trial 2)	Output voltage (V) (Trial 3)	Output voltage (V) (Trial 4)	Output voltage (V) (Trial 5)
1	3.344	3.305	3.33	3.51	3.583
2	3.344	3.305	3.344	3.515	3.579
3	3.344	3.305	3.344	3.525	3.593
4	3.344	3.305	3.344	3.52	3.598
5	3.344	3.305	3.33	3.54	3.598
6	3.344	3.305	3.344	3.505	3.579
7	3.344	3.305	3.344	3.51	3.579
8	3.344	3.305	3.344	3.5	3.583
9	3.344	3.305	3.344	3.51	3.588
10	3.344	3.305	3.344	3.505	3.583

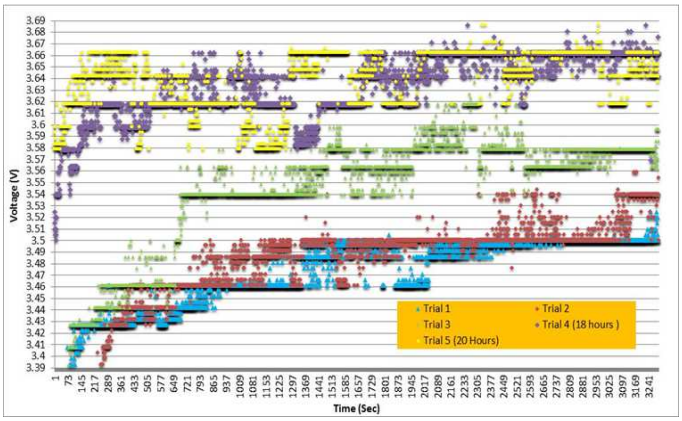

Figure 3.Time Vs Voltage, Preloading Impact analysis for FSR 400 force sensor by Interlink technologies

Figure 3 shows the voltage response over a range of time testing various trials. It can be seen in Figure 3 that the preloading impact apparently less visible for trial 2 in comparison with first trial. The reason behind this phenomenon is starting of the measurement, in other words, less preloading for FSR 400.A clear increase in output voltage over time was realized for third trial. Values of trial 4 which was 18 hours of preloading exhibit an increase in output voltage, and follow the same trend for fifth trial (20 hours of preloading) as well.

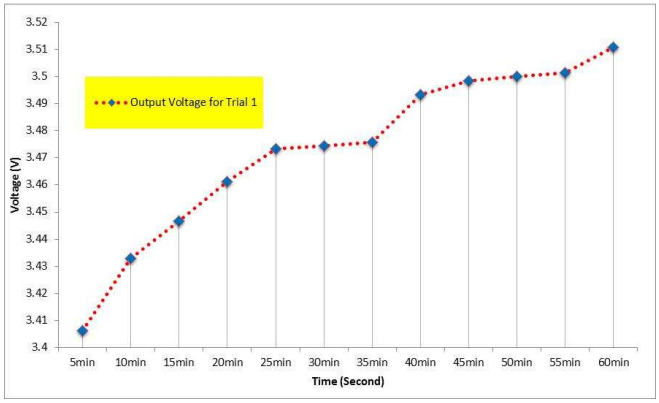

Figure 4.Time Vs Voltage, Preloading Impact analysis of First Trial for FSR 400 force sensor by Interlink technologies

On the other hand, statistical differences in the output voltage values for first trial were measured. As can be seen in Figure 4, a steady rise over time was observed in output voltage for trail 1.A significant change in output voltage for a fixed force was noted for all the trials and the impact of preloading for FSR 400 is very much visible.

IV. CONCLUSIONS

Based on evidence from the experiments, FSR 400 appears to have an effect of preloading. This proposed method can be explored in future for various force and details analysis with respect to time. Recommend a more precise and particular correlation and adding a factor will be the challenges for the future.

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Remote Sensing & GIS Based Spatio-Temporal Change Analysis of Shitolokkha River in Dhaka City, Bangladesh

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***Abstract*—The landscape of Dhaka city has been revamped due to unplanned urbanization, which has led the very existence of the once most prominent river Shitolokkha, under scrutiny. The objective of this research was to examine the spatial and temporal changes of land use - both agricultural and wetland, surrounding the Shitolokkha River. Both statistical analysis and landsat images show a progressive decrease of river and wetland, as in 2015 about 95.20 % of the river area has been lost and urban land increased about 284.70 %. This indicates uncontrolled population growth has contributed to filling of lowlands and encroachments, destruction of forest and fertile agricultural lands, resulting in eliminable damage to the environment surrounding the Shitolokkha River.**

***Keywords*—Remote Sensing, Land-sat Images, Urbanization, Wetland, Encroachment**

I. INTRODUCTION

A series of comprehensive geospatial datasets and Land-sat images were used to produce a thematic land cover map of the study area surrounding Shitolokkha River. These geospatial data were collected from USGS website and the map was created from Google earth map using polygon tool. Land-sat TM images were used for examining study area where 1988, 1995 and 2007 were Land-sat 4-5 TM and 2015 was Land-sat 8.The resulting overall classification accuracy was 85% in 1988, 88.2% in 1988, 92 % in 2007, and 92.4 % in 2014 image.

II. METHODS

The study area is located between 23°54'3.02" and 23°40'20.00" north latitudes and between90°26'50.94" and 90°36'45.84" east longitudes along the eastern part of Dhaka city of Bangladesh. Thearea is bounded by the Gazipur Thana in the North, Narayanganj, Bandar Thana in the south, Narsingdi, Araihazar, Sonargaon Thana in the East and Dhaka Metro in the West. The study area covers the Southern Part of the ShitalakshyaRiver. Total Area is 39945.6304 Hectares. Due to the heterogeneous character of land uses, a classification scheme was developed based on previous knowledge and field investigations combined with additional information from previous research in the study area. Land use types were determined by a combination of supervised and unsupervised (ISODATA) classification.

Since the aim of this study was to examine land use, agricultural land-use and wetland change, the spatial extent of built-up areas,a simple classification system was adopted.Seven thematic land use and land cover categories were generated and classified using training sites or signature files that appeared fairly homogeneous on the image. Nearly 300 land-sat signatures were collected from 4 individual years starting from 1988 to 2015, to assess the current land situation, using 7 thematic land use and land cover categories. This analysis indicates the relative degree of similarity, based on spectral distance. Water bodies, vegetation cover, crop fields, and core urban areas, for example, can easily be traced out since they show a distinct pattern of spectral reflectance. For other categories, Google Earth's image enhancement technique was used, as land covers were manually distinguished and then signatures were extracted from each land use class. Using these signature files, a supervised classification was carried out with a maximum likelihood algorithm.

Accuracy assessment was carried out using aerial photographs, topographic maps, and random samplings. The validation method varied from image to image.100 random sampling points were taken in each image and validated using aerial photographs and topographical maps of 2007 and 2015. For 1988 and 1995 image, accuracy assessment a confusion matrix of 100 random points were used.

TABLE I
AREA DETECTION FROM 1988-2015 (HECTOR)

Years	**1988**	**1995**	**2007**	**2015**
Features	Available Area (Hectares)			
River	2355.48	959.85	197.55	122.512
Wetland	6828.75	4442.92	2901.87	2364.93
Marsh Wetland	605.52	2042.01	8082	6228.14
Forest	10902.6	12824.5	7601.31	6939.45
Pasture	7578.83	7795.26	5610.78	4142.43
Urban	4422.15	8795.34	9864.36	17012.1
Barren Land	7243.92	3011.1	5679.18	3150.88

III. FINDINGS

The Remote Sensing model shows progressive decrease of River, Wetland, Forest, Barren land due to urban expansion to cope with population growth, as resulting into increase of Marsh wetland

and urban area shown in Fig. 1.The Urban Area has increased about 4 times at 2015 then 1988. On the other side the river has decreased 20 times from 1988 and wetlands 3 times.

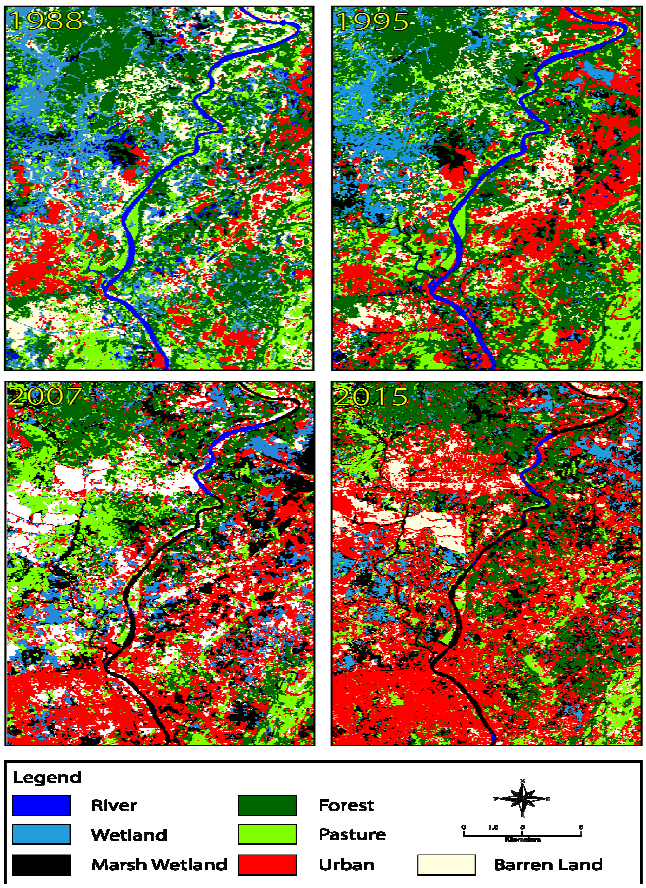

Fig. 1. Remote sensing image showing the land change pattern from 1988 to 2015

From the history of growth of the city demonstrated by Fig. 1 shows that, the city wasremaining almostsame up to the late 1988s. In 1995, pasture areas remained almost the same, but urban area increased (shown in red) significantly. In 2007, the south side of the map shows completely taken over by urban development. Blue wetlands also decreased and replaced by green pasture areas as pasture areas shifted to the north portion of the map from the south. In 2015, from Fig. 1 it is evident that almost all the map is covered with aggressive urbanization. River and wetlands reduced significantly. A significant correlation of lossof wetlands, rivers andforest wasalso found with increasing urban population and build-up area.

From Table 1 it can be seen that due to unplanned urbanization, river area has decreased by about 95.20% by 2015, with only 122.51 Hectares left, whereas urban area increased by about 284.70% reaching to an astonishing 17012.1Hectares. Due to pollution and uncontrolled dumping of waste, marsh wetlands have increased almost 10 times as in 2015 they ranged about 6228.14Hectares. Indiscriminate cutting of trees for construction and cooking purpose has reduced the forest area by about 36.35% as in 1988 about 10902.6 Hectaresof forest was located which came down to only 6939.45 Hectares.

The process of filling of lowlands, encroachment, and the destruction of arable agricultural land has resulted in uncountable losses of natural resources and significant environmental damage to Shitolokkha River. This changing trend of wetlands makes the drainage system of Dhaka City vulnerable, creating water logging problems and their consequences. Land filling and encroachment were recognized to be the main reasons for changing wetlands in the City.

IV. Conclusions

The city has expanded in all directions, mostly in unplanned and chaotic ways. Typically, expansion in peripheral areas takes place without forward planning, and housing projects are initiated, both with and without approval, in agricultural lowlands and hilly areas, leading to indiscriminate filling, flattening, subdivision, and sale of plots with no standards for provision of infrastructure or amenities. For development urbanization in Dhaka city is must. but these should be based on further specific studies and understanding of the hydrological system of the area, not just demand driven unplanned expansion. Special care should be given to the development and alteration of the existing water bodies so that natural hydrological condition can cope with the artificial structural action. Integrated water management must be the first concern for sustainable development in Dhaka city because of its natural settings.

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Bengali Character Grouping based on Identical Shape, Towards an Efficient Bangla OCR

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***Abstract*— Bangla is one of the most widely used languages in south Asia. It also has been used as official language in many organizations and countries. There are many projects and research going on to dissolve the appeal of Bangla Optical Character Recognition. Most of them use template matching to detect a character. This paper will demonstrate a new character recognition technique based on "Identical Shape". All Bangla characters will be grouped in different categories based on their identical shape. Feature extraction of different groups will differ from one another. The probability and knowledge based decision making and multilevel feature extraction based on their identical shape will improve the accuracy, efficiency and faster the Bangla Character Recognition process.**

***Keywords*— Bangla OCR, Character grouping, Identical shape of Bangla character. properties of Bangla characters.**

I. INTRODUCTION

Bengali OCR involves reading text from paper and translating the images into a form (say ASCII code/Unicode) that the computer can manipulate. There are so many research projects on Bangla OCR. But till now there are few scope to improve the overall performance. OCR system is still in preliminary level in case of language like Bengali, cause of its complexities in character shapes, top bars and end bars. Moreover it has some modified vowel and compound characters those are hard to differentiate from each other.

II. PROPERTIES OF BENGALI CHARACTER

There are 11 vowels and 39 consonant characters and 10 digits in Bengali language. Most of the characters have a horizontal line at the upper level shown in Fig 1 [1].

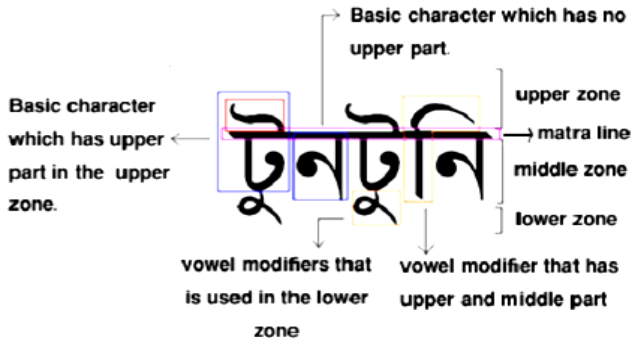

Fig 1: Dissection of Bengali word [1]

Some common properties in Bengali language are given below:

1. Writing style of Bengali is from left to right.
2. No upper and lower case in Bengali language.
3. Vowels take modified shape called modifiers or allograph [2, 4] as shown in Table 1.
4. There are approximately 253 compound characters composed of 2, 3 or 4 consonants as shown in Table 2.
5. All Bengali characters and symbols have a horizontal line at the upper part called "Matra" that remain connected with another character as in Fig 1.
6. Bengali characters contain three zones which are upper zone, middle zone and lower zone as in Fig 1 [3].
7. Some characters including some modifiers, punctuation etc. have vertical stroke. [2].
8. Most of the character has the property of intersection of two lines in different position; other has one or more corner or sharp angle [7]

In Bengali script sometimes a vowel takes a modified shape depending on the position in a word. If the first character of the word is a vowel then it retains its basic shape as in Fig 2(a). Generally a vowel followed by a consonant takes a modified shape and placed at the left or right or both or bottom of the consonant shown in Table 2.

Compounding three consonants is possible, where if the order of two consonants is changed then the compound character is also changed [1].

Table 1: Example of modified shape of vowel

Vowel	আ	ই	ঈ	উ	ঊ	ঋ	এ	ঐ	ও	ঔ
Modified shape	া	ি	ী	ু	ূ	ৃ	ে	ৈ	ো	ৌ
ক + vowel	কা	কি	কী	কু	কূ	কৃ	কে	কৈ	কো	কৌ

II. CHARACTER GROUPING

Bangla characters have some important properties based on their shape and usability. Most of the basic characters are consonants, as vowels in basic form can appear at the beginning of the word or two vowels cannot appear side by side. Important statistics on Bengali character are given below:

1. Average length of Bengali words is about six characters.

2. Compound characters are very infrequent, occurring in about 5% of the cases only.
3. In Bengali 41 characters can appear in the first position of a word. Out of these 41 characters 30 of them have headlines. Probability of getting a character with head line in the first position of a word is: p1= 30/41 and getting a character without head line in the first position is: p1=1-p1=11/41.[3]

Table 2: EXAMPLE OF COMPOUND CHARACTER

ক + ক	ক্ক	ব + ব	ব্ব
ক + ত	ক্ত	ব + দ	ব্দ
ক + ন	ক্ন	চ + ছ	চ্ছ
ক + ম	ক্ম	চ + ছ + ব	চ্ছ্ব
ক + ষ	ক্ষ	জ + জ	জ্জ
ক + ষ + ন	ক্ষ্ণ	জ + জ + ব	জ্জ্ব
ক + ষ + ম	ক্ষ্ম	জ + ঞ	জ্ঞ
ক + ল	ক্ল	ঞ + জ	ঞ্জ
ল + ক	ল্ক	ঙ + ক	ঙ্ক

4. In other positions of a word, there are mostly consonants and 28 out of 39 Bengali consonants have headlines (matraline). Probability of getting a consonant with head line for other positions in a word is: p2=28/39 and probability of getting a character without head line in other positions is: p2=1-p2=11/39. [3]

Table 3: CHARACTER GROUPING

Group's Name	Identical shape	Member									
ব	ব	ব	র	ক	ধ	ঝ	ঋ				
ত	ত	ত	অ	আ	হ	ই	ঈ				
ড	ড	ড	ড়	উ	ঊ	জ	ঙ				
য	য	য	য়	ষ	ফ	ঘ	ন	ম	থ	খ	
চ	চ	চ	ঢ়	ট	চ						
গ	গ	গ	প	ণ	শ	ল	স				
এ	এ	এ	ঐ	ঞ							
ও	ও	ও	ঔ								
Others		ছ	ঠ	দ	ভ	ৎ	ং	ঃ			
Number		০	১	২	৩	৪	৫	৬	৭	৮	৯

Characters in Bengali language are complex in many ways. Each of the character is formed using straight lines or curvature or/and compound among characters. Based on its shape the Bengali character can be grouped. Different groups of the Characters have been identified in Table 3.

Other character groupings have their own characteristics based on the identical shape of the characters.

ব – Group: one straight vertical lines joined with Matraline and two other lies are connected to this vertical line.

য – Group: one right sided vertical line is connected with another line at its end

ত – Group: one left sided vertical line connected to Matra that turns to right when closing to its base line.

In Table 3, character grouping is defined. Characters are grouped based on its identical shape.

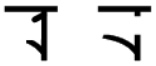

Fig 2. Error in scanned image

Since the characters are grouped based on their identical shape, group based identical shape could be used to identify characters even if the character has error or insufficient data to match with template as in Fig 2.

According to the usual OCR procedure an image file is accepted as input and then the system works as follows: images are first converted into grayscale and then to binary images, skew detection and correction, check is this file contain text or it is a photo through line detection, then Noise detection and elimination, segmentation till character level. After detecting the group, the characters will be segmented into geometrical shape and this zoning will differ from one group to another. Image scaling is not required because this procedure does not use template matching. This technique will make better decision, if any characters have missing parts or confusing noise.

III. VII. CONCLUSION

Geometrical shape and probalistic behavior of bangla character could be efficient tools to identify a bangla character. Although identical shape for compound charecters are indepent, but their probability of aperance is very few. This mulisteps Character recognition procedure will help to improve the efficiency of Bangla OCR.

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Enhancing Wind Turbine Performance by using Compressed Air

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***Abstract*—The current consumption of energy is unsustainable and humans have to change their habits to ensure a better future. We can utilize alternate renewable energy and air is one of them that is cost effective, free and pollution free. But there is not enough technology to completely depend on this renewable energy in Bangladesh. The aim of this article is to find out an efficient way to utilize the pertinent parameters that will enhance the amount of energy Produced from available air by using air compression technique.**

***Keywords*—Compressed air, wind energy, renewable power, Wind Turbine**

I. INTRODUCTION

Energy consumption world-wide has continued to rise, it is estimated that in 1900, the world consumption was around 22 exajoules (EJ) by 1960, it rose to 128 EJ in 2008, total worldwide energy consumption was 474 EJ (1 exajoules = 1×10^{18} joules). Which is equal to (474×10^{18} J) with 80 to 90 percent derived from the combustion of fossil fuels [2].

The sun is the best solution that has been shining onto the earth for 4.5 billion years, delivering 47 billion kilowatt hours (kWh) of heat and light every second. But it is quite impossible to collect all of its.

Another source of energy is wind. Due to temperature and humidity differences in the atmosphere and the rotation of the earth, 1.2 billion kWh (1.2%) are transformed into wind energy every second. Under consideration of a density of 6 MW on each square kilometer of floor area there is a worldwide technically useable potential of about 20,000 TWh per year.

Wind energy is a technique which converts the air flow into mechanical energy which is eventually converted into electricity without generating pollutants. e, "Large Wind Plant" is targeted at utility grade power generation; "One Small Turbine" is used for distributed generation for residential loads; and "Remote Community" refers to wind-diesel systems in remote communities.[3]

This wind energy is one of the best solutions for Bangladesh to face the challenges of producing electricity. Bangladesh has a 724 km long coast line and many small islands in the Bay of Bengal, where strong south-westerly trade wind and sea-breeze blow in the summer months and there is gentle north-easterly trade wind and land breeze in winter months. [1]

II. ENERGY

There are five forms of energy and there are convertible among them.

- Mechanical Energy
- Electrical Energy
- Chemical Energy
- Nuclear Energy
- Thermal Energy

Among them Mechanical energy of air are being converted into electrical energy.

This type of energy is associated with the ability to perform physical work. There are two forms in which this energy is found; namely potential energy and kinetic energy.

A. *Potential energy*

As the name implies is contained in a body due to its height above its surroundings, examples such as the gravitational energy of the water behind a dam, and the energy stored in batteries.

Potential Energy = mass x acceleration due to gravity (9.81) x height above datum

$$Ep = m \times g \times h$$

The energy produced by one kilogram of water falling from a height of 100m above ground is a potential energy, which can be calculated from equation (1) as follows:

$$Ep = 1 \times 9.81 \times 100$$

$$= 981 \text{ Joule/kg}$$

B. *Kinetic energy*

Kinetic energy is related to the movement of the body in question. Examples of KE: The flywheel effect and the energy of water flowing in a stream.

Kinetic Energy = ½ mass × velocity squared

$$Ek = ½ \times m \times v^2$$

The water stream in a river flowing at a velocity of 2 m/s has a kinetic energy of:

Kinetic Energy = ½ mass x velocity squared

$$= ½ \times 1 \times (2)^2$$

$$= 2 \text{ Joule/kg.}$$

Also this kinetic energy is the most cost effective available renewable energy.

III. ENHANCEMENT OF WIND ENERGY

In Theory, Wind power (P) is calculated by the following general equation (the proof for which will be derived in the following section):

$$P = C_p * \frac{1}{2} \rho * A * V^3$$

The value of the ideal power is limited by what is known as Betz coefficient with a value of Cp = 0.59 as the highest possible conversion efficiency possible.

In practice, most wind turbines have efficiencies well below 0.5, depending on the type, design and operational conditions.

Where,

Cp = Power coefficient
P= Density of the oncoming air
A= Swept area of the rotor
V= Velocity of the wind

In the operational output range, wind power generated increases with wind speed cubed. In other words, at a wind speed of 5 m/s, the power output is proportional with 5 cubed = 125, whereas at a wind speed of 10 m/s, the power output is proportional to 1000. This shows that doubling the speed from 5 to 10 m/s resulted in a power increase of 8 folds. This highlights the importance of location when it comes to install wind turbines. The effect of the rotor diameter affect the power output in a square manner, i.e, doubling the rotor diameter results in increasing the power output by four times.

There is another variable p, the density of air. Although the effect of density is not much enough as speed of air, but there is a scope of enhancing the performance of wind turbine. The density could be increased by compressing the available air.

This compressed will increase the air pressure on the bleeds of turbine. The pressure ratio is the same in both cases but the actual increase in pressure is much greater toward the rear of the compressor than the front. The compression ratio will increase & decrease with turbine speed. The ideal compression ratio will produce the maximum pressure.

The actual power is further reduced by two more inefficiencies, due to the gear box losses and the generator efficiency.

Fig. 1 Wind energy graph

After a saturation level the wind turbine can not increase the rate of produceing power. In this case for the saftey of wind turbine some prevention procedure could be implement to reduce the risk of accident in high speed wind.

IV. CONCLUSION

Wind energy is the reliable renewable source of energy. This architecture is suitable for a developing country like Bangladesh. The Wind energy could be enhancing by increasing the density of wind. The infrastructure of wind turbine requires some safety issue to prevent extra pressure of air.

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Portable compact solar charger for Mobile phone

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***Abstract* – Mobile phone becomes an essential part of our daily life. Mobile phone depends on battery charges like others portable electronic devices. It is a most used electronic device and running out of charge may happen at the most inconvenient time and place where no charger is available. But the solar energy is available everywhere. In this article a solar energy based direct charging system has been proposed. This system includes small pieces of solar panel and those are connected through a controller with mobile phone.**

Keywords*— *Solar charger, Portable Charger, Solar-energy, Mobile phone charger.

I. INTRODUCTION

Solar energy is radiant light and heat from the sun harnessed using a range of ever-evolving technologies such as solar heating, solar photovoltaic, solar thermal electricity, solar architecture and artificial photosynthesis [1]. However, the total solar energy absorbed by Earth's atmosphere, oceans and land masses is approximately 3,850,000 (EJ) per year. [2]

The working principle can be shown using a diagram below:-

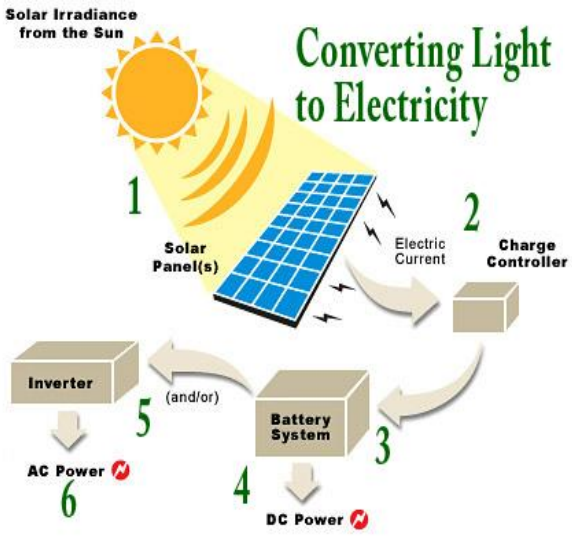

Fig. 1: Conversion of solar energy to electricity [3]

Solar Powered Mobile Charger- Solar cell phone chargers use solar panels to charge cell phone batteries. They are an alternative to conventional electrical cell phone chargers [4] and in some cases can be plugged into an electrical outlet.

And now days it is used in many parts of the world due to its cheapness instead of our traditional electricity.

II. COMPACT MOBILE CHARGER

A prototype have been built by small solar panel collected from small electronic devices like calculator that can produce about 3.0 volt, which is not adequate to charge a cell phone battery. But it requires more time than usual to charge a mobile phone.

Using some calculator's solar cells we want to build a "mobile charger" that will help us in emergency situations. These cells will be situated in the back part of a mobile phone or can be bought with a cell phone which will act as an alternative charger like a charger that a mobile company normally provides us when we buy any sets. A demo is given in the next section. For more improvements, we add more solar cells to get a charge that helps us at urgent times.

Fig. 2: Parts of solar panel

A complete solar cell is being used which consists of +ve and –ve points in both sides of the cell and with the help of thin wire, they are connected to the positive and negative terminals of the mobile phone at the back side.

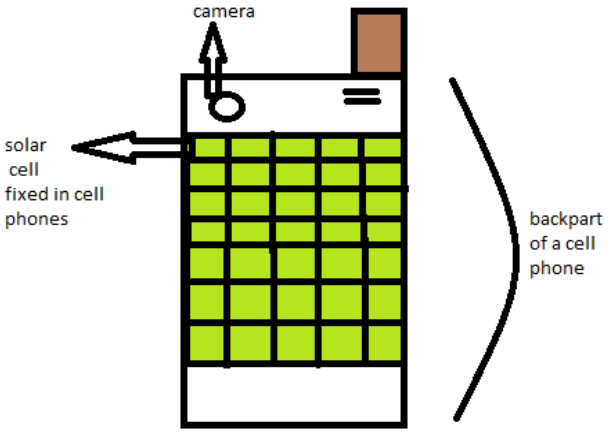

Fig. 3: Solar panel embedded mobile phone (back side)

Next, positive & negative wire that comes out from cell joined in cell battery section part of mobile phones.

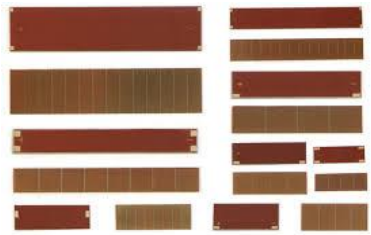

Fig. 4: Different size of Solar panels

Fig. 5: (Previous model) Prototype of compact charger

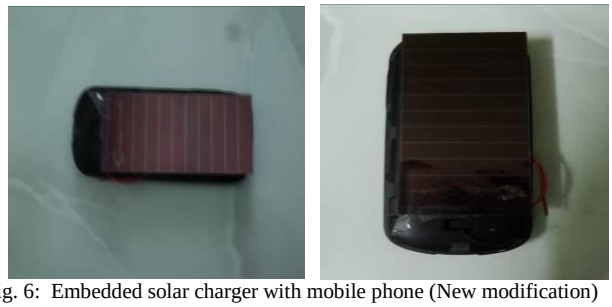

Fig. 6: Embedded solar charger with mobile phone (New modification)

III. ADVANTAGES

Advantages of this compact solar charger are –

- Help in Rural areas where electricity is not available
- Decreases dependencies on charger.
- It is environment friendly as renewable energy is used. Power consumption is less.

IV. CALCULATION

For example, 6 cells produced about 3.0 volt, which is not adequate to charge a cell phone battery. Even then, it charged a battery 1/4 of the way and it took almost 50 minutes to do so. We could use that battery for about 10 to 15 minutes.

Though the result shows a very minimum voltage output and this give me few minutes back up. But if this done with more advanced and technological way then we will get benefits that will never be lost or erased from daily life.

V. CONCLUSION

This system does not work in cloudy weather because it works on solar energy. Though the efficiency is low, it could be over come through using more powerful solar panel. This compact charger will make our digital life easier and tension free.

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A Study over education system of Bangladesh

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***Abstract*— The education system of Bangladesh consists of lack of integration, inadequate institutions and different type of stream based on religion, language, and subjects. There are eight different boards working indecently. There are three different stream of education based on language and they maintain their own curriculum. In this article the present scenario of education system and scope of improvement have been analysed.**

***Keywords*— Education system of Bangladesh, Different stream of Education, inadequate institute, Lack of Integration in Education system**

I. INTRODUCTION

The education system of Bangladesh is consists of lots of problem. But the government taking initiative through different projects to promote the education of children in Bangladesh include compulsory primary education for all, free education for girls up to grade 10, stipends for female students, a nationwide integrated education system and a food-for-education literacy movement. A large section of the country's national budget is set aside to help put these programs into action and to promote education and make it more accessible. Recent years have seen these efforts pay off and the Bangladesh education system is strides ahead of what it was only a few years ago. Lacks of integration in education system with surprizing results are scope of working with it.

II. CURRENT STRUCTURE OF EDUCATION SYSTEM

Education system of Bangladesh is divided into three major stages-primary, secondary and higher educations. Primary education is a 5-year cycle while secondary education is a 7- year one with three sub-stages: 3 years of junior secondary, 2 years of secondary and 2 years of higher secondary. The entry age for primary is 6 years. The junior, secondary and higher stages are designed for age groups 11-13, 14-15 and 16-17 years. In the general education stream, higher secondary is followed by college/university level education through the Pass/Honours Graduate Courses (4 years) in general, technical, engineering, agriculture, business studies, and medical streams requiring 4-6 years. In each of the courses of study, except for medical education, a 5- year course of study is required for the first degree. The master's Degree is of one year's duration for holders of Bachelor Degree (Honours) and two years duration for holders of (Pass) Bachelor Degree.

At all levels of schooling, students can choose to receive their education in English or Bangla. Private schools tend to make use of English-based study media while government-sponsored schools use Bangla.

Madrashas (Arabic for educational institution), functional parallel to the three major stages, have similar core courses as in the general stream (primary, secondary and post-secondary) but have additional emphasis on religious studies. Other systems include a Professional Education System. Each of these three main systems is divided into five levels:

- Primary Level (years 1 to 5)
- Junior Level (years 6 to 8)
- Secondary Level (years 9 to 10)
- Higher Secondary Level (years 11 and 12)
- Tertiary Level

Tertiary education in Bangladesh takes place at 37 governments, 80 private and 3 international universities. Students can choose to further their studies in Chartered Accountancy, engineering, technology, agriculture and medicine at a variety of universities and colleges.

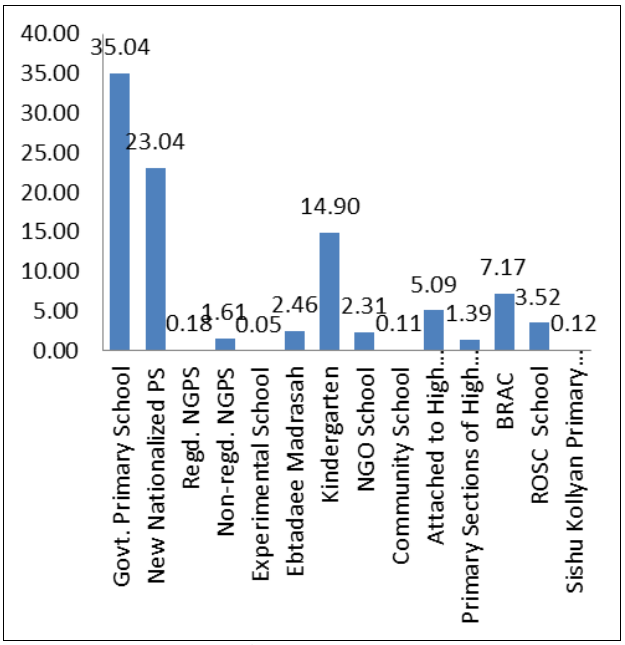

Fig. 1: Types of primary educational institute [1]

The following table contains the total number of Alia Madrasahs under each degree/certificate programme in 2013:

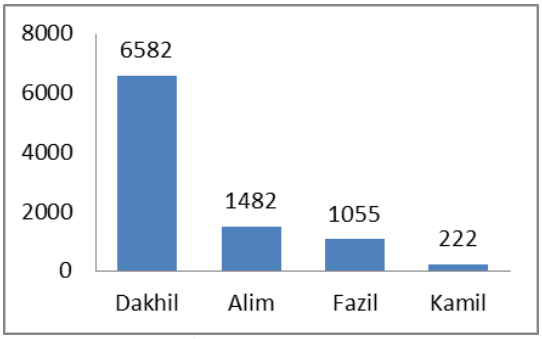

Fig2: Types of Madrasah Level Educational institutions (total 20,446, year 2014) [1, 3]

Again, students of general stream chose three different major.

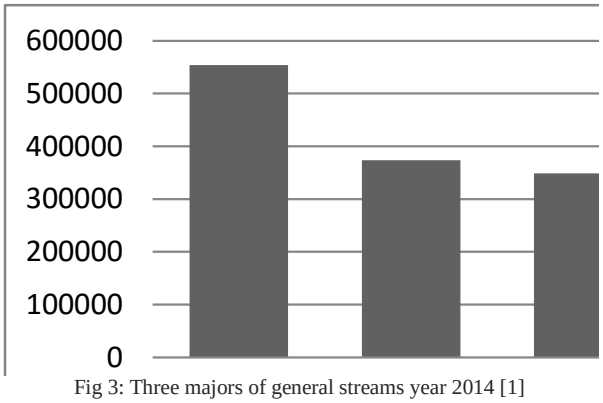

Fig 3: Three majors of general streams year 2014 [1]

All students of Bangladesh have been divided into eight independent boards. The question papers of public examination are different from others.

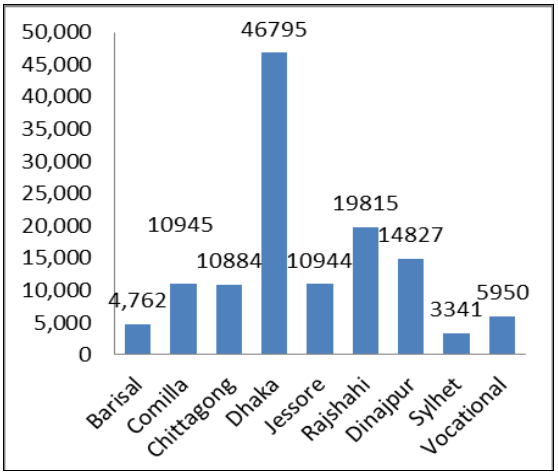

Figure 4: Eight Education Boards with students year 2014[1,2,3,4]

Among them student of Dhaka board are always performing well. Although there are so many problems exit in our education system but the result talks in different ways. Each and every year the number of student of GPA 5 is increasing. Result Comparison (2001-2014) graph are given in fig 5.

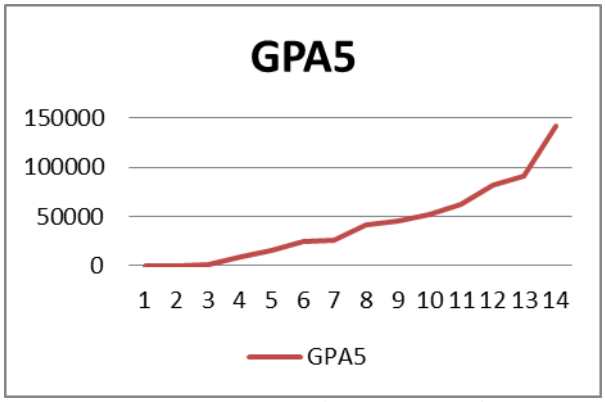

Fig 5: Result graph, number of GPA5 per year of SSC [1]

III. Conclusions

The present scenario of educational system of Bangladesh is a cause of mismanagement and lack of integration. Bangladesh is one of the most populated countries. The number of seats available in colleges is less than the number of students who wants to enrol, and the number of seats available in universities is also less than the number of students who passed the higher secondary level and want to join in a university. Besides, the cost of education is increasing day by day; as a result many students are unable to afford it. To ensure the proper and equal education the authority have to develop more infrastructure and have to design a common educational platform up to a certain age.

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Effect on Performance Characteristics of Patch Antenna for the Variation of Design Parameters

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***Abstract*— Microstrip or patch antennas are becoming increasingly useful because of several advantages compared to conventional microwave antennas and they can be printed directly onto a circuit board. This paper is dedicated to simulate a patch antenna by using the software HFSS. We study the effect on performance characteristics of rectangular patch antenna with varying design parameters. All of the design parameters in a rectangular patch antenna such as length and width of the patch, height of the dielectric substrate etc can control the properties of the antenna and radiation pattern. This paper gives a general idea of how the parameters affect performance, in order to understand the design process.**

Keywords—Microstrip Patch Antenna; Patch Antenna Design; Design Parameters; Radiation Pattern; S and Y Parameter

I. INTRODUCTION

Microstrip patch antennas are among the most common wide-beam and narrowband antenna types in use today, particularly in the popular frequency range of 1 to 6 GHz [1]. In high performance aircrafts, spacecrafts, satellites, missiles and other aerospace applications where size, weight, performance, ease of installation and aerodynamics profile are the constraints, a low or flat/conformal profile antenna may be required [2]. In recent years various types of flat profile printed antennas have been developed such as Microstrip antenna (MSA) strip line, slot antenna, cavity backed printed antenna and printed dipole antenna. When the characteristics of these antenna types are compared, the micro strip antenna is found to be more advantageous [3,4]. Microstrip antenna are conformable to planar or non planar surface, simple and inexpensive to manufacture, cost effective compatible with MMIC designs and when a particular patch shape and excitation modes are selected, they are very versatile in terms of resonant frequency, polarization, radiation patterns and impedance[5,6].

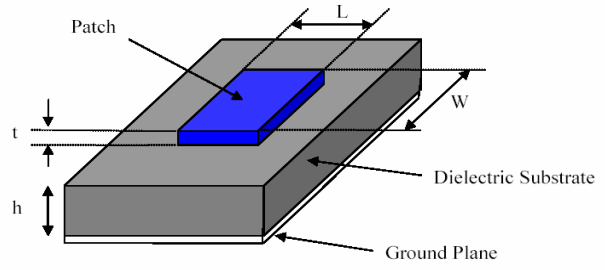


Fig.1. Model of microstrip patch antenna

Feeding in microstrip is achieved through use of coaxial line with an inner conductor that terminates on the patch. The placement of the feed is important for proper operation of the antenna [7]. A basic structural model of microstrip patch antenna is shown in Fig. 1 [8].

II. DESIGN AND GEOMETRY OF PATCH ANTENNA

A patch antenna is fabricated by etching the antenna element pattern in metal trace bonded to an insulating dielectric substrate, such as a printed circuit board, with a continuous metal layer bonded to the opposite side of the substrate which forms a ground plane. Common microstrip antenna shapes are square, rectangular, circular and elliptical, but any continuous shape is possible. Some patch antennas do not use a dielectric substrate and instead made of a metal patch mounted above a ground plane using dielectric spacers; the resulting structure is less rugged but has a wider bandwidth [9],[10]. The design parameters can be determined as follows:

A. *Width of the Patch [11]*

The width of the antenna can be determined by

$$w = \frac{c}{2 fo \sqrt{\frac{(\varepsilon_r + 1)}{2}}} \qquad (1)$$

B. *Length of the Patch[11]*

The effective dielectric constant can be obtained by

$$\varepsilon_{reff} = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2}\left[1 + 12\frac{h}{w}\right]^{-1/2} \qquad (2)$$

Where,

εeff= Effective dielectric constant; εr= Dielectric constant of substrate; h = Height of dielectric substrate; W = Width of the patch

The dimensions of the patch along its length have now been extended on each end by a distance ΔL, which is given empirically by

$$\Delta L = 0.412h\frac{(\varepsilon_{reff} + 0.3)(\frac{w}{h} + 0.264)}{(\varepsilon_{reff} - 0.258)(\frac{w}{h} + 0.8)} \qquad (3)$$

The actual length L of the patch is given as

$$L = \frac{\lambda_0}{2} - 2\Delta L \qquad (4)$$

III. Simulation and Results

All of the parameters in a rectangular patch antenna design such as length of the patch (L=dx), width of the patch (W=dy) and height of the dielectric substrate (h=dz) are control the properties of the antenna. As such, this paper gives a general idea of how the parameters affect performance, in order to understand the design process.

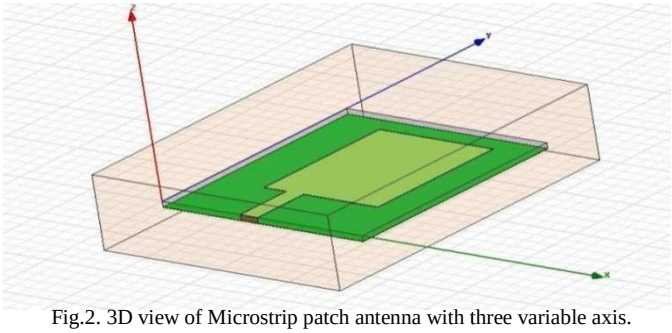


Fig.2. 3D view of Microstrip patch antenna with three variable axis.

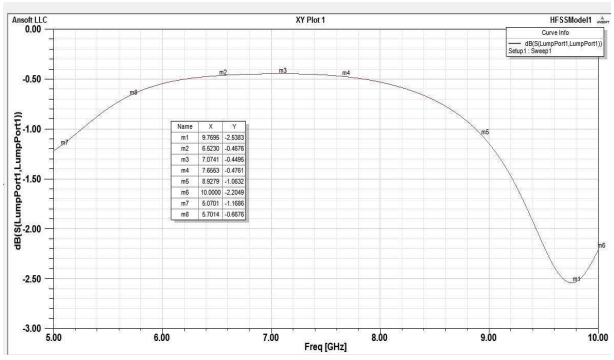
Simulation results are presented by using HFSS Software. S parameter, Y parameter, Radiation Pattern (2D results are obtained by simulation process. Now we are going to show the effect of the variation of different design parameters.

A. Effect of changing length of the patch(L=dx)

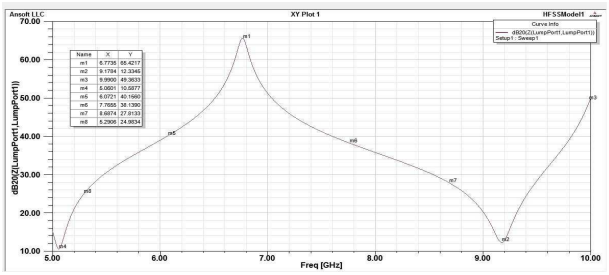
Table 1 shows the value of different designing parameters with variable dx and dy or dz are fixed.

Table I. Design Parameter Selection for Varying dx

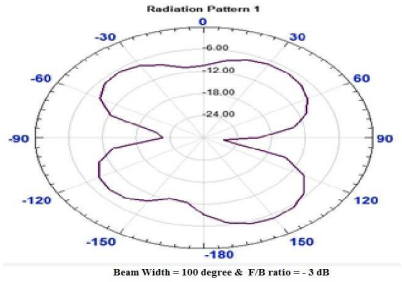
Starting Point (mm)	Full Length (mm)
x=7.025	dx= 8 ,12 and 16 (variable)
y=8	dy= 16
z=0	dz= 0.05



(a)

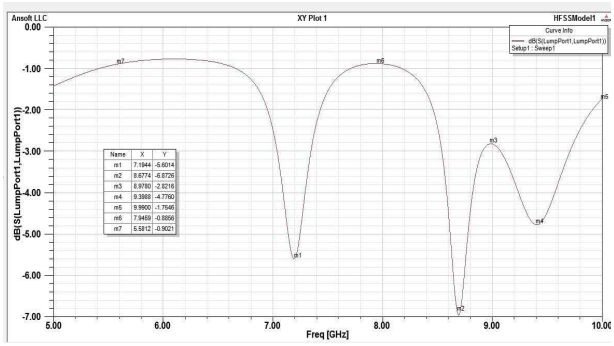


(b)

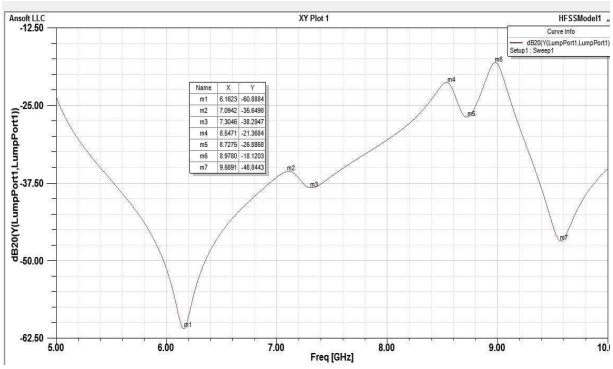


(c)

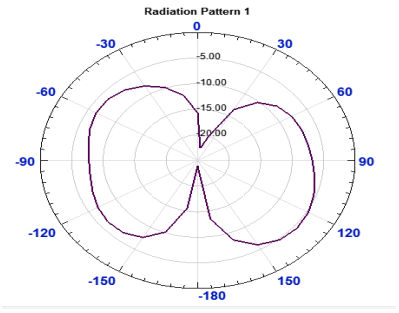
Fig. 3. Characteristics curve for dx=8mm (a) S parameter (b) Y parameter (c) Radiation pattern (2D))[Beam width=100 degree & F/B ratio= -3dB]



(a)



(b)



(c)

Fig. 4. Characteristics curve for dx=12mm (a) S parameter (b) Y parameter (c) Radiation pattern (2D))[Beam width=110 degree & F/B ratio= -2dB]

1) Comments

From the characteristic curve of S parameter shown in Fig. 3(a) and Fig. 4(a) respectively we had observed that with varying "dx" (8 mm, 12 mm and also can be shown for dx=16 mm), the antenna response point shifts around 9.8 GHz, 8.7 GHz and 5.9 GHz respectively. So it is evident that resonating frequency can be controlled by variable "dx" parameter.

From the characteristic curve of Y parameter shown in Fig. 3(b) and Fig. 4(b) respectively we had observed that with varying "dx" (8 mm, 12 mm and also can be shown for dx=16 mm), the antenna response point shifts around 9.2GHz, 6.78GHz and 6.5GHz respectively. So it is clean that resonating frequency will be decreased with increase of dx.

From the radiation pattern (2D) shown in Fig. 3(c) and Fig. 4(c) respectively we had observed that with varying "dx" " (8 mm, 12 mm and also can be shown for dx=16 mm), the beam width point shifts around 100 degree, 110 degree and 50 degree respectively. Again, the front to back ratio are -3 dB, -2 dB and -2.5dB. Also the radiation pattern (3D) slightly changes.

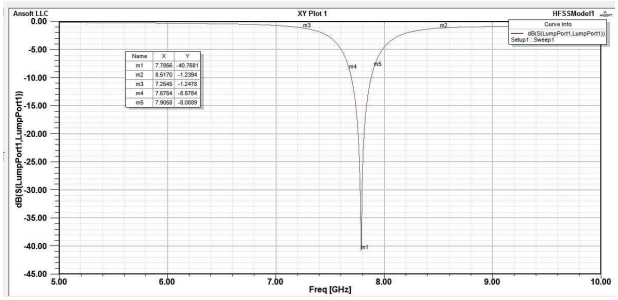
B. Effect of changing width of the patch(W=dy)

Table 2 shows the value of different designing parameters with variable dy and dx or dz are fixed.

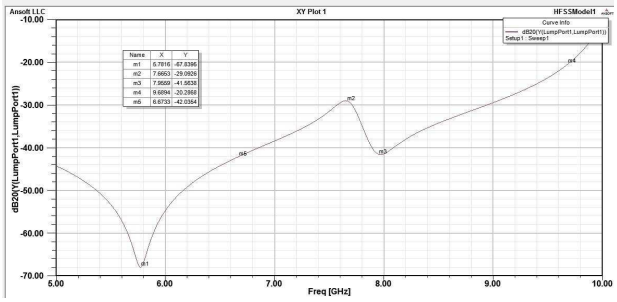
TABLE II. DESIGN PARAMETER SELECTION FOR VARYING DY

Starting Point (mm)	**Full Length (mm)**
x=7.025	dx=12.45
y=8	dy=8, 12 & 16 (variable)
z=0	dz=0.05

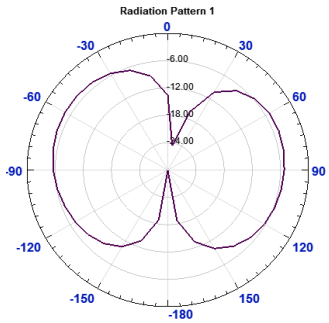
Now let us see the S parameter, Y parameter and Radiation pattern (2D) for different values of dy.



(a)

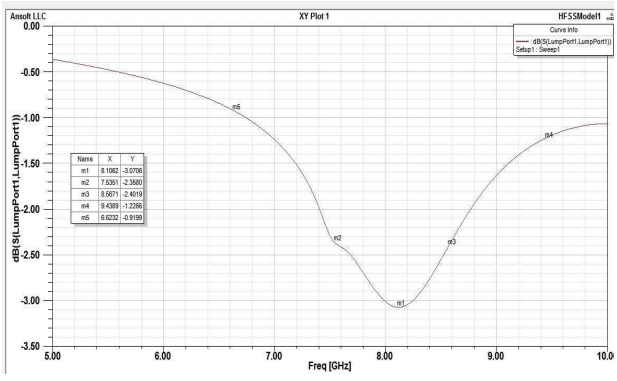


(b)

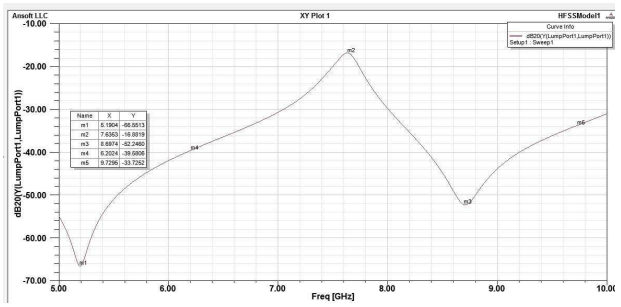


(c)

Fig. 5. Characteristics curve for dy=8 (a) S parameter (b) Y parameter (c) Radiation pattern (2D)[Beam width =96 degree & F/B ratio=-1dB]



(a)



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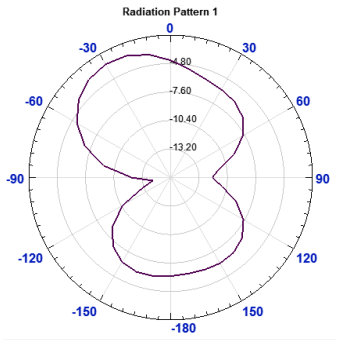


(c)

Fig. 6. Characteristics curve for dy=12 (a) S parameter (b) Y parameter (c) Radiation pattern (2D)[Beam width=135 degree & F/B ratio= -1dB]

2) Comments

From the characteristic curve of S parameter shown in Fig. 5(a) and Fig. 6(a) respectively we had observed that with varying "dy" (8mm ,12mm and also can shown for dy=16mm), the antenna response point shifts around 7.78GHz, 6GHz and 7.1GHz respectively. So it is clean that resonating frequency can be controlled by variable "dy" parameter.

From the characteristic curve of Y parameter shown in Fig. 5(b) and Fig. 6(b) respectively we had observed that with varying "dy" (8mm ,12mm and also can shown for dy=16mm), the antenna response point shifts around 5.78GHz, 6GHz and 7.1GHz respectively. So it is clean that resonating frequency will be decreased with increase of dy.

From the radiation pattern (2D) shown in Fig. 5(c) and Fig. 6(c) respectively we had observed that with varying "dy" (8mm ,12mm and also can shown for dy=16mm), the beamwidth point shifts around 85 degree, 96 degree, 135 degree and 120 degree respectively. Again, the front to back ratio are -1 dB, -1 dB and -2dB. Also the radiation pattern (3D) slightly changes.

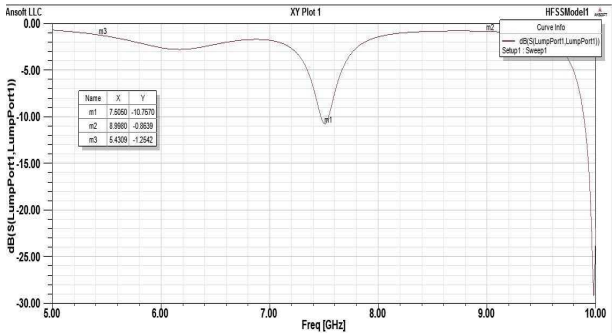
C. *Effect of changing height of the dielectric substrate(h=dz)*

Following Table 3 shows the value of different designing parameters with variable dz and dx or dy are fixed.

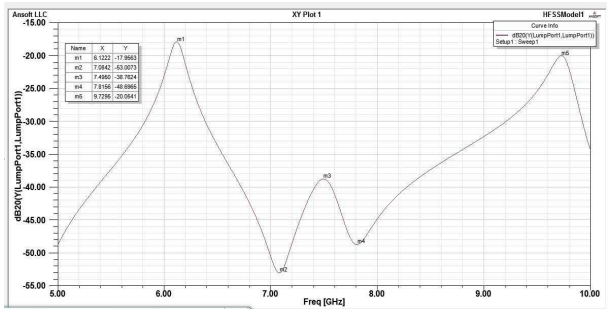
TABLE III. DESIGN PARAMETER SELECTION FOR VARYING DZ

Starting Point (mm)	**Full Length (mm)**
x=7.025	dx=12.45
y=8	dy=16
z=0	dz=0.03, 0.07 & 0.1 (variable)

Now let us see the S parameter, Y parameter and Radiation pattern (2D) for different values of dz.



(a)



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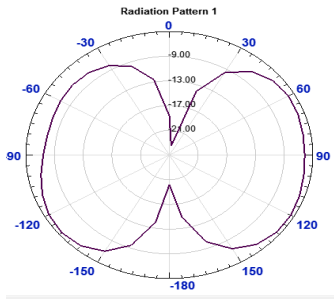
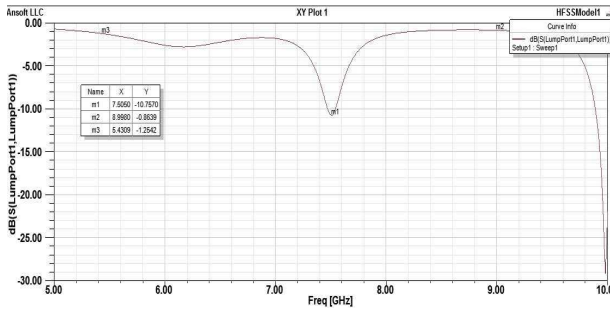
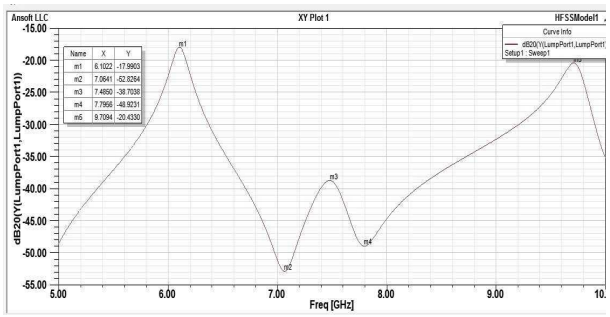


(c)

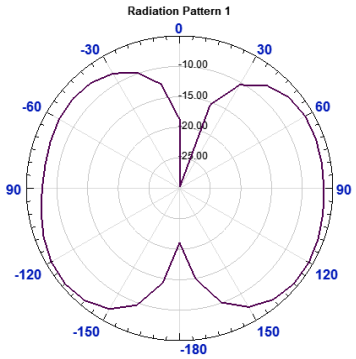
Fig. 7. Characteristics curve for dz=0.03 (a) S parameter (b) Y parameter (c) Radiation pattern (2D)[Beam width=120 degree & F/B ratio= -2.5dB]



(a)



(b)



(c)

Fig.8. Characteristics curve for dz=0.07 (a) S parameter (b) Y parameter (c) Radiation pattern (2D)[Beam width=125 degree & F/B ratio= -0.5dB]

3.3.1 Comments

From the characteristic curve of S parameter shown in Fig. 6 and Fig. 8 respectively we had observed that with varying "dz" (0.03 mm , 0.07 mm and also can be shown for dz=0.1 mm), the antenna response point shifts around 7.5 GHz, 7.1 GHz and 7.1 GHz respectively. So it is clean that resonating frequency can be controlled by variable "dz" parameter.

From the characteristic curve of Y parameter shown in Fig. 6 and Fig. 8 respectively we had observed that with varying "dz" (0.03 mm , 0.07 mm and also can be shown for dz=0.1 mm), the antenna response point shifts around 7.1GHz, 7.05GHz and 7.05GHz respectively. So it is clean that resonating frequency will be slightly decreased with increase of dz.

From the radiation pattern (2D) shown in Fig. 6 and Fig. 8 respectively we had observed that with varying "dz" (0.03 mm , 0.07 mm and also can be shown for dz=0.1 mm), the beamwidth point shifts around 120 degree, 125 degree and 125 degree respectively. Again, the front to back ratio are -2.5 dB, -0.5 dB and -0.5dB.

IV. CONCLUSION

Presented simulation includes S Parameter, Y Parameter, and Radiation Pattern (2D) of the Microstrip Patch Antenna for the different values of designing parameters. Also the performance characteristic such as resonating frequency, radiation pattern of the antenna has been investigated successfully. It can conclude that this paper has successfully showed that how the performance characteristics of a rectangular patch antenna will changes due to the changing its designing parameters such as length of the patch(L=dx), width of the patch(W=dy) and height of the dielectric substrate(h=dz) using HFSS software.

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Pattern of Bioelectric Impedance Variation with Different Frequencies on Healthy Test Subjects to Create a Standard Reference

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Abstract— **The paper proposes a standard of bioelectric impedance for healthy human subjects to compare against bioelectric impedance of abnormal body tissues found in patients with diseases like cancer. The paper is focused on the hypothesis that an abnormal tissue will show a deviation in the bioimpedance from the normal. A group of people with common ethnicity, locality & narrow age range was tested using the four electrode method of measuring bioelectric impedance. The survey was done with multiple frequencies & the results showed a certain pattern after taking into consideration all the possible errors.**

***Keywords*— Bioelectric impedance; four electrode method; statistical analysis; reference level; abnormal tissue detection**

I. INTRODUCTION

Bioimpedance is a measure of the opposition to the flow of electric current through the tissues, and a non-invasive method for measuring blood flow and body composition. Bioimpedance is relevant to the development of devices to measure cardiac output and circulating blood volume. Electrical conductivity can vary as a result of breathing so the accuracy of bioimpedance for analysing the tissue was initially questioned. But different improvements made later to the basic idea has grown it's trustworthiness.

II. ELECTRONIC MODEL OF A CELL & A TISSUE

Cells consist of a group of organelles floating in a dissolution enclosed within the plasma membrane which is made of a lipid double layer with some embedded proteins. The structure acts as a capacitor with a resistivity around 100 Ω/cm² and a capacitance of 1μF/cm².The internal fluid is an ionic dissolution hence the resistance is lower, about 100 Ω/cm. In addition, the current can flow through the external fluids; it has about 60 Ω/cm. The organic tissues are a collection of cells quite different in size and composition into an ionic salt dissolution.

A. Principles of four electrode measurement system

This method consists on applying a current (I_0)and detecting the voltage between other two different electrodes With this method, the impedance of the electrodes is eliminated from the impedance measurement. This is true as long as the electrodes have relative low impedance compared to the input impedance of the voltage detector circuit. In the case of superficial measurements, the skin impedance is also reduced, because it is in series with each electrode [1].

III. METHODS AND LIMITATIONS

A. Multi frequency bioimpedance measurement

A tissue of the body consists of cells with conducting contents surrounded by insulating membranes embedded in a conducting medium. Inside and outside of the cell is conducting fluid. At low frequencies of applied current, the current cannot pass through the membranes and conduction is through the extracellular space. At high frequencies current can pass through the membranes which act as capacitors. For frequencies from around 100 KHz to several MHz there are large changes in dielectric properties associated with the resistive nature of the cell membranes. At high frequencies it is possible to differentiate between narcotic tissue and healthy tissue because of their different electrical characteristics.

B. Electrical Impedance spectroscopy (EIS)

Electrical Impedance Spectroscopy is used for the characterization of healthy and pathological tissues based on spectrum of their electrical properties. The most suitable technique for EIS is to use four electrodes, where current flows between two outer electrodes (stimulating electrodes) and potential differences are measured between two inner electrodes (measuring electrodes). This reduces effects of electrode impedance and electrode polarization [2, 3]. This is important when using grids of small electrodes (microelectrodes or microelectrode arrays).

C. Parameters affecting bioelectrical impedance analysis (BIA)

The changes in body fat and water balance will reflect on tissue impedance. Cell and tissue death also cause many

irreversible changes including viscosity of the extracellular and intracellular fluids which promotes changes in the mobility and distribution of ions which have the ability to transport the current [4].If the blood flow is interrupted, metabolism could continue in an anaerobic manner. Therefore, BIA when applied in such conditions shows a false increase in the tissue impedance [5].

D. Results

The graphical representations of the experimental data are given below.

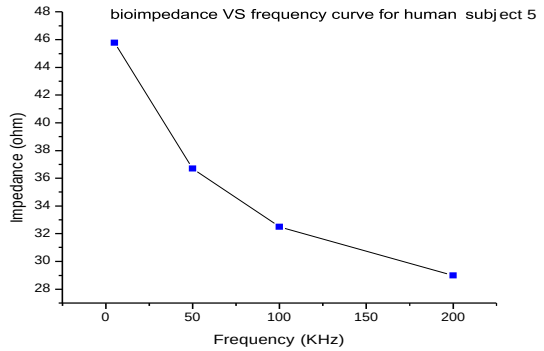

Fig. 1.Variation of Bioimpedance as a function of frequency for a human subject.

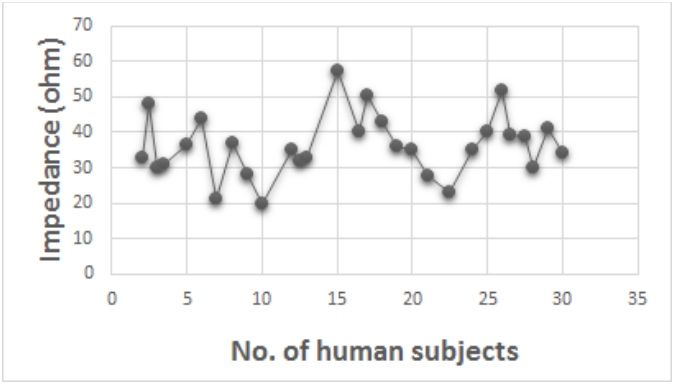

Fig. 2.Variation of the Bioimpedance at a frequency 50KHz for different human subjects.

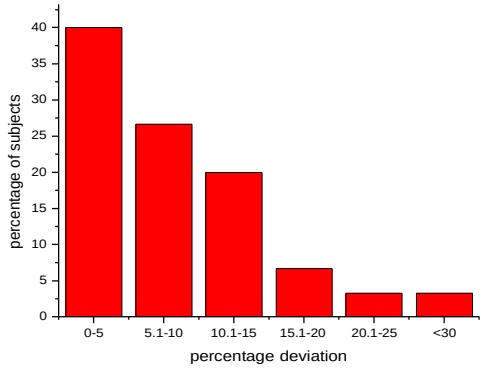

Fig. 3.Variation of the percentage deviation in case of percentage of subjects

E. Analysis

For this work, bioimpedance data are collected from 30 normal healthy human subjects with age varying between 22 years to 27 years, height varying from 5' to 5'8" and weight varying from 47kg to 82kg. The bioimpedance data for different subjects has been measured at frequencies 5 KHz, 50 KHz, 100 KHz and 200 KHz. At frequency 5 KHz bioimpedance varies from 23.6 ohm to 66.7 ohm, at 50 KHz from 19.8 ohm to 50.7 ohm, at 100 KHz from 18.2 ohm to 43.8 ohm and at 200 KHz from 16.6 ohm to 38.6 ohm. This variation of the bioimpedance is due to the bio-chemical composition in the cells. At any fixed frequency, it is observed that the bio impedance varies from one subject to another in a wide spectrum so no particular assumption can be made.

The bioimpedance versus frequency curve for all 30 test subjects was found to decay with increase of frequency. This decay as presented in the figure 4.1. is found in all the human subjects. This fall of bioimpedance as the frequency increases can be explained as the effective capacitive reactance of the cell membranes changes as the frequency changes.

The ratio of two bioimpedances (Z_r) for 5 KHz and 200 KHz are found to be in the range of 1.4 to 2.1(average 1.56) for the 30 subjects that have considered for this research work. The percentage deviation of the (Z_r)from the average value is calculated for all 30 subjects. It is found that 40% subjects among the 30 subjects is in the range of 0-5% and the (Z_r) value for the majority cases falls within a short deviation of the bioimpedances. So a measure of (Z_r) might indicate the characteristics change in the tissues or cells that is normal and diseased tissues or cells.

IV. Conclusions

The collected data can also be used as a reference as the central limit theorem of sampling allows for the sample mean to become a good approximate of the population mean with large sample frequency (at least 30). But the data is only for a narrow age range so further calibration is needed. Also this data is for a particular locality & ethnicity. Also, damaged cells such as those of a cancer patient were not tested in this paper because of unavailability of scope to carry out the test. If the method is well calibrated it can become a good tool in early cancer detection

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A robotic system to uncover unreachable place visually and to sense the safety

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***Abstract*— A robotic system is developed which can be sent anywhere impossible for human like narrow dark area, underground and so on to know the present condition by seeing. Besides it can detect any dangerous gas which can lead to severe explosion. This robot can be controlled using Bluetooth.**

***Keywords*— Bluetooth, Visualization, Gas leakage, Server computer, Safety.**

I. INTRODUCTION

This robot is actually a vehicle robot consist of gas sensor, motor, wheel, motor driver, pic microcontroller and Bluetooth module. Besides a mobile phone having camera is placed on it which is controlled by a servo motor. The servo motor is attached with arduino uno.An application installed in the mobile phone can send the real time video to a server computer within specific range.

This paper represents four sections where section2 delineates about the parts of the robotic system individually, section3 introduces the working procedure,section4 shows details about programming and in section5 the conclusion is illustrated.

II. OVERVIEW OF DIFFERENT MODULES

II.A ARDUINO UNO

This is an integrated circuit which consists of microcontroller, analog, digital and power distribution pins. When arduino [1] board is powered up, light on the board starts shining. This board has power rating of 7-12v i.e. it is operated with 9v battery. There is having a microcontroller(Atmega328p) on the board where the program is stored to operate the several parts of the robot. The program must be written in the ARDUINO IDE and sent in microcontroller using the usb cable. Pin 9 was attached with servo motor and the motor rotate with in 90 Degree.

II.B BLUETOOTH MODULE

Bluetooth module is used to ensure the communication between robot and the user. Here HC-06 [2] bluetooth module was used. It is powered with 3.3V. It may get damaged if it is connected with 5V for long time. It is easily understood whether the module is connected with controller device or not simply seeing the application or light on the module. It has 4 pins named RXD, TXD, VCC , GND. 'RXD' is used to receive data sent from mobile where 'TXD' is used to transfer data. Here the 'TXD' pin was connected with 26th pin of the PIC16F877A.

II.C MOTOR DRIVER

Its importance is to control the motor rotation. L293D [3][4] motor driver was used in this robotic system which has 16 pins and using those only two motors can be driven. If the enable1 pin is connected with 5v,it enables the left side of this driver to work. But for the activation of the right side, enable2 must be connected with 5v as well. It has four input pins connected with microcontroller and four output pins connected with two motors. Here 6V was used for vs a port used for motor power and 5V at vss port for driver IC. The four input pins were connected with port D0,D1,D2 and D3 of the microcontroller.

II.D MICROCONTROLLER

Microcontroller is the brain of this robot. PIC16F877A [5][6] was used as microcontroller which has 40 pins and is operated with 5V. Three things must be ensured to keep the microcontroller working good. One of them is to put reset button. Secondly connecting the power and ground pin and finally use the crystal. Here 20MHz crystal was used. The A0 pin was used as ADC(Analog to Digital Conversion) to read the sensor value.

II.E GAS SENSOR

Gas sensor can sense the dangerous gas leakage. Here MQ-06 [7] was used which consists of four pins namely A0, D0, VCC and GND. As VCC, 5v was used and A0 pin was attached with A0 pin of the microcontroller. In programming a reference value was mentioned and if the current value exceeds the reference value the microcontroller will notify just by using a LED light though anything can be used instead of light like buzzer or anything else so that user can get idea regarding this.

II.F MOTOR AND WHEEL

Two 3V-6V motors were used in this robot. Each motor has two pins connected with motor driver. According to power supply the motor can be rotated clockwise and anticlockwise. Two wheels were attached with those motors and a castor wheel was placed in front of the robot.

III. OPERATIONAL SCHEME

The mobile phone with required application continuously sends the real time video to the server computer. Watching the video on the computer the user can operate the robot. The robot is operated using three conditions.

Firstly, the servo motor will be moving within 90 Degree using 8 seconds to allow the user to watch the front view.

Secondly, It will be continuously searching for the command from user and if gets any then will go for the task. For doing this some character type number were mentioned according to ASCII(American Standard Code for Information Interchange) table like '0' for going ahead, '1' for moving left, '2' for moving right, '3' for turning backward and '4' to stop.

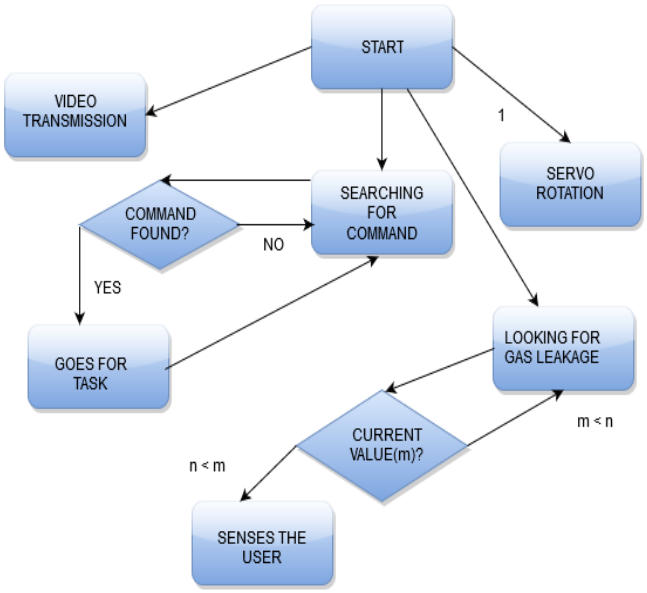

Fig. 1 Algorithm used in this robot

Thirdly, The gas sensor will be searching for dangerous gas. If the microcontroller detects the sensor value more than the reference value then the microcontroller will light a LED to sense the user about the presence of dangerous gas.

IV. Programming

Mikro C [8] a software was used to write the code. Before writing the code the microcontroller and the frequency have to be mentioned first. Besides same chip and crystal have to be used in hardware otherwise the code will not be working. When writing of the code is completed another software is needed to upload the program to the chip using microcontroller programmer[9] or microcontroller burner. The job of the compiler is to convert the code into machine language so that in can be understood by the microcontroller. Besides it stores the data in a hex file. The programmer software feeds the hex file into microcontroller memory. The burner software was used here was PICKIT 2 [10] and was connected with microcontroller burner using USB port. Besides for arduino an ardino IDE was used to write the program and the program was uploaded using same software and an USB cable was used to connect the arduino uno with the computer.

V. Conclusion

In this study study it was demonstrated how robot can come in our favour for critical work. This sort of robot can be preferable due to having less cost and having better advantages. Now another study is going on to ensure the robot controlling from long distance without limit. Some others modifications can be

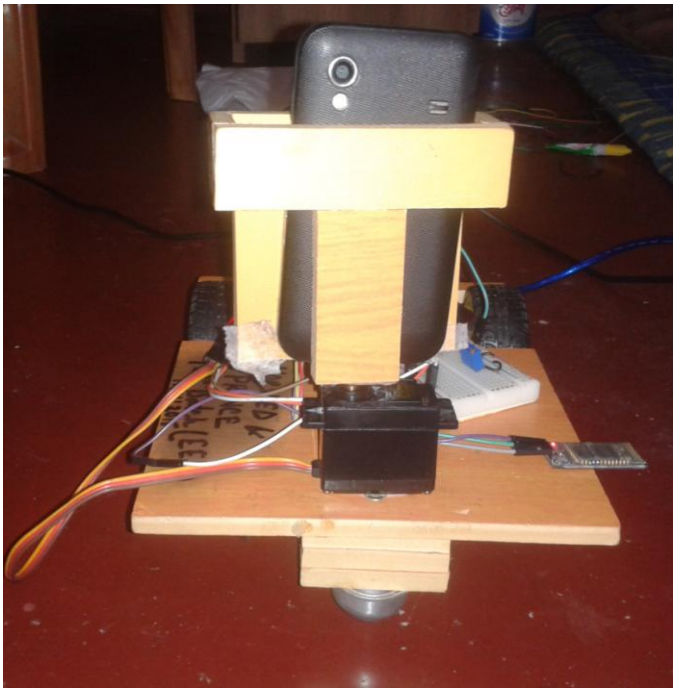

Fig. 2 Prototype of the robot

made like addition of robotic hand, excavator and so on to make it more powerful and useful.

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MONITORING SEA SURFACE TEMPERATURE ANOMALY IN THE COASTAL BELT OF BANGLADESH

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***Abstract*— This paper tries to detect sea surface temperature (SST) at the coastal belt of Bangladesh using satellite or airborne remote sensing techniques. Overall average surface temperature of the globe is increasing and the ocean is absorbing an extensive portion of it. This is causing increase in the water surface temperature or overall water temperature, swelling up of the water, damage to the marine biodiversity and surrounding ecosystems etc. So visualization of sea surface temperature and its spatial variations might help the decision makers to integrate such issues in development policies. This paper presents the data, methods for atmospheric correction, sea surface temperature (SST) and environmental change detection. The freely available recent Landsat 5 and Landsat 8 imagery of the year 1989 and 2014 from United States of Geological Survey (USGS) website helped to monitor these changes of SST at different locations.**

***Keywords*— coastal belt, Remote-Sensing, Sea surface Temperature, Ecosystem.**

I. INTRODUCTION

Climate change the 'wicked problem' is continually imposing significant threat to the nature as a whole, according to the recent projections [1]. Small changes can greatly impact the sea bathymetry, destroy coral biodiversity and hamper natural ecosystems [2]. Different research shows that increase in the CO_2 emissions hampering the overall climatic conditions. About 25% of the CO_2 is absorbed by the ocean in the form of H_2CO_3 ($CO_2+H_2O = H_2CO_3$) increasing the oceanic acidification. Moreover the surface temperature is also in the rise. It has greater impacts on cyclones, swelling up of water, polar caps melting and sea level rise [3]. Before the 1980s the measurement practice of the SST using ships, buoys such time consuming methods but after that period most of the information about global SST has come from satellite observations.

Several satellites monitoring the earth can provide thermal information about the oceanic conditions. Thematic mapper and enhanced thematic mapper onboard the Landsat, Advanced very high resolution radiometer (AVHRR) onboard the National Oceanic and Atmospheric Administration (NOAA) and advanced space borne thermal emission and reflection radiometer onboard the Terra satellite are very effective for monitoring thermal patterns in the coastal oceans [4]. This study tries to delineate changes in the sea surface temperature at the coastal area of Chittagong, Bangladesh. This study initiates the cheapest level freely available data on the process of determining SST.

II. METHODS

Landsat 5 image and Landsat 8 imagery of the year 1989 and 2014 from USGS helped to monitor these changes of SST at different locations. The data was validated with ground data and incorporating ground truthing data to the system. Initially the collected image of the location has to be checked and georectified. The projection system used is the Bangladesh Transverse Mercator (BTM). The images are checked to be Zero cloud cover and the initial atmospheric correction is necessary. The image processing contains conversion of digital number values of the image to the pixel wise radiance values. Later on the dark subtract processing is done to avoid scattering problems of the pixels of the images. Then the band wise mathematical calculations are processed in the band-math tool of ENVI 4.7 software to derive temperature values at different water surface locations based on the reflectivity. The necessary value for the equations is derived from the metadata of the image. The resulted temperature is compared with NASA derived worldwide sea surface temperature and the field observations.

DN – Radiance: L_λ= MLQCAL + AL; L_λ= TOA Spectral Radiance, ML = Band specific multiplicative rescaling factor, AL = Band Specific additive rescaling factor, QCAL = Standard Product Pixel Value (DN)

Conversion to At-Satellite Brightness Temperature (Kelvin): T = K2/ ln ((K1/ L_λ) + 1); T= At-satellite brightness temperature (K),L_λ= TOA spectral radiance (Watts/(m2 * srad * μm)), K1= Band-specific thermal conversion constant from the metadata K2= Band-specific thermal conversion constant from the metadata [5].

C = T-273.15; C = Temperature in Celcious, T = Temperature in Kelvin [6].

III. FINDINGS AND ARGUMENT

The analysis on the 1990s image of the Chittagong coast area shows the result is biased due to the environmental scattering. Some pixel values resulted in unrealistic results. The temperature varies in between 20.52 to 35.041 degree celcious or above at different locations. Moreover the Landsat 5 TM with its thermal band 6 is more capable of calibrating the land surface temperature with its wide range of wave length value varying between 10.40-12.50 µm. It results in unrealistic classifications through macro level of analysis through incorporation of larger wavelengths to the analysis. However the analysis results shows that the natural tendency through temperature calibrating using a Landsat image the temperature values rises nearer the shore area and decreases with the distance.

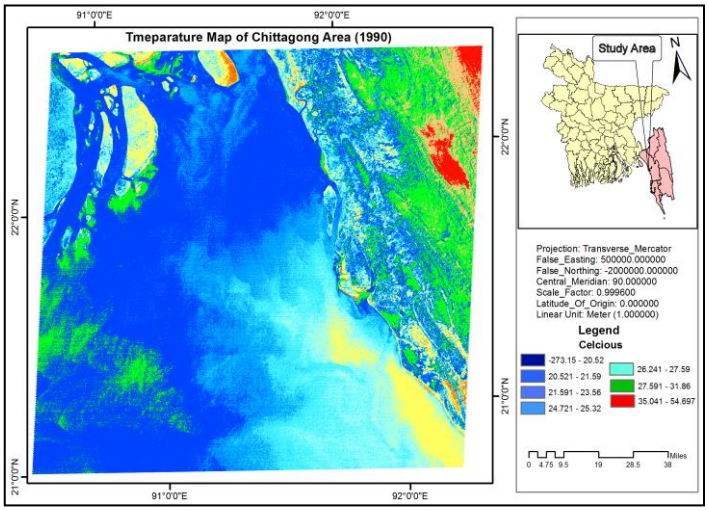

Fig. 1: Derived Temperature Map of Chittagong Coast (1990).

On the other hand the analysis using Landsat 8 image with the thermal band 10 resulted in greater accuracy. Band 10 of the Landsat 8 consists of wavelength of 10.60 – 11.19 µm focuses at more micro level analysis and results in a good SST derivation. The near-shore area surface temperature varies within 25.321 – 26.24 degree celcious and the temperature of the water surface drops with the increasing distance. The distribution of SST varies of location. Higher the surface temperature at the location near the shoreline compared to location farther. Distribution of higher temperature contributed by suspended sediment and residential area. Figure 2 shows the SST distribution over study area. The result was compared with theoretically idea of the typical SST and water depth of the since the absent of ground measurement data.

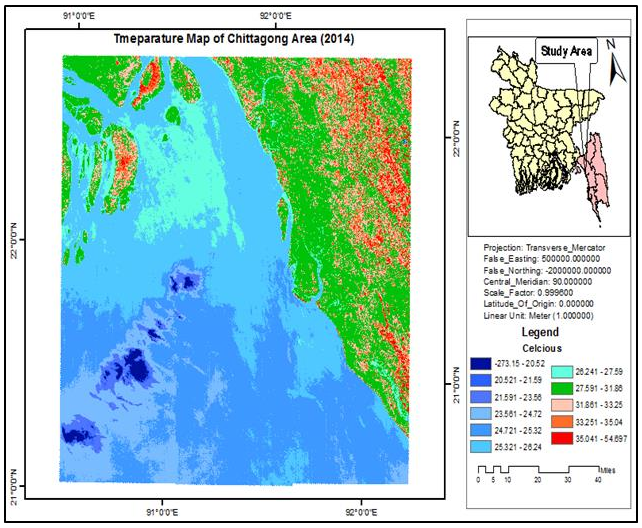

Fig. 2: Calibrated Temperature Map of the year 2014 of Chittagong Coastal Area.

IV. CONCLUSIONS

Satellite measurements are time efficient and helps quick decision making. Through rapid analysis and monitoring real time decision making is possible. SST is related with morphological dynamics and the coastal ecosystem. The coastal area maintains a complex and dynamic relations in combination with marine and human ecosystems. So, little changes in the temperature variation determination with the cheapest methodological approaches and data can help policy makers. Further studies with this methodological approach will look forward to determine changes in the chlorophyll contents, sea bathymetry dynamics etc.

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Base –Width Modulation of AlGaN/GaN Heterojunction Bipolar Transistors

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***Abstract*- The effect of base-width modulation is analyzed using an enhanced drift-diffusion model and GaN/AlGaN material parameters, which are previously verified. For this material the emitter-base diode turn on voltage must be greater than 2.7 V. The neutral base-width X_B is a function C-B voltage which is varied by varying the C-B voltage changes from 2 to 70 volt.The change in neutral width effects the collector current. . The effects of base width variation on transistor performance presented in this work.**

***Keywords*-Base-width modulation, Increased current density, Higher performance.**

I. INTRODUCTION

For the last couple of years, the III-V semiconductor nitride system has been viewed as highly promising for semiconductor device application. Increasing development of commercial communication system creates a need for high performance devices. Thousand of engineers and scientists have been made significant contributions for this development. The idea of modulating the width of the base has come forward from that thought.

In a transistor (in active region) the emitter-base junction is in forward bias and the collector-base junction is always in reverse bias condition. If the reverse bias voltage is increased, the space charge width increases. There is no effect of the forward bias voltage in the thickness of the space charge width. As the base is lightly doped compared to the collector the depletion region penetrates deeper into the base region. This reduces the effective width of the base. This variation is known as the **Base-Width Modulation** or **Early-Effect.** This modulation has mainly three effects-

1. Reduction of the recombination factor in the base region, which increases the current density with increasing collector base voltage (V_{CB}).
2. The increase in the concentration gradient of the minority carrier, which increases the emitter current.
3. The effective base width may be reduced to zero for extremely large collector base voltage, causing the voltage breakdown. This effect is known as **Punch through Effect.**

By varying the collector base voltage, the changes in the neutral base-width and its effect in the collector current have been analyzed here.

II. METHODS

The characteristics of the predicted device strongly depend on the material properties. For that reason the values of GaN/AlGaN parameters were selected to be consistent with the experimentally investigated material and device properties, rather than assumed values.

The cross-section of a device that has been used in this experiment is presented in Fig.1.

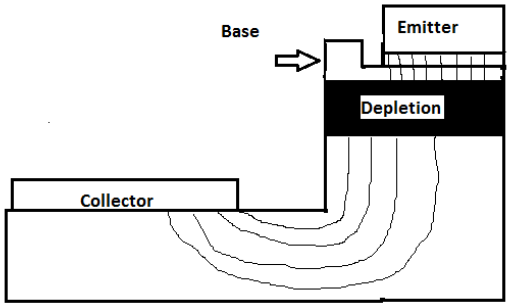

Fig. 1 Cross section of Simulated AlGaN/GaN [1]

The nominal design of the ALGaN/GaNhas three basic layers[1]. Layer specifications are presented in table.1.

TABLE 1
Layer Specifications

No.	Layer Name	Material	Layer Size (A^0)	Layer Types	Concentration (cm^{-3})
1	Emitter cap	$Al_{0.2}Ga_{0.8}N$	1000	N type	10^{19}
2	Base	GaN	900	P type	2×10^{18}
3	Collector	GaN	5000	N type	5×10^{16}

Following equations[2] are used to change space charge width with increasing collector-base voltage.

$$\mathbf{X_{dB}=\{2\in(V_{bi}+V_{CB})/e\ [(N_c/N_B)\times1/(N_C+N_B)]\}^{1/2}}$$

$$\mathbf{V_{bi}=KT/e\ \ln[N_BN_C/\ n_i^2]}$$

Here we have taken the following values:

$K=1.38\times10^{-23}$ J/K

$n_i= 1.9\times10^{-10}cm^{-3}$[3]

$e=1.6\times10^{-19}$ coulomb

From the above equation the calculated value of $V_{bi}$is 3.12V.

Now,

$$\mathbf{X_B=X_M-X_{dB}}$$

Here,X_B=Neutral Base-width

X_M=Metallurgical width

X_{dB}=Depletion region width

$$\mathbf{Jc=\{(eD_Bn_{Bo})/X_B\}\ *exp(eV_{BE}/KT)}$$

J_C=current density

$\mathbf{D_B=KT\mu/e}$; μ=electron mobility =800 $cm^2/V/s$ [1]

III. Findings

By using matlab we plot two graphs.-(Vcb vs Xb) and(Jc vs Vcb).The value of Vcb is changed (from 2 to 70 volts).As a result the value of Xb is decreased.The following figure illustrate the result of the experiment

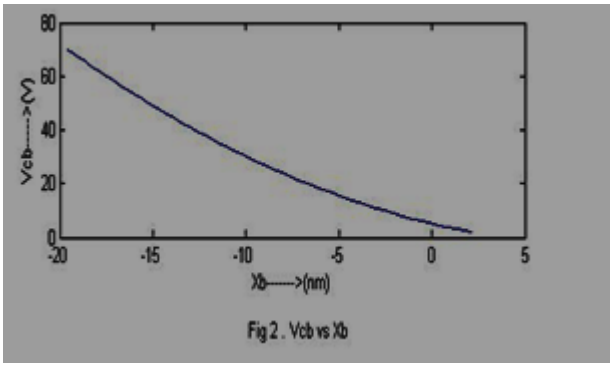

Fig 2 . Vcb vs Xb

From the figure it's clear that neutral base width decreases with the increasing reverse bias voltage.

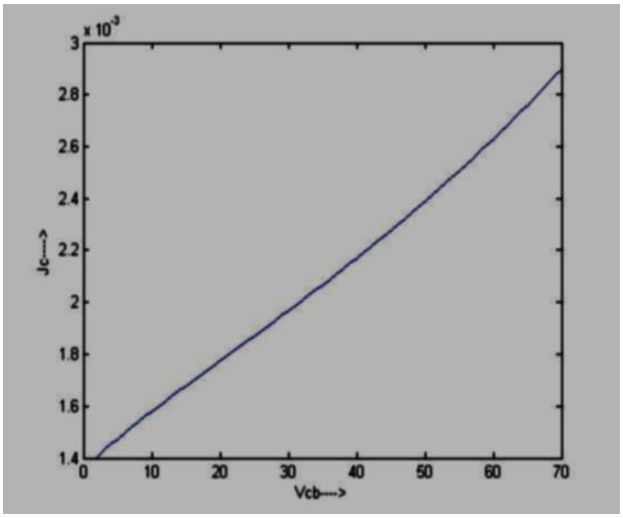

Fig. 3 Jc vs Vcb

IV. Conclusions

In this work The performance of HBT is studied in which the width of the base has been modulated, though the reduction in Xb is very small(in the nm range) ,atleast it's clear to us that base width modulation has a great impact on device performance[4].Reduction in neutral base width produces an increase in current density sggesting that this AlGaN/GaN can be sed at high voltage.

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High Electron Mobility Transistor Concept and I-V Characteristics: A Simulation Based Study

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***Abstract*—The growth of integrated circuit device density has been astounding which is the *raison d'etre* of advanced semiconductor devices. With the decreasing size of transistors, need for new technologies that can supplant or integrate with the currently dominating CMOS technology is increasing. This quest for more efficient device prompted us to explore the concept of high electron mobility transistor and the prime objective of this paper is to study the structure and basic operation and I-V characteristics of AlGaN/GaN based HEMT. MATLAB simulation has been used to investigate the I-V graph of this device.**

***Keywords*—HEMT, 2DEG, I_{DS}-V_{DS} graph, AlGaN/GaN. MATLAB**

I. INTRODUCTION

The exclusive aspect of HEMT is its heterojunction under the gate in which carriers diffuse from doped wide band gap material to the undoped narrow band gap material [2],[5]. This phenomenon is known as modulation doping. HEMT is a field effect transistor which reduces the ionized impurity scattering by confining the charge carriers in an undoped quantum well, and thus offers increased mobility and improved device performance [1]. Mobility enhancement phenomenon in heterostructure reported by Dingle *et al.* [3] paved the way to the first demonstration of HEMT by Takashi Mimura *et al* [4]. AlGaN/GaN based HEMT offers some unique and interesting features which are promising but it is still in the embryonic stage with some challenges to overcome. So a thorough understanding is the prerequisite to make further progress in this field. Conventional charge control model has been considered to simulate the I_{DS} *vs.* V_{DS} graph in MATLAB.

II. STRUCTURE

Fig. 1 shows a schematic diagram of an AlGaN/GaN based HEMT.

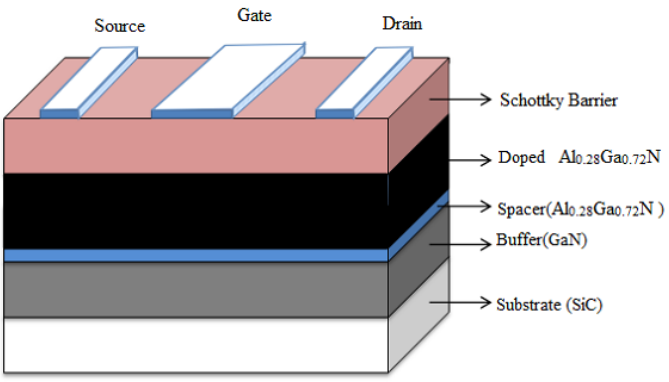

Fig. 1 A typical cross section of HEMT.

An interesting attribute apart from modulation doping is the formation of 2DEG (Two Dimensional Electron Gas) mainly due to spontaneous and piezoelectric polarization resulting in higher current capability [2]. During the formation of a heterostructure between two materials with different band gaps (E_g), permittivity (ϵ), work functions ($q\phi_S$) energy bands bend to align the Fermi level. A discontinuity in conduction band and valance band forms a quantum well and 2DEG is created illustrated in the figure 2 [6]. This existence of 2DEG can be confirmed by Hall-effect measurement.

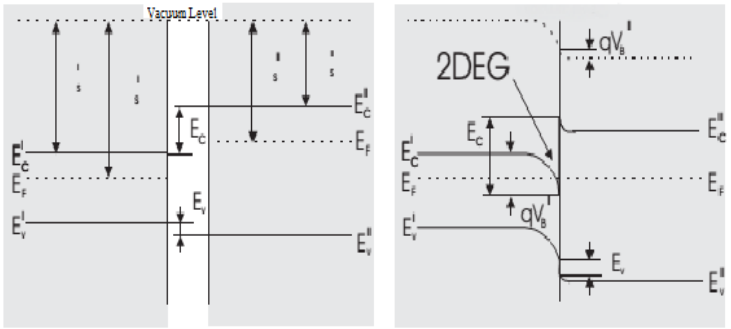

Fig. 2 Energy band diagram and formation of quantum well. [6]

In our work we used a $Al_{0.28}Ga_{0.72}N$/ GaN material model system, in which 3µm GaN buffer layer is considered on SiC substrate which is followed by a 10 nm $Al_{0.28}Ga_{0.72}N$ spacer layer and doped $Al_{0.28}Ga_{0.72}N$,with a concentration of 5×10^{18} cm^{-3}. Ti/Al/Ni/Au multilayer ohmic contact and Ni/Au

schottky contact is considered. These values are taken from the reference [7].

III. RESULTS

Fig. 3 shows the simulated I_{DS} vs. V_{DS} curve of the AlGaN/GaN system. It is observed that, current is substantially large in a HEMT.

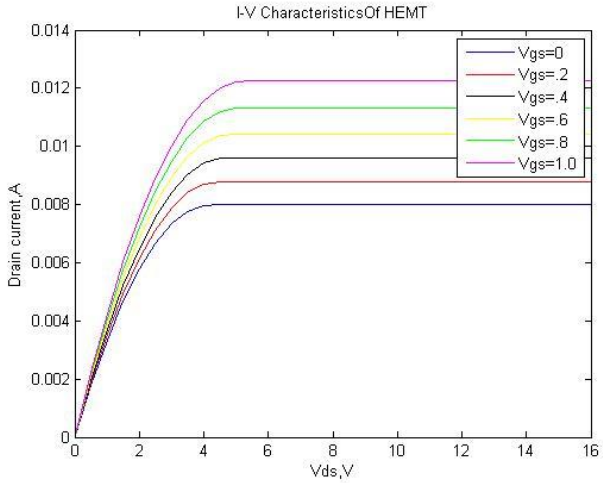

Fig. 3 MATLAB Simulation of I-V characteristics of HEMT. The parameters used to generate this plot are, constant mobility = 1520 cm^2/V, gate length $L=10^{-4}$ cm, width $W=2\times10^{-4}$ cm.

Conclusions

In this work we simulated the I-V characteristics of HEMT. A lot of parameters were kept constant to avoid complications in the calculation. But even so, it can be found that, the current is larger than that of a MOSFET, or JFET etc. If the cost scaling and other challenges can be overcome then we might expect HEMT to dominate in the specialized applications where speed, high frequency on the order of 100 GHz and beyond are critical.

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