Hand Geometry Based Person Verification System

Md. Khaliluzzaman*, Md. Mahiuddin and Md. Monirul Islam

Dept. of Computer Science and Engineering
International Islamic University Chittagong (IIUC)
Chittagong – 4318, Bangladesh
E-mail: *khalilcse021@gmail.com, mmuict@gmail.com, monirliton@yahoo.com

Abstract— Hand geometry which is the famous biometrics system is utilized in the various identification systems with different feature estimation methods. Hand geometry plays a vital rule in the biometric authentication and security application. For this regard, this paper presents a biometric system for the person verification based on the hand geometric features. The hand geometric features are extracted from the upper palm including four fingers of the right hand. The main aim of this proposed system is to reduce the feature and database size and improve the performance of the system. For that, initially, top four fingertip points and two corner valley points from the right hand four fingers are estimated. After that, eight distance edges from these fingertip and valley points are computed. From these eight distance edges, three triangles are estimated. These three triangle area are used as a three feature and stored in the database as the feature vector. Finally, the test candidate hand feature is compared with the predefine database feature vector through the Euclidian distance metric. The proposed verification system is tested with the own dataset size of 250 user's images i.e., 1250 hand images and results show the momentous improvement with compare to the existing state of the art.

Keywords—verification system; hand geometric feature; fingertip points; Euclidean distance

I. INTRODUCTION

In the current decades, person verification system is growing needs in the network society. For this regard, biometric system plays a great role in the field of network society and human system interaction. Biometric system works based on behavioral or physiological characteristics. Person verification system based on biometric is divided into two categories i.e., identification and verification [1]. The biometric system is fluently used in the field of immigration, criminal investigation, and border control. To indentify a person uniquely through the biometric system, some unique, distinguishable, and non-intrusiveness biometric data such as human traits are desirable. Some human traits are hand geometry, voice and face recognition, palm print, iris recognition, fingerprint etc [2-3]. As the special illumination setup is required for maximum of the traits, for low cost and easily access the hand geometry image is used for person verification. Hand geometry is basically used the physical property of user's hand and fingers to uniquely identify the persons.

In the past few decades, researchers have been proposed many different methods for person identification through hand geometry. For example, in [4], author innovate hand geometry system to recognize the person uniquely. In this method authors proposed a novel system to extract the hand geometrical features from low resolution video stream. Authors also proposed CHVD algorithm to identify the location of the fingers and donuts graph visual algorithm to identify the features of the hand geometry. Later, in [5], authors proposed an approach to identify the person uniquely through the features of four fingertips of right hand. This approach is based on the edge detection method. This approach increases the accuracy as the approach reduces the feature vector size. Here, all fingertips are detected using fingertips location algorithm.

A Hand geometry feature based person identification method is introduced in [6][7][9]. Where, in [6], features are extracted from hand through image processing and the features are recognized by utilizing machine learning approach i.e., artificial neural network (ANN). This method increases the success rate by using complete distance and graph theory based nearest neighbor algorithm. In [7], 15 features are extracted from right hand's fingers width, area, as well as circumference. Features are classified through the absolute and Euclidean distance. On the other hand, in [9], 14 distinct features are utilized to identify the person uniquely.

A palm print based person identification system is introduced in [8]. Here, both hand geometry and finger print features are utilized. Different verification methods are utilized in [10] to identify the unique person. The verification methods are Hamming distance, Euclidian distance and Gaussian mixture model. Discrete cosine transform based palm print authentication system is presented in [11]. Later, in [12], a biometric verification system is introduced with 2D and 3D features of hand geometry.

Eigenfinger and eigenpalm feature based biometric identification system in proposed in [13]. Here, the features are extracted based on K-L transform, matching and fusion. The final verification is performed through (k, l)-NN classifier. Later, a person authentication system is presented in [14]. In this system performance is improved by integrating palmprint features with hand geometry features. A biometric authentication system for low resolution hand image is presented in [15]. In this method, position invariant hand features are extracted through Random transform and verification is performed by the Euclidian norm match score.

In this paper presents a new hand geometric based person verification system by utilizing physical property of the

Modeling, Simulation and Performance Analysis of SEPIC Converter Using Hysteresis Current Control and PI Control Method

Mirza Muntasir Nishat
Department of Electrical and Electronic Engineering
Islamic University of Technology
Dhaka, Bangladesh
mirzamuntasir@iut-dhaka.edu

Fahim Faisal
Department of Electrical and Electronic Engineering
Islamic University of Technology
Dhaka, Bangladesh
faisaleee@iut-dhaka.edu

Mohammad Abdul Moin Oninda
Department of Electrical and Electronic Engineering
Islamic University of Technology
Dhaka, Bangladesh
mamoin@iut-dhaka.edu

Md. Ashraful Hoque
Department of Electrical and Electronic Engineering
Islamic University of Technology
Dhaka, Bangladesh
mahoque@iut-dhaka.edu

Abstract— This paper proposes an analytic study of SEPIC (Single-Ended Primary Inductor Converter) converter by employing Hysteresis Current Control and PI control technique to observe Output Voltage Stability, Total Harmonic Distortion (THD), Power Factor (PF) and Efficiency. SEPIC converter is extensively used in battery operated equipment for its significant feature of stepping up and stepping down voltage without changing polarity. The paper focuses on modeling SEPIC converter in CCM (continuous conduction mode) mode. State-Space Average technique is deployed to model the system mathematically and to implement the PI controller. Satisfactory performance is achieved by adopting both Hysteresis Current Control and PI control. Hysteresis current control method shows THD of 2.798% and efficiency of 90.07% whereas PI control method depicts THD of 17.17% and efficiency of 88%. Power Factor of 0.966 is achieved for PI controller while hysteresis current control method shows a power factor of 0.8208. PSIM software has been used for simulation purpose and the total investigation is analyzed for both methods.

Keywords— *SEPIC; PI Control; THD; Continuous Conduction Mode (CCM); State-Space Average Technique; Hysteresis Current Mode Control*

I. INTRODUCTION

With the advancement of technology, researchers are more focused on designing and analyzing more robust and compact power electronics devices. AC-DC and DC-DC converters [1] are on the top of this list for their widespread applications in power supplies, battery operations and charging systems [2]. Among all the converters, SEPIC converter is the most significant and widely employed as it can both increase and decrease the voltage by changing the duty cycle without reversing the polarity [3]. Moreover, small input ripple current and extension to multiple outputs are two prominent features of this converter [4].

Different types of converters are maneuvered in various applications in power electronics. Boost, Buck, Buck-Boost and Cúk converter are some of the popularly used converters for their individual distinct features. Amongst them, Boost converter has high input current ripple and Buck converter gives high output voltage ripple [5]. However, these phenomena can be minimized if they are coupled with switched capacitor [6], switched inductor [7] and combinations of voltage multiplier with coupled inductor [8-10]. Moreover, Buck-boost converter suffers from harmonics and to minimize that phenomenon a large capacitor or an LC filter is required [11]. Hence, Cúk converters solve both of these problems by using an extra capacitor and inductor [12]. However, huge amount of electrical stress on the components results in device failure or overheating [13]. Thus, SEPIC converter manifests better performance in terms of these problems and is brought into play in different sectors of power electronics [14].

Various close loop control techniques are required to operate the converter in desired form. For this reason, hysteresis current control and PI control techniques are studied and implemented with SEPIC converter and performance parameters are investigated through rigorous simulation. Quick response, internal current limiting capacity and stability are some of the significant advantages exhibited by Hysteresis current control method [15]. By considering these advantages, hysteresis current control is extensively used in power inverter, AC drive [16], active power filter [17, 18] and so on.

In addition, a PI controller is employed in converter circuit to make an investigative study alongside the hysteresis current control method. PI controller is a special case of PID controller in which the derivative of the error is not used. The lack of derivative action makes the system steadier in the steady state region in case of noisy data [19, 20]. This is because the derivative action is more sensitive to higher-frequency inputs. In SEPIC converter, switching frequency is very high and hence, the PI controller is selected to observe the overall performance.

In Section II, the conventional circuit design and operation is studied. The mathematical modelling of the converter is presented by State Space Averaging Technique in Section III.

Design of a Compact 600VA Sinusoidal Inverter with Battery Storage System

Anik Chowdhury*, Md. Samiul Alam, Shovon Dey, Afiya Ayman

School of Science, Engineering and Technology, Dept. of EEE, East Delta University (EDU)

East Nasirabad Khulshi, Chittagong-4209, Bangladesh

*anik.chy.113@gmail.com

Abstract—Due to the increase of renewable energy sources, an efficient inverter system should be designed which can work both in grid-connected and stand-alone mode. This type inverters should be synchronized with the conventional grid system and control the power flow according to the grid voltage and frequency. A 600VA inverter design with battery storage system considering the small weight compared with the available inverter which can be used in both modes has been proposed in this paper. A full bridge DC-DC converter is used for converting the 24V DC input to 380V DC, and SPWM drove H-bridge inverter is used to get the AC output. An LCL filter is used to get the pure sinusoidal output from the SPWM signal. Successful demonstration and the hardware implementation of the overall system has been presented.

Index Terms—Bridge circuits, full bridge topology, Inverters, LCL filter, SPWM, Synchronverter.

I. INTRODUCTION

Impacts of the renewable energy sources are increasing in the power generation system due to their positive effects on the environment system and the decreasing amount of fossil fuels [1]–[4]. Moreover, renewable sources like solar and wind energy are available everywhere and can contribute to the conventional power system [5]–[8]. However, management and get the desired output from these sources is not an easy task. Consequently, an efficient inverter system should be designed where the system can work both in stand alone and grid connected mode [9]–[13]. It will take power from the solar system to charge the battery and supply the power from the battery to the grid or the load depending on its working mode and the grid frequency and voltage. It is expected that grid-connected storage systems should provide flexibility in optimizing and operating the smart grid as well as mitigate the irregularity of the renewable sources by having a battery storage system. However, designing a seamless system with efficient power control, cost efficient and minimum harmonic injection is challenging [14]–[16]. Managing such a system requires extensive knowledge of battery energy management, circuit theory, control and power systems [17], [18].

Design a 600VA inverter system which has a battery storage system and has a seamless power management both in standalone and grid connected system while reducing cost and the weight and using the available circuit component is the main concern of this work. As almost all of the commercial appliances are AC controlled hence an efficient inverter system should be designed where the output of the inverter is sinusoidal and has better THD. A full bridge topology is used for the DC-DC converter and after that, SPWM drove H-bridge inverter is used to convert the DC voltage to an AC one. And then an LCL filter is used for the SPWM signal so that it can convert into a pure sinusoidal signal. A battery charging unit is also available which is based on synchronous buck topology contains basic charging, discharging and protection circuitry for the battery. The whole system can be used as a unit device, that can act as conventional inverter system and can also be worked as grid connected mode which is the future extension of this work.

The rest of the paper is described as follows. Overview and the detailed operation of the proposed system have been discussed in section II. Experimental results of the individual part of the system have been described in section III, future scopes have been described in section IV and the conclusions have been drawn in the section V.

II. OVERVIEW AND OPERATION OF THE PROPOSED SYSTEM

The system is employed keeping ease of control in mind. The system block diagram is shown in Fig. 1. The IC Powering Circuit takes the battery as an input and produces a 16.5V nominal voltage which is supplied to all the other circuits that require power. This voltage is supplied through switches which are magnetic relays. They are controlled by delay mechanism. First, the DC-DC Converter and then the inverter is turned on. Inverter becomes high impedance when it is not connected to
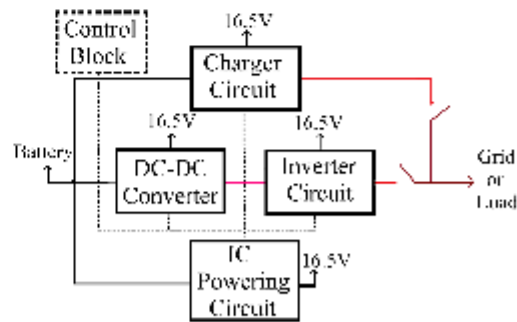

Fig. 1. System block diagram

Consumer Perception About Prepaid Energy Meter System-A Study In Khulna City

Tawhida Akand

Department of Electrical and Electronic Engineering
Khulna University of Engineering and Technology
Khulna, Bangladesh
tawhidacuet@yahoo.com

Abstract— This research attempts to find out the consumer's perception about prepaid energy meter in Khulna city. In this research 100 consumers of different category like domestic, commercial, small industries were selected in where prepaid meter is installed already for various period of time. This paper reveals that consumer prefer prepaid energy meter to postpaid meter & this is because of very much useful & attractive feature of it.

Keywords—Pre paid meter, Consumer perception, power system, distribution system.

I. INTRODUCTION

For many years revenue is collected by the electricity distribution authority of Bangladesh by using the conventional credit metering and billing system. This system has its own limitations. These disquiets for universal service in utilities and to improve efficiency motivated the company and regulators to prescribe technologies and regulatory options aimed at making it easier for consumers to pay for the services. So, the prepaid meter system has been introduced.[1]

Electricity metering refers to methods of installing and utilizing devices to measure the amount of electricity and the direction of flow of electricity intended for consumption. But prepaid or credit metering requires the consumers to pay before consuming whereas postpaid metering consumers have to pay after using or consuming the electricity . Prepayment mechanism means holding credit by customers and using the service until the credit exists. The concept of universal service in utilities motivated firms and organizations to encourage accessing the services and make it easy for people to pay for the services (Casarin & Nicollier, 2008).[2] In some studies, it has been defined as outlay made before consuming by a consumer (Gómez-Lobo & Contreras, 2003).[3]

The advantages of prepaid billing systems have been mentioned in some of the studies(Bandyopadhyay, 2008). [4]

In mid-1980s prepaid electricity billing was first introduced. The primary purpose of this initiative was supplying electricity at an affordable rate to lower income level people. Their motive was to extend the electricity connection in not only the poor urban area but also in the far poor rural areas (Tewari & Shah, 2003).[5] Some studies tried to find out the consumer perception and adaptability on the prepaid metering system(Quayson-Dadzie, 2012).[6] Its aim was to determine the level of consumer adaptability towards prepaid electricity billing in Accra West Region of ECG. It also analyzed the factors considered by the consumers before adopting prepayment process by using a descriptive model of research design. It took a sample size of 391 from the 18000 consumers of a district. The finding of the study approves the existence of some factors considered by consumers and those play a vital role in accepting and using the prepaid billing system. The response of employees and clients to the transition of service from postpaid to prepaid electricity bill payment was studied in the West Kenya region(Miyogo, Nyanamba, & Nyangweso, 2013) [7]. Several models have been used in previous researches to determine user acceptance and usage behavior. The Technology Acceptance Model (TAM) was developed in a research (Davis, 1989)[8] which is actually based on the research (Fishbein & Ajzen, 1977)[9]. According to this model Behavioral Intentions (BI) can be predicted by two variables named perceived usefulness and perceived ease of use. Here some variables have been considered as exterior which influence perceived usefulness such as design characteristics, user characteristics, task characteristics, nature of the device or implementation process, political influence, organizational structure etc. Other researchers included some other variables as extra such as self-efficacy, prior usage and experience, objective usability, and user characteristics. Another research has found that there is a direct relationship between perceived usefulness and BI(Davis, Bagozzi, & Warshaw, 1989).[10] This study discussed as other studies (Sheppard, Hartwick, & Warshaw, 1988)[11].

The research has used a semi-structured interviewer administrated five-point Likert scale questionnaire.
Consumer perception about prepaid meter is divided into two aspects i.e.; the importance of prepaid meter usage and challenges facing using prepaid meter.

Prepaid meter is a new edition of WZPDCL consumer. WZPDCL introduces pre-paid meter later part of 2015 in Khulna city.

Paper Currency Detection System Based on Combined SURF and LBP Features

Prashengit Dhar
Port City International University
nixon.dhar@gmail.com

Md. Burhan Uddin Chowdhury
Port City International University
chowdhuryburhan57@gmail.com

Tonoy Biswas
Port City International University
tonoybiswas09@gmail.com

Abstract—Currency detection falls into the field of computer vision technology. Detection of currency is a helping hand for visually impaired people. Moreover it is also useful in surveillance system. In this paper we presented a paper currency detection system which can detect paper currency from image. Detection is based on training different currencies. At first we extracted SURF and LBP features of currencies respectively. Later we combined both features. Then trained them with SVM classifier. SVM as a classifier performs very well in training image datasets. After that applying sliding window technique on input image, we detected currency from an image. In this currency detection system we focused on only paper currencies of Bangladesh. Along with currency detection, this system shows number of currencies and also the total amount of currencies exists in an image. The proposed system is able to detect paper currencies in rotated positions also and it achieves an average accuracy of 92.6% in detection.

Keywords—SURF, LBP, Support Vector Machine

I. INTRODUCTION

Surveillance and monitoring system is become very useful in our daily life. Now everywhere people using these systems for safety and verification task. Monitoring systems also helps in a securing maintenance task. Paper currency detection is a part of monitoring system. It is a helpful hand for those who are visually impaired. In banking systems paper currency detection can play a great role. Moreover in different offices and markets, it is usually happened that someone lost his currency or fall down anywhere, in this case this system can act as a chief role in detecting paper currency.

Our proposed paper currency detection system detects currency by prediction. We trained a enormous amount of images using svm classifier to detect currency. In terms of features, both global and local features are used based on the required application. Our system is developed by using local features. Though many uses deep learning for prediction. Many methods have been offered for recognition of paper currency. Muhammad sarfaraz proposed a new paper currency classification method [1]. It only recognize paper currency base on correlation of images and interesting features. Iyad and Basahr developed a currency recognition system for smartphones using SIFT feature [2]. Different features of paper currency like- shape ,color information, number, RBI seal and signature identification are used by many[3,4,5].A system to recognize paper currency is presented by Debnath which uses negative correlation learning and ensemble neural network[6]. Murthy suggested a way to classify currencies using image processing techniques [14]. Mirza and Nanda presented a technique for extracting denomination of paper currency [7]. They used Pattern Recognition and Neural Networks matching method

with the ROI. Mahajan and Gaikwad proposed a method to identify indian coin in which segmentation technique is done by row wise and column wise traversing through the whole image [8].This method used radius matching of selected image. Liu proposed a solution of eight steps to identify valid Indian note [15]. Sargano proposed an intelligent system to recognize paper currency of Pakistan [9]. His systems needs less time than others and classification task is done by three layer Neural Network. Da Costa developed a system to recognize notes in different scales and views [10]. Feature matching is used for recognition. But the system is computationally costly.

In this study, we have proposed a new paper currency detection system supported by SURF and LBP features combination. Support Vector Machine is proposed here as a classifier.

II. SYSTEM OVERVIEW

In this paper, we used the combination of SURF and LBP features to detect paper currency. Firstly we applied some pre-processing task to enhance image. By applying sliding window technique we processed every frame of input image. We extracted SURF and LBP features of each frame. Features of SURF and LBP are extracted independently. After that we combined both features. Then SVM predicts the frame(s) that contain paper currency. Fig.1 depicts the proposed currency detection system completely.
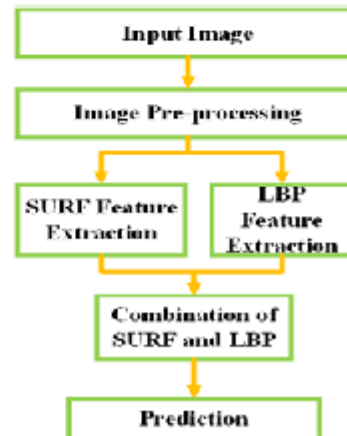

Fig. 1. Proposed system

Power Loss Minimization and Voltage Profile Assessment of Distribution System using WT-DG

S.M.G. Mostafa
Department of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
mostafa_93eee_iiuc@yahoo.com

H.M. Enamul Haque
Electric Power System Mangement
Energy FoS
Asian Institute of Technology (AIT)
Khlong Luang, Pathumthani-12120
Thailand
enamul.haque2008@gmail.com

Titipong Samakpong
Electric Power System Mangement
Energy FoS
Asian Institute of Technology (AIT)
Khlong Luang, Pathumthani-12120
Thailand
st111844@ait.asia

Abstract— Due to adverse environmental change the integration of Distributed Generations (DGs) is gradually increasing in commercial and domestic power system. Hence, it is indispensable to investigate pros and cons of DGs before incorporating in existing network. Non-optimal size and placement of DGs will cause high active power losses in distribution systems and poor voltage profile. This paper presents a probabilistic approach to design of Wind Turbine (WT) distributed generation and its impact on distribution system. Monte Carlo simulation (MCS) has been used to incorporate the stochastic nature of wind variations. Matpower has been used in Matlab environment to design the radial network. All parameter of WT is carefully considered into the equivalent network. For any random wind velocity the WT power is represented as negative load. Current summation method has been used for power flow solution from Matpower. The proposed method has been tested on a 33-bus radial test system.

Keywords— Distributed Generations (DGs), Monte Carlo simulation (MCS), Matpower, Probabilistic approach, WT

I. INTRODUCTION

The power system is expanding rapidly because of vast development of technologies. The grids already became a complex system by incorporating more DG units in terms of management and operation [1, 2]. Dispersed generation or distributed generations are small generation unit ranging from 50 MW to 100 MW [3] but it is hard to define exact size and optimal location because of structural feature of power system network. The operation of power system and its characteristics may change after adding DGs in different nodes. DGs may cause bidirectional power flow that can affect power losses and voltage level at different buses. It is very important of proper placement of DG to take the benefits of DG integration. Because, DG integration can enhance voltage profile, voltage stability, reduce system losses and improve power quality by reducing GHG emission and system congestion [4].

Among the distributed Renewable Energy resources the Wind is one of the fast rising renewable energy technology and recently a vast number of wind generators already integrated into power system [5]. A WT generating system is differentiate into fixed and variable speed [6, 7]. The variable speed WT can be incorporated with Doubly Fed Induction Generator (DFIG) and Permanent Magnet Synchronous Generator (PMSG) along with a partial-size and full-size converter respectively. Since the variable speed

WT can adjust reactive power, so variable speed generating system are broadly used in big wind farms. On the contrary, the fixed speed WT incorporated with a Squirrel-Cage Induction Generator (SCIG) that is linked by a step-up transformer to the distribution network. In distribution system the fixed speed WTs are widely used because of some special characteristics such as: low cost, maintenance free, brushless and rugged construction and simple operation [8]. The main drawback of fixed speed WT is that it demands reactive power (Q) [9]. Consequently, it may cause node voltage deterioration at various node and hence voltage stability margin of distribution system may change. But voltage profile at various nodes can mitigate by employing local static capacitors. So, it is inevitable to examine voltage stability of a distribution system when it employed with fixed speed wind generating systems.

Most of the research based on line losses which mainly focused on the minimization of feeder losses [10–17]. Where the losses are considered for a single load and generation case. These methodologies were based on Analytical methods because those approaches were non-iterative and time saving [10, 11]. These techniques are used to find the size and location of single DG unit only. But, the multiple DGs integration creates nonlinear impacts on operation of power system [12, 13]. As a result, various multiple DGs integrations techniques have been introduced [14]. In addition, DGs were placed on the basis of Voltage Stability Index *(VSI)* without considering optimal size and location [18]. However, it is very hard task to find an analytical solution that can be used in the multiple DGs placement problem.

This paper proposes a way to find optimal size and location of WT-DG in more than one location that reduces the feeder losses and gives better voltage profile. Besides, the static capacitor has been used to see the reactive power compensation and further improvement of voltage in fixed speed WT-DG. Monte Carlo simulation has been used to address the randomness of wind speed. Current summation method from Matpower has been used for load flow results. An array of different size of WT has used to get optimum size and for each size the power follow was carried out in every node to get the minimum loss node. The acquired results were compared with a literature to show the voltage profile improvements.

Short Channel Effects Characterization of 3-D FinFET for High-k Gate Dielectrics

Zunaid Ahmed Zaki
Dept. of Electrical and Electronic Engineering
Shahjalal University of Science and Technolgoy
Sylhet, Bangladesh
zunaidzaki@gmail.com

Noshin Tanjila
Dept. of Electrical and Electronic Engineering
Shahjalal University of Science and Technolgoy
Sylhet, Bangladesh
noshintanjila44@gmail.com

Jibesh K. Saha
Dept. of Electrical and Electronic Engineering
Shahjalal University of Science and Technolgoy
Sylhet, Bangladesh
jksaha14@gmail.com

Abstract—In modern technology FinFET replaces MOSFET as aggressive technology scaling as per Moore's law has led to elevated power dissipation levels owing to short channel effects. In this research, we focused on different FinFET structures. We compared short channel effects, such as I_{on}/I_{off} ratio, threshold voltage roll-off and subthreshold swing of Double gate FinFET (DGFinFET) and Tri-Gate FinFET (TGFinFET) for different high-k dielectric material. The structures were designed for 22 nm technology. Also, effect of different dielectric material on different underlap length of TGFinFET is discussed in our work.

Keywords—*DGFmFET, TGFinFET, threshold voltage, subthreshold swing, I_{on}/I_{off} ratio, underlap channel.*

I. INTRODUCTION

The technology is expanding and in the field of semiconductor MOSFET devices, devices are continuously being scaled down. For that reason, controlling activity of gate over the device channel is a discrepancy from its performances hence, several undesirable effects such as Short Channel Effects (SCE) emerges out. Nowadays controlling of these effects is major concern since SCEs reduce the electrostatic integrity [1]. SCEs like threshold voltage roll-off, subthreshold swing and I_{on}/I_{off} ratio are very important issues of performance analysis of FET devices. Effect of different material as channel, as gate insulator and effect due to change in their dimension is one of the major research fields for nano-FET devices [2]. Detrimental property of the devices in subthreshold region and threshold voltage (V_T) roll-off puts a limit on shrinking the dimension of MOSFET in nanometer regime [3-4]. Conventional MOSFET approaches its physical limitation due to the ongoing aggressive scaling process. On the other hand, FinFET represents a promising emerging substitutional device technology to extend CMOS scaling process. FinFET showed remarkable performance for 22 nm channel length and beyond due to their efficiency in suppressing short channel effects and leakage power and improving drive current. So, FinFET is more preferable to MOSFET in present days for high speed electronics purposes [5-11]. FinFET could increase the performance of nanoscale design with Gate-Source/Drain underlap length. Underlap is the gate free region which mostly controls the channel potential, leads to controlling current flow [12]. FinFET design with underlap length minimizes parasitic capacitance , gate drain/source tunneling current and reduces leakage

components such as gate-induced drain leakage current [13].We study the effects of underlapped source/drain parameters on the device performance such as on-current, leakage current, subthreshold swing and threshold voltage.

In this paper, extensive study of the FinFET structure is carried out. We designed Double Gate FinFET and Tri-Gate FinFET using a numerical simulator (Silvaco TCAD). We used 4 types of dielectric materials (SiO_2, HfO_2, Si_3N_4 and Al_2O_3) for gate oxide and compare among them to understand which structure is giving better performance in case of short channel effect. Detailed comparison of threshold voltage roll-off due to channel length variation for DGFinFET and TGFinFET is also carried out in this work. Other parameter like I_{on}/I_{off} ratio and Subthreshold swing (SS) also compared among the structure. Finally, effect of underlap length is also discussed varying its dimension.

II. DEVICE STRUCTURE

In this paper we study the performance parameters such as I_{on}/I_{off} ratio, threshold voltage V_{th} and Subthreshold Swing (SS) of Double gate FinFET and Trigate FinFET with different dielectrics. As shown in Fig. 1 and Fig. 2, we designed two devices, TGFinFET and DGFinFET respectively with 22 nm channel length (L_g) with SiO_2 as the gate oxide material. The gate oxide thickness of dielectric remains same (T_{ox}) for this two structures. The height of the Fin, H_{Fin} is 35 nm and the thickness of Fin is given by $T_{FIN} < H_{FIN}/2$, $T_{FIN} < 0.7L_G$ (channel length) in order to achieve realistic and operational FinFET and reduce SCE [14]. Here we take the fin thickness (T_{fin}) 10 nm for both structures.
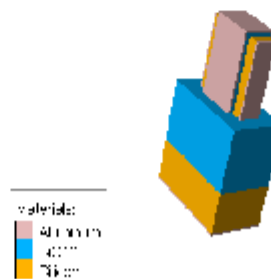

materials:
Aluminum
silicon
Silicon

Fig. 1. 3-D Tri-gate FinFET structure

Probabilistic Power Flow Model for the Uncertainty Analysis of Wind Energy and Loads

Muhammad Shahzad
Department of Electrical Engineering
Institute of Southern Punjab (ISP)
Multan 66000, Pakistan
shahzadpansota@hotmail.com

Md. Rabiul Islam
Department of Electrical and Electronic Engineering
Dhaka University of Engineering Technology (DUET)
Gazipur 1700, Bangladesh
eeerabi77@gmail.com

Patrobers Simiyu, Nabeel Abdelhadi Mohamed Fahal, Muhammad Umair Shoukat, and Khalid Hussain
School of Electrical and Electronic Engineering
North China Electric Power University
Beijing 102206, P. R. China
simiyupr@yahoo.com; nabilfahal72@gmail.com; umairshoukat@yahoo.com; engr.khalid125@gmail.com

Abstract—In a modern power system, stable operation of the electrical system is a major concern. For the stable operation of power system, it is desirable to access the effect of unforeseen events and identification of more sensitive nodes. The most outstanding job of distribution engineers is to simulate the power system for corrective action. Probabilistic power flow (PPF) is a tool that can effectively access the performance of power system network over most of its working conditions taking into account the unforeseen events. In this paper, a new PPF model is developed to evaluate power system network taking into account the uncertainty with input random variables, such as wind energy, loads, generation outage, and branch outage. This model is based upon the two well-known methods, Monte Carlo simulation (MCS) and point estimation method (PEM). For the sake of, computational efficiency and results accuracy Box-Muller sampling equation was used with MCS and *2m+1* concentration scheme was used with PEM. The proposed model was investigated by using modified IEEE 14-bus standard test system.

Keywords—probabilistic power flow, Monte Carlo simulation; Point estimation method; random variable;Sampling; uncertainty.

I. INTRODUCTION

Due to the integration of renewable energy in a distribution network, the operation and planning of delivery network are becoming a challenge for the engineers. Most of the engineering problems are subject to uncertainties. The electric power system is a most complex human-built network assembly that is always subjected to the various type of incorporate infeed uncertainties, i.e. daily load variation over a wide range, generation outage and faults on a feeders or outage of lines [1]. The variation of load pattern is one of the more series problem nowadays. For the operation, control, and planning of the power system, it is important to predict any unforeseen events and identify the sensitivity of power system nodes. Uncertainty modelling tools are required to control and minimise the risks associated with the operation and planning of power system.

A classical way of power flow analysis is a deterministic power flow (DPF) analysis. DPF analysis has not the capability to handle the uncertainty problems. DPF analysis only calculate the values chosen by the analyst [2]. In DPF analysis, uncertainties related to load and generation are not considered. As a result of power flow studies are used for the decision making of power system operation and planning purpose. The study of uncertainty is essential for the decision of future operation of power system.

Although, it is possible to access uncertainty through DPF but it is impractical. For each possible computation need to perform the analysis separately that is not only time consuming but also hectic [2]. To handle the above problem, PPF analysis are taken into account. PPF analysis has the capability to handle all kind of uncertainties in power system network. The probabilistic methods could be categories into three types as follow: simulation methods, approximate method, and analytical methods [3]. In simulation method, MCS based methods are more famous and has been used in many papers [4-9]. In MCS based methods required a large number of iteration to get a reasonable accuracy and convergence, and also no need to an approximation of power flow equations. The main drawback of MCS based method is to require a large number of iteration that is the result of enormous computation burden and storage. However, Due to the development of efficient computation tools, MCS is frequently used in PPF studies. In the analytical methods, need to linearize the power flow equation to work with probability density function [10, 11]. In approximation based methods, PEM is famous one and has been used in many papers [12-14]. In this approach, no need of linearization of power flow equation. In these methods number of the evaluation points are decreased by using different techniques such as point estimation method [13, 15, 16].

In this proposed model MCS and PEM are utilised for the PPF evaluations problems, MCS is used with *Box-Muller* algorithm equation in order to determine the samples in a specific iteration. For PEM, *2m+1* concentration scheme is used. This model can address the uncertainties as a particular probability distribution function and total load of the proposed standard test system is considered as a random variable which following the normal distribution, wind farm is modelled as

Developing A Self-Learning Braille Kit For Visually Impaired People

Mohammed Abdul Kader
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
kader05cuet@gmail.com

Rubel Ahmed
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
jxrubelahmed@gmail.com

M Iftikhar Rahman Noman
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
iftikhar.eee18@gmail.com

Arif Billah
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
arifbillah0468@gmail.com

Mouslah Uddin Apple
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
applemahmud852@gmail.com

Abstract— Braille is a pattern of written language for visually impaired people. In this system, alphabets are represented by raised dots which are sensed by fingertips. In Bangladesh, there are only few special schools to teach visually impaired people. The number is very insufficient considering its large population and this creates a large impediment to eradicate the illiteracy of the visually impaired people who are living in Bangladesh. Realizing the social responsibility towards visually impaired people, a self-learning braille device is developed and presented in this paper, which can help visually impaired people to learn brail alphabet without the assistance of visual people. The device has two modes of operation. The first mode is given the name as learning mode, where the device itself generate braille pattern by switching six solenoid actuator and pronounce resembling alphabet to the speaker. User can touch braille generated by rising limb of solenoid actuator with hearing the alphabet which helps them to memorize the braille alphabet. The second mode is the practice mode. In this mode, user can select a printed braille card and assume the alphabet written on it sensing by his finger tip. After that he can place the card to the braille reader section of the device and the device pronounced the sound of that alphabet. By this way user can verify his leaning. We think this device can play an important role to increase the literacy rate of visually impaired people of Bangladesh.

Keywords— braille; visually impaired; SPI bus; microcontroller; audio amplifier; SD card

I. INTRODUCTION

Bengali is the one of the most used languages all over the world. About 210 million people are speaking in Bengali language in the world. More than 0.75 million are visually impaired in Bangladesh [1]. The literacy rate of the visually challenged people is very low in Bangladesh due to lack of special school, limitations of tutors, unavailability of education materials etc. The way of reading and writing in a language without the use of sight is Braille system. Braille is not a language rather it is a code of raised dots to represent the alphabet of a language which provides a means of literacy of visually challenged people [2].

There has been considerable amount of research work for assisting visually challenged people. Parag Wagh et. al. have developed a system for English language which reads a braille type writer and produce braille pattern with playing sound of that pattern [3]. Kishalay Dhar et. al. also developed a system named interactive generalized keyboard driver for Bengali braille embosser which can produce sound and print Bengali braille alphabet on the braille paper as a response of pressing a key in the keyboard [1]. Sariat Sultana et. al. developed a low-cost, low-power, portable and user friendly braille system which takes the input through Braille keyboard and produces the braille output in braille display; the corresponding English characters are also displayed on the LCD and also in the laptop if it is connected with the system [4]. Z. H. M. Jawasreh et. al. introduced a system named Braille tutorial model using braille fingers puller which consists of braille learning technique and braille self-test method [5]. The work presented in this paper has unique dimensions compared to previous related research works. The aim of this research is to develop a user friendly and low cost self-learning braille device which can assist a visually challenged people to learn Bengali braille alphabet. The developed braille device has an IR sensor array with seven sensors to read braille card. To generate braille pattern it has 3X2 solenoid actuator cell. Also audio amplifier circuit and speaker is used to produce sound. The read-write operation of all these peripheral devices are controlled by microcontroller (ATmega2560).

II. OVERVIEW OF THE SYSTEM

"Fig. 1", shows the block diagram of the complete system. Here, mode selection switch is a simple PUSH button, by pressing this PUSH switch user can select the operating mode of the device. The sound of alphabet is stored in SD card. Microcontroller read the sound file by its SPI bus and write the audio signal to the audio amplifier to play it in speaker. IR sensor array is connected with seven input pins of microcontroller which used to read the braille card in mode-2 (practice mode). The function of the solenoid actuator cell is to generate the braille pattern by rising the tip of specific solenoid actuators among six actuators.

III. SYSTEM DESIGN

The methodology to develop the prototype of the system is described in this section. The development process

Methanol Extract of *Diploclisia glaucescens* Leaves Shows Hypoglycemic Activity in Mice Model

Rashaduz Zaman
Faculty of Biological Sciences
Friedrich Schiller University
Jena, Germany
rashaduz.zaman@uni-jena.de

Muhammad Imran Ahammad Chowdhury
Department of Pharmacy
State University of Bangladesh
Dhaka, Bangladesh
ctg.imranchowdhury@gmail.com

Minhajul Islam
Department of Pharmaceutical Sciences
North South University
Dhaka, Bangladesh
Minhaj.pharmacy.iiuc@gmail.com

Mohammed Abu Sayeed
Department of Pharmacy
International Islamic University
Chittagong
Chittagong, Bangladesh
pmsayeed@yahoo.com

Mohammad Parvez
Quality Assurance
Acme Laboratories Ltd.
Dhaka, Bangladesh
mparvez.qo@acmeglobal.com

Abstract- Methanolic extract of *Diploclisia glaucescens* was found to exert hypoglycemic effect after glucose load (2g/kg BW) on normal swiss albino mice. Oral glucose tolerance test (OGTT) was done to evaluate the hypoglycemic activity. Methanol extract of *D. glaucescens* did not show any type of toxicity in the studied animals throughout the study period of 14 days even at dose of 2000 mg/kg body weight. There was no sign of major toxicities. Both doses (200mg/kg and 400mg/kg) of methanol extract caused a significant raise in blood glucose level at 30 minute time point of the test and reached to peak level at 60 min in each group. After that, the blood glucose levels of all extract treated mice steadily revert back to initial glucose level. The capability of this extract to reduce the blood glucose level was significant in comparison to the standard drug glibenclamide. It can be a potential candidate in the field of diabetology.

Keywords— Diploclisia glaucescens, acute toxicity, OGTT, hypoglycemic, glibenclamide, Menispermaceae Introduction (Heading 1)

I. Introduction

Diploclisia glaucescens (Bl.) Diels (family: Menispermaceae), a perennial and large woody; stems up to 20 cm in diameter. Leaves usually coriaceous, broadly ovate to suborbicular, apex rounded to acute. Flowers are very small, yellowish. It is rarely found in the forest areas of Chittagong Hill Tracts, mid country region [1] of South India and Sri Lanka [2]. Leaves are used to alleviate from diarrhea in Rangamati [1], in the treatment of biliousness and venereal diseases [3], rheumatic arthritis, urethritis, snake bites, cholecystitis [4]. Chemical investigation of the plant revealed the presence of phytoecdysteriods including ecdysterone in seeds [5], stigmasterol, serjanic acid, twenty five saponins including phytolaccagenic acid, diploclisin [6], acetylenic acid, ocetadecanoic acid-9-yne, triacontanoic acid, undecanoic acid, β-sitosterol [7], diploclidin [8], phenyl glycosides [9], vibo-quercitol, glaucescine, proaporphine alkaloid stepharine [10], and (-) syringarenol (lignin) [11]. Phenols, Tannins, Flavonoids, Alkaloids, Saponins, Proteins and Amino acids were present in aqueous extract of *Diploclisia glaucescens* [12].

The existed scientific reports on this plant showed various activities like, insecticidal, spermicidal [5], molluscicidal, cytotoxicity [6], anti-inflammatory [2,6], ocetadecanoic acid-9-yne showed strong PAI-1 bioactivity [7] and antibacterial activities [12]. Ecdysterone which is present in the *D. glaucescens*, has been reported to increase muscle insulin signaling by modulating acylcarnitine profile and mitochondrial oxidative phosphorylation complexes in mice [13]. It also showed anabolic, gastroprotective, antioxidant effects. Moreover, it showed the possibility of metabolic syndrome symptom suppression like antidiabetic activity, and protection of heart and blood vessels [14]. Stigmasterol, isolated from the bark of *Butea monosperma* reduced glucose concentrations [15].

Diabetes (both Type-1 and Type-2) will be the 7th leading cause of death in the world by 2030 [16] while an estimated 1.6 million deaths in 2015 were directly caused by diabetes and Diabetes prevalence has been rising more rapidly in middle- and low-income countries. 77% of total diabetic patients live in low- and middle-income countries and Bangladesh is one of them [17]. As Bangladesh is a middle income country and due to high cost of diabetic medicines, people do not get the appropriate treatment.

Plants are enriched in chemicals that can be used as medicines after appropriate processing. "80% of people use plant as medicine", reported by WHO [18]. Recently in Bangladesh, researches have been increasing on medicinal plants to find out the effectiveness for specific treatment on the basis of their ethnobotanical uses [19].

Till now, no scientific report has been published on antidiabetic activity of *D. glaucescens* and chemical entities in other plants similar to that of *D. glaucescens* showed antidiabetic activities. So, an attempt was made to assess the anti-hyperglycemic effect of *D. glaucescens* on mice.

II. Materials and methods

A. Plant material collection

Molecular Docking Studies and Virtual Screening of Rapamycin and it's Derivatives against mTOR for Treatment of Cancer

Abul Bashar Ripon Khalipha[1,2*], Rajat Bagchi[1], Md. Solayman Hossain[1], Milon Mondal[1], Sajal Biswas[1]

[1] Department of Pharmacy, Bagnabandhu Sheikh Mujibur Rahman Science and Technology University

[2] Evergreen Scientific Research Center, Bagnabandhu Sheikh Mujibur Rahman Science and Technology University

Abstract—The mammalian target of rapamycin (mTOR) pathway has a significant role in cellular growth, proliferation and cell survival and is aberrantly activated in various types of cancer. The mTOR protein kinase, the pivotal target for cancer treatment is inhibited by rapamycin (D) and its analogs that blocks allosterically the catalytic binding sites. The poor solubility and pharmacokinetics of rapamycin have triggered us to design several new chemical entities for the discovery and development of new compounds. In the present study, rapamycin, its analogs and some rapamycin derivatives were screened against the mTOR homologous structure. Molecular docking was performed under AutoDock vina in PyRx platform to screen noble scaffolds having highest binding affinity for the receptor molecule. Rapamycin exhibits highest binding affinity -9.6 kcal/mol against 5WBU protein among the proteins and the drug analogs. According to the findings, two rapamycin derivatives D-C6H5 (-11.4 kcal/mol) and D-F (-11.8 kcal/mol) have been proposed having better stability, nonbond interactions and pharmacokinetic properties than the classic inhibitor complex, rapamycin. Molecular orbital theory and discovery studio visualizer v16.1.0.15350 were applied to get thermodynamically more stable and chemically reactivity compounds and find the nonbonding interactions and binding sites of the ligands. Admet@SAR online database has been utilized to predict the pharmacokinetic properties of rapamycin and its derivatives.

Keywords—mTOR, Rapamycin, Molecular docking, binding affinity, Admet@SAR

I. INTRODUCTION

Rapamycin also known as sirolimus, a macrocyclic triene antibiotics exhibits various pharmacological and biological activities, including anticancer, immunosuppressive, anti-aging, metabolic disorder correction, organ transplantation, antifungal and neuroprotective activities (1). It was initially discovered in 1975 as an antifungal metabolite produced by *Streptomyces hygroscopicus* in a soil sample from Easter Island of South Pacific (known as Rapa Nui) (2,3). Rapamycin and its analogous, called rapalogs act as allosteric inhibitor of mammalian target of rapamycin (mTOR) which is a serine/threonine kinase belonging to the phosphatidylinositol-3 kinase (PI3K) family (4). The mTOR pathway occupies an effective intracellular signaling pathway in cell cycle for regulating multiple nutritional and environmental factors, including cell growth, metabolism, cellular energy levels and cell stress (5). Deregulation of this pathway has been implicated in a number of diseases such as cancer, genetic disorders metabolic disorders, neurological diseases (6). Rapamycin and

its analogues inhibits mTOR pathways by the binding to the intracellular receptor of the FK506-binding protein (FKBP12) and form the rapamycin-FKBP12 complex (7). This complex then binds directly to the FKBP12-rapamycin binding (FRB) domain of mTOR a part of mTORC1, blocking allosterically the catalytic phosphorylation site and inhibits the pathway (8). The mTOR protein kinase forms two functionally distinct complexes TOR complex 1 (TORC1) and TOR complex 2 (TORC2) located in different cell compartments (9). These complexes contain shared and distinct protein components which control a myriad of cellular processes in response to diverse environmental and endocrine stimuli (10). mTORC1 is composed of mTOR, mLST8, Raptor, DEPTOR and PRAS40 that are the master controller of cell growth and proliferation, including mRNA biogenesis, protein, lipid and nucleotide synthesis and energy metabolism (11). Increased activation of mTORC1 was generally observed in various type of human cancer, genetic disorders due to function mutation in oncogenes (12). In contrast, mTORC2 composed of mTOR, Rictor, mSin1, mLST8 and DEPTOR which participates in the regulation of cytoskeletal dynamics and cellular survival (11). Only mTORC1 was acutely inhibited by rapamycin whereas mTORC2 shows significantly less sensitivity to rapamycin (13). Chronic exposure to rapamycin inhibits mTORC2 in some cell type by sequestering newly synthesized mTOR molecules (14). In this study, molecular docking studies has been performed to understand the nonbonding interaction between the designed drug and serine /threonine protein kinase mTOR protein. Frontier molecular orbitals and Admet@SAR, have also been analyzed to design a drug having improved pharmacokinetics properties with minimum toxicity.

II. METHODOLOGY AND COMPUTATIONAL DETAILS

A. Preparation of Ligands

The 3D structure of Rapamycin (D) drug and its analogues Everolimus (D1), Tacrolimus (D2), Temsirolimus (D3) retrieved from PubChem online database. Molecular geometry optimization of rapamycin and rapalogs executed in chem3D pro 12.0 to get the optimum conformation of the structures. The structure of rapamycin was modified with -C6H5, -CF3, -F, -NH2, -OH functional groups at 36 carbon position by replacing hydrogen atom that leads to the formation of new rapamycin derivatives (D-C6H5, D-CF3, D-F, D-NH2, D-OH). Molecular geometry optimization for the rapamycin derivatives also

Surface Modification of PDMS Film by Si Template Synthesized Through a Facile Process

A.S.M. Iftekhar Uddin
Department of Electrical and
Electronic Engineering
Metropolitan University
Sylhet, Bangladesh
E-mail: iftekhar@metrouni.edu.bd

Kazi Wohiduzzaman
Department of Electrical and
Electronic Engineering
Metropolitan University
Sylhet, Bangladesh
E-mail: ohid@metrouni.edu.bd

Nawshar Ahmed Chowdhury
Department of Electrical and
Electronic Engineering
Metropolitan University
Sylhet, Bangladesh
E-mail: nawshad@metrouni.edu.bd

Abstract—In the current contribution, surface modification of polydimethylsiloxane (PDMS) has been presented using patterned silicon (Si) template. Different patterns on the Si substrate were fabricated using lift-off (photolithography) and metal-assisted chemical etching process. Experimental results revealed that the formation of highly oriented pattern on the Si wafer preferentially yielded high-density, uniform, and rough friction surface of PDMS films. Importantly, surface modified PDMS film can exhibit higher surface-to-volume ratio, higher friction area (friction contact points), and excellent hydrophobicity. It is expected that the adopted approach will imitate the ability of patterning microstructure on any polymer surface in large-scale and will improve the performance of smoothed-surface polymer films those are currently used in various sectors.

Keywords—*photolithography, chemical etching, PDMS, Si template, surface modification*

I. INTRODUCTION

The micro/nanostructure arrays or textures on insects, animals, and plants exhibit extraordinary performances, such as controllable adhesion, tunable friction, anti fouling and self-cleaning properties [1-4]. Besides, they also exhibit super hydrophobicity with an extremely high water contact angle (>100°) and/or low roll-off angle [4, 5]. Very recently, these fascinating structures have been stimulated for producing micro/nanostructures on the polymer materials and has become a promising interdisciplinary research area to improve the surface reactivity of materials in bionics, mechanics, nanotechnology, and many other fields. Recent developments in micro/nano-fabrication technology have greatly prompted the progress of artificial adhesive setal arrays, which include photo-lithography, soft-lithography, electron beam lithography, nano-printing, and hot embossing [6-9]. However, most of these techniques utilize an expensive and complex mold-casting process, which also involves de-molding the setal array from the patterned templates. In addition, due to the strong adhesive properties of the most polymers, high vacuum pressure (~3 Pa) is required to reduce the template-precursor adhesion energy for smooth peeling-off the patterned polymer films from the template.

Polydimethylsiloxane (PDMS) is one of the most familiar silicon-based organic polymers widely used in contact lenses, medical devices, and as elastomers in antifoaming food agent, caulking, lubricants and heat-resistant tiles. Most recently, PDMS has attracted special attention in fabricating high performance nanogenerators, especially triboelectric nanogenerators, due to its greater ability to attract and retain electrons upon contact with any positive charged triboelectric materials [10, 11]. Additionally, micro/nanopatterned PDMS surfaces exhibit higher friction area, which is crucial to enhance the nanogenerators' output [11].

In this work, a facile and efficient process of forming micro/nanopatterns on the PDMS surface has been proposed. Typically, p-type Si substrate was used to construct the basal podium of replica template and was used as a mold to form the micro/nanopatterns on the PDMS surface. Importantly, additional surface treatment of the Si template was utilized to improve the peeling-off process of the patterned PDMS from the template.

II. EXPERIMENTAL SECTION

A. Synthesis of PDMS

To prepare the solution, PDMS elastomer and cross-linker (Sylgard 184, Tow Corning) were mixed rigorously at 10:1 ratio (w/w) in a conical centrifugal tube. After 10 minutes, the mixer was degassed in vacuum for 2 hours and then kept in incubation for further use.

B. Fabrication of Si template (process-I)

A V-grooves/inverted pyramids patterns was constructed on a polished 4 cm × 4 cm native-oxide etched p-type Si (100) wafer using conventional photolithography process. In the current work, SiO$_2$ (100) wafer was selected to fabricate the mold. In a typical process, SiO$_2$ wafer was first cleaned by de-ionized (DI) water and dried at 80°C on hot plate for 1 hour. Later on photo-resist (PR) was spin coated on the wafer and soft baked at 110°C for 90 seconds. The ultraviolet (UV) mask (cubic array shaped) was then set on the wafer, exposed under UV for 333 seconds, and hard baked at 110°C for 90 seconds. The exposed wafer was then dipped into developer solution to remove the UV exposed PR from the wafer. The substrate was then degassed into buffered-oxide-etchant (BOE) for 5 minutes followed by pouring into tetramethylammonium hydroxide (TMAH) (20 wt%) at 80°C. Wet etching process by TMAH (20 wt%) can significantly reduce the cost of dry etching based micro-fabrication fields. Importantly, TMAH exhibits higher etching rate in comparison to KOH, which could be cost effective in time consuming case. Finally, the template was cleaned by acetone plus ethanol plus water and dried at 80°C to evaporate the residual solvents. The cleaned template was then stored in laboratory oven for further use.

Design of a Two Stage CMOS Operational Amplifier in 100nm Technology with Low Offset Voltage

Saidul Alam Chowdhury[1]   Om Prakash Bose[2]   Quazi Delwar Hossain[3]

[1,2,3]*Department of Electrical and Electronics Engineering*
[1,2,3]*Chittagong University of Engineering and Technology*
. Chittagong-4349, Bangladesh

[1]Saidul.cuet105@gmail.com   [2]omprakash4594274@gmail.com   [3]quazi@cuet.ac.bd

Abstract - The motive of our study is to design a two-stage CMOS operational amplifier with low input offset voltage. Basically, an operational amplifier (op-amp) has two different inputs and one output. The output voltage signal of an op-amp is the distinction between the applied signals of its two separate inputs. This implies that if there is no difference between the two inputs, there will be no voltage on the output. But practically there is always a little input offset voltage because of the mismatch of the circuit components which restricts some of its applications. In this paper, the offset error has been reduced through improving the phase margin of a two-stage CMOS op-amp using compensation capacitor connected in parallel with the second stage of the op-amp. Miller theorem has been applied while connecting the capacitor to reduce the power consumption; therefore, we have designed the MOSFETs according to the improved phase margin. Matching property of the MOSFETs has been also used when designing the circuit. The achieved results show that offset error is reduced after the modification. This study may be useful in DC amplifiers where this small error can be significant because of the large gain of the circuit.

Index Terms – Op-amp; offset voltage; phase margin; compensation capacitor; cadence.

I. INTRODUCTION

Operational amplifiers are being used extensively in many electrical appliances such as converter, integrator, voltage comparator, filter, and many others. Op amps are also used in analog to digital converter (ADC) and digital to analog converter (DAC) [1]. Because all-real life signals are naturally analog, the necessity of ADC and DAC is inevitable; thus, the operational amplifier has become a very effective and multitasking device.

Being an obligatory part of many analog and compound signal systems, Op amp plays an important role in nanotechnologies. The design of analog circuits such as op-amp in CMOS technology has become important because of the increasing demand for the mixed mode integrated circuits; moreover, nowadays the practical usages of CMOS op-amp have increased because it requires low input power to drive the system [2].

Because of the defects in the generation process, the design process of CMOS op-amp circuits has become quite cumbersome. Design an op-amp with low offset error is one of the major challenges in this regard. Depending on the mismatched input transistors, this error voltage may vary from 1 mV to 5 mV. The value also changes with temperature [3]. Our aim is to build an op-amp with respectively low offset error at a maximum phase margin to confirm stability. Both the compensation capacitor and the matching property of MOSFETs have been implemented to achieve the targeted results.

II. LITERATURE REVIEW

The most conventional method to reduce the offset error of op-amp is auto zeroing which is a discrete time sampling process. It employs sampling the offset of the amplifier and excludes it from the input signal. The process needs two clock phases for its implementation. The drawback of the system is that it causes noise folding [4].

Chopping is another method that is more adoptable than auto zeroing since it is a continuous-time modulation process that does not cause noise folding; nevertheless, there begets a chopper ripple at the output terminal of the amplifier in chopping [5].

Another Research study introduced ac coupling as a compensation technique [6] in which a capacitor was used at the input or output terminal. Although we can optimally reduce the offset error through this process the drawback is signal loss and large area due to the large capacitor.

In addition, Chih-Wen Lu (2007) conducted a study to minimize input offset for two-stage CMOS op-amp using an auxiliary amplifier [7]. The offset error was reduced to 1.898 mV in his research. Several types of compensation techniques have been also drawn up by different researchers such as Md. Abdullah-Al-Kaiser et al. (2017) presented a scheme to design two-stage CMOS op-amp [8]. The input offset voltage around 8.4 mV has been achieved in their experiment.

In our project, we have used compensation capacitor by connecting it in parallel with the second stage of the op-amp. But, implementing the Miller theorem while connecting the capacitor, we could overcome the previous drawback of using a large capacitor. Because, it is possible to generate large capacitor by using small capacitor connected in parallel with the second stage according to the Miller multiplication; therefore, we were able to improve the phase margin as well as the offset error of the CMOS op-amp.

Vector Space Model based Topic Retrieval from Bengali Documents

Topu Dash Roy
Department of Computer Science and Engineering
North East University Bangladesh
Sylhet, Bangladesh
topucse05@gmail.com

Shamima Khatun
Department of Computer Science and Engineering
North East University Bangladesh
Sylhet, Bangladesh
shamimaneub07@gmail.com

Rubina Begum
Department of Computer Science and Engineering
North East University Bangladesh
Sylhet, Bangladesh
rubinarubi10@gmail.com

Al Mehdi Saadat Chowdhury
Department of Computer Science and Engineering
North East University Bangladesh
Sylhet, Bangladesh
amschowdhury@neub.edu.bd

Abstract—This work attempts to find the topic of a Bengali text document based on a traditional similarity based retrieval model named Vector Space Model. This fascinating model has traditionally obtained much fame in the research community, but to the best of our knowledge, was never tried for Bengali topic retrieval. In this work, therefore, we have used four different settings of the vector space model which are TF-IDF weighting scheme with Euclidean distance, TF-IDF weighting scheme with Manhattan distance, TF-IDF weighting scheme with Cosine similarity and Improved document scoring scheme. The K-nearest neighbor algorithm is then used to retrieve the topic of a query document. For training and testing purpose, we have also created a large corpus of Bengali text documents. On this corpus, our result shows the best retrieval accuracy of 93.33%.

Keywords—Vector Space Model, TF-IDF, Cosine Similarity, Manhattan Distance, K-nearest Neighbor, Improved Document Scoring Scheme

I. Introduction

Topic retrieval (TR), a subfield of information retrieval (IR) system, deals with the problem of identifying the topic a document discusses about. Research on information retrieval is dated back to 1950[1] and still remains as a very important research field due to the need of information in various real world tasks including ranking web pages by search engines, document categorization, similar topic or document extraction and many more. Among many different IR tasks, the problem of retrieving topic from a document gained huge attention of the researchers for its inherent complexity and diverse application area.

A topic can be defined as a collection of similar terms that occurs frequently among documents. For example, terms like "medicine", "doctor", "hospital" occurs frequently when the topic is "Health". This intuitive description leads to the formal problem formulation of the topic retrieval system. A topic retrieval problem assumes a collection of m documents available as a corpus C, that is, $C = \{D_1, D_2, ..., D_m\}$. Each document consists of a collection of t terms,

$D_x = \{T_1, T_2, ..., T_t\}$, for any document x. It is also assumed that, the true topic of each of the document in the corpus is also known in advance. One or more query documents is then given to the retrieval system, on which prediction should be made. The query document also consists of a collection of terms $Q = \{T_1, T_2, ..., T_t\}$. Generally, a topic retrieval system compares this query document with the corpus by assigning some real number score $s(Q, D_i)$ to each ith document of the corpus, which represents the similarity of the query with a particular document of the corpus.

On top of the formulated problem, several researchers has tried to solve the topic retrieval problem using several different techniques. All these techniques can be broadly categorized into several models including similarity based models which measures the similarity between a query document and documents from the corpus as the relevance criteria, probabilistic relevance models that estimates the probability of a binary random variable of success and failure, language models that looks at the semantic structure of the sentences and so on. Several interesting techniques including Probabilistic Latent Semantic Analysis[2], Latent Dirichlet Allocation[3] etc. has been proposed in the process.

Although diverse algorithms has been tried and tested for English language, topic retrieval in languages like Arabic [4,5,6], Tamil [7], Punjabi [8], Indonesian [9] etc. mostly took the text classification based retrieval approach. Almost all research work on topic retrieval done for Bengali language [10,11,12,13,14] primarily employed classification based approach. A major limitation in the classification based approach is that, they do not consider the semantic information present in a document. Moreover, the correlation between words were completely ignored. Past research on English suggests us that, it is a good idea to use an approach that uses the semantic information and word correlation information present in a document.

In this work, we therefore used a similarity based approach known as vector space model for the retrieval of

A New Design Approach for Gesture Controlled Smart Wheelchair Utilizing Microcontroller

Abu Tayab Noman
Electrical and Electronic Engineering (EEE),
International Islamic University Chittagong (IIUC)
Chittagong, Bangladesh
atnoman@yahoo.com

Md. Salman Khan
Electrical and Electronic Engineering (EEE),
International Islamic University Chittagong (IIUC)
Chittagong, Bangladesh

Mohammad Emdadul Islam
Electrical and Electronic Engineering (EEE),
University of Science and Technology Chittagong (USTC)
Chittagong, Bangladesh
sazzad.emdad@gmail.com

Humayun Rashid
Electrical and Electronic Engineering (EEE),
International Islamic University Chittagong (IIUC)
Chittagong, Bangladesh

Abstract— Every year, a large number of people become lame due to a road accident and unable to walk normally. Wheelchair is the best assistive device used by the older and differently abled people who cannot walk normally. The driving and controlling of traditional manual wheelchair are much harder task. The modern wheelchairs like joystick-controlled and voice-controlled wheelchair is a bit difficult to operate for certain people like the older and physically weak people. Moreover, this wheelchair is not cost effective. So the aim of this paper is to make such a cost-effective electronic gesture-based wheelchair which will be easy to operate rather than the joystick input to control a wheelchair using in-built gesture function of a smartphone and touch sensor. ATMega328 used as the processor long with the L298N motor driver, DC Gear Motor, Ultrasonic Sensor, TTP224 Capacitive Touch Sensor, Bluetooth Module and IP Camera. Special features of this wheelchair are that obstacles on the way of the wheelchair can be detected which can avoid the collision between the wheelchair and that detected obstacle. Another feature of this chair is to use an IP camera that gives visual and acoustic information to the guardian of the riding person.

Keywords—Microcontroller, Gesture Control, Smart Wheelchair, IP Camera

I. INTRODUCTION

More than 100 million people around the world, with physical inabilities, require the help of a wheelchair however just a little level of them really possess or have the freedom of getting one. Though manual wheelchairs have turned out to be valuable for the debilitated however it has just filled the need of individuals with minor inabilities [1].

Currently, a lot of assistive and guidance systems available out there in the market which makes more comfortable navigation for the physically disabled person. The systems that are developed are highly competitive in replacing the old traditional systems [2].

There are many assistive systems to control the wheelchair like Joystick, voice control and much more.

Most of the users feel comfortable with the joystick controller to control an electric wheelchair. But the joystick controlled wheelchair cannot be operated by the person whose upper half of the body is disabled [3]. In voice control system, there are problems in the noisy environment. The accelerometer sensor is the tilt detecting sensor used for hand gesture recognition. The capacitive touch control system allows the rider to control the chair by his finger. When the rider fails to control the chair, there needs a safety system to avoid an unwanted collision. This paper is to describe a smart wheelchair utilizing smartphone is introduced to control the navigation of wheelchair based on voice and gesture development [4].

Rakhi A. Kalantri and D. K. Chitre published a research proposal [5] that the wheelchair can be controlled in four directions by just tilting acceleration sensor. The ultrasonic sensors are used to control the wheelchair movement by taking over some responsibility for steering and avoiding collision with objects until the user is able to handle the situation. By applying the simple formula, they calculated the amount of tilt and output of tilt will decide to move in which direction.

Prof. Vishal V. Pande et al. [6] developed a wheelchair control system for the handicapped persons which can be controlled with his hand movement or his hand gesture recognition using Acceleration technology. They employ a sensor ADXL202, which controls the wheelchair hand gestures made by the user and interprets the motion intended by the user and moves accordingly.

Gaurav Kumar Soni et al. published a paper on Hand Gesture Recognition Based Wheel Chair Direction Control Using AVR Microcontroller [7]. They designed and developed a hand gestured based wheelchair that can be easily controlled by the help of a gesture recognition system. They designed their wheelchair with the help of MEMS 9 accelerometer sensor.

A battue on anionic dye (congo red) removal from aqueous solution of dye by acryl amide grafted polyethylene

Mst. Sumaia Aktar Sumi
Dept. of Chemical Engineering
Jessore University of Science and Technology
Jessore, Bangladesh
sumi.just@gmail.com

Md. Al Raihan
Dept. of Chemical Engineering
Jessore University of Science and Technology
Jessore, Bangladesh
raihan.che@gmail.com

Md. Wasikur Rahman
Dept. of Chemical Engineering
Jessore University of Science and Technology
Jessore, Bangladesh
wasikur.just@gmail.com

Syed Aminul Islam
Dept. of Chemical Engineering
Jessore University of Science and Technology
Jessore, Bangladesh
aminul.che.just@gmail.com

Dipa Dutta
Dept. of Chemical Engineering
Jessore University of Science and Technology
Jessore, Bangladesh
dipadutta009@gmail.com

Fazla Elahi
Dept. of Chemical Engineering
Jessore University of Science and Technology
Jessore, Bangladesh
fazlaelahi95@gmail.com

Abstract— Polymer modification has drawn much attention in the recent time among which modification by grafting is one of the most selective method. Radiation induced graft polymerization was employed for synthesis of acryl amide grafted polyethylene (AAm-g-PE) adsorbent. Different irradiation doses, monomer concentration and distilled water as a solvent were used to optimize grafting yield. The percentage of Grafting was optimized found to be 383% which was obtained for 6% monomer concentration at 12 kGy radiation dose without initiator in distilled water. The prepared grafted polyethylene was characterized by Fourier Transform Infrared Spectrometer (FTIR). The prepared grafted materials were used to be removed anionic dye (congo red) from aqueous solution of dye. The effectiveness of the adsorbent for removing dye from aqueous solution was evaluated by batch technique. The influences of different experimental parameters on removal process such as contact time and dye concentration were evaluated. Results showed that initial dye concentration of 30 ppm at pH 6.10 yields 65.4% dye removal efficiency by AAm-g-PE film.

Keywords—Grafting, Radiation Induced Grafting, Acryl amide, Polyethylene, Fourier transform infrared (FTIR), Acryl amide grafted polyethylene (AAm-g-PE) film, Congo Red.

1. INTRODUCTION

In order to meet the demand of polymeric age, modifying the properties of a polymer has become very crucial for target applications. In last few decades a large number of studies have done on graft polymerization to improve the characteristics of polymer [1-7]. There are large number of grafting techniques but in our studies have concentrated on grafting initiation by radiation technique [8-11].

More recently, the main interest in this field has been directed towards the modification of polymer in purpose of removing dye from waste water [12]. For this purpose, great effort has been developed to the development of new processes and chemistry aiming at modifying polyethylene by grafting with acryl amide to develop such a polymer of intense adsorption capacity of dye.

Congo red dye is very harmful for water system and aquatic life (almost 1 ppm is unacceptable).It badly affect and reduce the photosynthetic process of aquatic plants [13].

That's why, the removal of congo red from the effluents before discharge into the water is the assertion of the environment. Although various methods are available which have different efficiency and cost, however adsorption remains the outmost process because of its simplicity, high efficiency, easy recovery, and so forth [14].The current trend in research and development studies show that at present "Radiation Grafting on Polymer" is developing in three main directions: polymeric adsorbents, good adsorption capacity and removal of dye [15]. One of the new developments in the field of dye adsorption is the use of functional monomer grafted synthetic polymers as adsorbent. Adsorbent prepared by grafting of AAm on polyethylene (PE) and films have been investigated for the adsorption of perilous dye (Congo red) [16-17] from aqueous solution which demonstrated good potential of PE-based adsorbent in Congo red removal.

Acryl amide is a crystalline solid and has a greater solubility. Due to higher decomposing property it make septic non-thermally (produce ammonia) and thermally (produces carbon monoxide, carbon dioxide, and oxides of nitrogen). Along with these, acryl amide is widely used as a grouting agent and for the production a wide variety of high molecular weight polyacrylamides for industrial application. So grafted acryl amide show much more improved properties which could be a greater potential for the removal of dye.

2. EXPERIMENTAL

2.1 Materials

The ordinary polyethylene (PE), obtained from a commercial source. The chemicals used in the present work are Acryl amide was imported from Merck, Germany, acetone (used for washing PE film sample), aluminum iron(II) sulfate $[(NH_4)_2 Fe(SO_4)_2.6H_2O]$, which is used to resist the homopolymer., hydrochloric acid [HCl] (reagent used for acid wash of the grafted PE), and congo red (anionic dye) also used in this research. Besides that distilled water is used as a solvent and also used for washing

Automatic Shrinking and Sorting of Industrial Finished Products

Imam Hossain Saydee
Department of Electrical and Electronic
Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
ihsaydee@yahoo.com

S.M.G. Mostafa
Department of Electrical and Electronic
Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
mostafa_93eee_iiuc@yahoo.com

Bayazid Al Imran
Department of Electrical and Electronic
Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
imranctg91@yahoo.com

Abstract— To reduce the cost of products, the world is always striving to unveil the latest inventions that transform human lives. Automatic shrinking and sorting of finished products has brought a radical change in the industrial process. It has added a new dimension in the section of sorting process along with shrinking rather than analog processing which is done by PLC i.e. Programmable Logic controller. The system we have invented which is the combination of two individual processes successfully integrated into one system. On the beginning of the process shrinking is done through the hot chamber and later different sized products get separated into the different conveyer to go to market finally. The PLC we have used Siemens Logo which is programmed with comport version 7.0 software. The system has been run successfully as expectation. The industrial finished section will be benefited through this project by reducing time, cost and labors. One prototype is done for testing the system flexibility.

Keywords— Automatic; Conveyor; Shrinking; Sorting; PLC; Programmable Logic Controller; Finished Products; Siemens Logo; Prototype .

I. INTRODUCTION

Automatic Shrinking and Sorting of Finished Products is a system that can be applied to detect the object passing through main conveyor for packaging with polythenized wrapping paper and then it will be automatically sorted based on its different sizes collecting them into different sub-conveyors by means of electrical pushers. The present era mostly saturated by automatic controls over the most processes for which Industries are revised their processes. Experimentally types of automation processes are developed via micro-controlling devices like sorting of industrial products .Though it is run in lower cost, for the combination of larger processes it has tedious operation. On the contrary, Programmable logic controller has been brought up easier solution in the deployment for various processes.

Most of the Industries and factories (like in Bangladesh) are now moving towards the automatic system controlling. Some steel re-rolling mills have been better launched with fully PLC based automation. In this project automatic size-based product sorting is introduced with prior confirmation of shrinking process. Shrinking operation may have been done either mono-direction or bi-direction as per system requirements which can be imposed of different thickness in a layer. Materials mostly used for wrapping are made of ethylene or propylene polymers with having the level of temperature sensitivity. Most food products are surely preserved through air-tight wrapping on it which is mainly used for commercial purposes. We notice it verily in the preservation system of fruit product's marketing. This paper proposed a method to make cost effective PLC based automatic machine for shrinking and sorting of industrial finished products.

Shrinking of finished products (usually food preservation) plays an important role. By knowing the characteristics of a wrapping film, it makes easier to explain how exactly sealed the he targeted object [4]. An effort about the necessity of wrapping for longer ability of preserving foods to keep it with healthy quality where they showed individually its comparative advantages other than unwrapped one [5],[6]. Also it is required to reach the consumer or the receiver. For the quickest delivery, different products are being correctly sorted through different ways either manual or automated. Rather manual sorting is not suitable for many plants.

Nowadays automatic sorting is very common in every sector other than industries too. To recycle the garbage plastics and other objects, automatic sorting with the combination of auto detection technologies is developed to signify those objects like plastic bottles of various characteristics [11],[12],[21]. For satisfactory running as well as managerial controlling and supervisory information about the market, real-time/automated replenishment system is used in the vending operations [2]. For mail sorting system in the post office, Mani, et.al [3] proposed an automatic process using the artificial intelligence based on detection technology to minimize error. An automated liquid filling method is shown by N. Shaukat [13] using commands through programmable logic controller (PLC) where volumetric measurement is placed to controlled liquid flow.

Industrial products are mostly sorted through automatic procedure. K.R. Pardeshi, et.al [14] proposed a machine for product sorting with the use of microcontroller, sorting is based on undrilled and drilled of the two identical products. L. Peilin, et.al [1] proposed a way to sort out the industrial finished- metallic machinery parts automatically with detection from CCD camera vision through image recognition processes where whole system is controlled through PLC. A. Varpare, et.al [15] proposed a colors, material and weight based object detection system run by means of PLC. D. Tailor, et.al [16] proposed metallic

An Extension of Vigenere Technique to Enhance the Security of Communication

Md. Selim Hossain

Lecturer, Department of Computer Science and Engineering, Khwaja Yunus Ali University, Sirajgonj, Bangladesh
E-mail: selimtee@gmail.com

Md. Tarequl Islam

Senior Lecturer, Department of Computer Science and Engineering, Khwaja Yunus Ali University, Sirajgonj, Bangladesh
E-mail: tareq.cse@gmail.com

Abstract- Security is one of the most important issues in modern world. With the fast growing of internet and networked system, its applications such as banking, e-commerce, government etc. demand for effective raw material of information is growing rapidly. Cryptology deals with the data communication to transfer data in secure manner from place to another. It is the system by which cryptography and cryptanalysis are combined. It consists of two matching fields of study that are cryptography and cryptanalysis. We will discuss the cryptanalysis of Poly-alphabetic substitution cipher by applying the modified Vigenère table in which message is presented to encrypt and decrypt the data. Time so change, if we apply this process the brute force attack in the cryptanalysis is impossible.

Keywords: Cryptography, Poly-alphabetic, Cipher Text, Key, Proposed Vigenere Table, Plaintext, Information Security

I. INTRODUCTION

The word cryptography which derives from the Greek word kryptos means hidden or secret by some process and graphein which means writing documents. In encryption process the plaintext is encrypted by encryption algorithm and cipher-text is created, after then the cipher text is decrypted and we get the original message. Cryptography is the procedure to transfer information securely from sender to receiver without getting interfered by intruders. Cryptography is the system in which an algorithm is recycled to convert the information into an arrangement which is un-understandable to anyone except the sender and receiver who participate in this process. The algorithm must be reliable, efficient and easy to understand by the sender and receiver involved in this communication process. Here we use key along with the algorithm as a result we can use the algorithm again and again with the application of different keys by randomly chosen by the participants as the development of new algorithm is very tough task every time to share some information with others . Even if the algorithm is known to others so that the knowledge of key will be unknown to process the communication. Here below the Fig. 1 that deals with the

Overall process of cryptography in which the plaintext is encrypted using following particular algorithm and key by the sender part whereas the participants are unable to get the message without decrypting the cipher-text at the receiver part. Cryptanalysis is the process of getting the plaintext message from the encoded cipher text dishonestly without the absence of knowledge of algorithm that is used in the process of encryption.
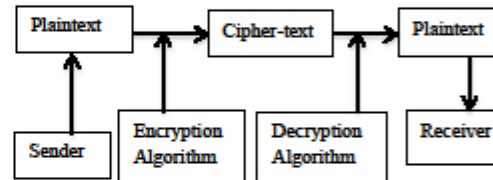

Fig. 1. Process of Encryption and Decryption [1]

In this paper, we have modified vigenere table to mark the cryptanalysis process more difficult by increasing the rows and columns including special symbols and digits. Next we elaborate some systems which are used to make the procedure of substitution cipher more secure. Then we discuss about poly-alphabetic cipher in detail. In the following part, we have proposed our new vigenere table consists of 69 rows and 69 columns which provides better level of security and attempts to encrypt the characters, numbers along with special symbols. Finally, we have discussed the conclusion and future work of this research [1].

II. BACKGROUND AND RELATED RESEARCH WORK

It was proposed by Nacira to enhance the vigenere cipher. Nacira provide two methods to include numbers in vigenere cipher. Firstly, a matrix that includes the number of 36 rows and columns to represent decimal and alphabets symbols. Secondly, each character is used to substitute by each other related to the alphabets. The paper describes that the cipher is dependent upon encryption degree; that is

EqSA: A Golden-IC Free Equal Power Self-Authentication for Hardware Trojan Detection

[1]Fakir Sharif Hossain, [1]Mohammed Abdul Kader and [2]Tomokazu Yoneda

[1]Department of Electrical and Electronic Engineering
International Islamic University Chittagong (IIUC), Chittagong, Bangladesh
[2]Graduate School of Information Science
Nara Institute of Science and Technology, (NAIST), Nara, Japan
Email: sharifo16@yahoo.com, kader05cuet@gmail.com, yoneda@is.naist.jp

Abstract— Due to outsourcing of numerous stages of IC manufacturing process in different foundries, the security risk such as hardware Trojan becomes a potential threat. This work presents a power based side-channel analysis framework, which magnifies the detection sensitivity and does not rely on a Golden IC. This method exhibits design for security (DFS) addressing scan chain partitioning and segmentation technique for scalability. An equal-power self-referencing approach is proposed in order to detect Trojans. The detection process uses parametric comparison of at least two neighboring regions, which consumes equal power for a set of selected patterns. We generate launch-on-capture test patterns and apply them with modification so as to restrict the switching activities (noises) from other regions. A theoretical analysis in the presence of die-to-die and intra-die process variations with the help of other existing methods is addressed. In our experiments, conducted for both combinational and sequential small Trojan circuits, we report a high detection rate thus substantiating its effectiveness in realizing an equal power self-authentication technique which is independent of any Golden IC.

Keywords— Hardware Trojan, Golden-IC free; Power Side-channel; Scan Chain; Scan Partition; Self-authentication

I. INTRODUCTION

Over the last decade, the threat of hardware Trojans in integrated circuits (ICs) has been a topic of concentrated investigation by the researchers and governmental entities. Hardware Trojan (HT) is defined as a malicious addition or a set of modifications into existing circuit elements, which can be exploited by a knowledgeable adversary to cause incorrect results, steal sensitive data, or even incapacitate a chip. Indeed, traditional test methods fall short in revealing hardware Trojans, as they are intended towards identifying modeled defects and, therefore, cannot disclose unmodeled malicious inclusions.

While numerous hardware Trojan detection approaches have been explored in the literature, side-channel analysis has been among the most powerful investigated ones [1]. The underlying premise of this method is that hardware Trojans will distort the side-channel parametric (temperature, electromagnetic radiation, input-output timing behavior or power) profile of an IC, even if they do not alter its functionality. Thus, ICs' parametric characteristics display a deviation from those golden references revealing HT detections through golden fingerprints. The trusted chips, however, often need to perform destructive de-layering of an IC to reach high accuracy in internal nodes with advanced imaging and painstaking reconstruction of its netlist through image processing methods, a rather tedious and costly [2]. Additionally, access to a trusted foundry facility, even if simply for producing a low volume of golden ICs, is typically of prohibitive cost, if at all available.

There are some reported approaches in HT detection relying on side channel fingerprints. Delay based side-channel analysis is proposed in [3,4]: the first work [3] generates delay test patterns using an ATPG tool depending on path delay information; The latter [4] puts additional gates into the circuit so that it can compare on-chip delays, in order not to rely on a golden IC. In [5], the authors present a multiple-parameter approach that exploits the intrinsic relationship between dynamic current and maximum operating frequency. The approach fails in identifying HTs whenever the impact of the HT is smaller than the variability.

Power-based side-channel analysis is introduced in [6, 7] in which random patterns are applied to compare dynamic power between IC under-test and the golden references. However, process variations (PV) mask the impact of small HTs. In order to improve HT detection sensitivity under large PV, several authors propose circuit partitioning approaches to localize switching activity into a specific region, minimizing activity in the rest of circuit [8, 9]. However, in their self-referencing technique, the systematic spatial correlation cannot be ignored resulting in difficulties in identifying small Trojans if any systematic intra-die variation is present. In [10], a method is presented that uses static power to perform gate leakage estimation by a system of equations that allows characterizing each single gate of the circuit. However, the scalability to big circuits remains an issue. [11] proposes a modification of the design to reorder scan cells, based on their geometric position. The method is layout-aware and practical for detecting Trojans. However, the scan cell partitions are of considerable size, setting in the small Trojan contribution is being challenging to detect by Trojan-to-circuit activity.

A Low-Cost GPS based Application for Navigating Shallow Waters

Sadman Shahriar Alam[1], Akib Jayed Islam[2], Md. Mahmudul Hasan[3], Md. Nafiz Imtiaz[4]

[1]Department of Electronic Systems, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway
[2,3]Department of EEE, American International University- Bangladesh (AIUB), Dhaka-1229, Bangladesh
[4]Department of EEE, Independent University Bangladesh, Dhaka-1229, Bangladesh
Email: sadmanshahriar23@gmail.com, akibjayedislam@gmail.com

Abstract—Parts of the Norwegian coastline have a dense population of skerries, which can easily lead to collisions of small boats. Bigger vessels have an abundance of navigation systems, Automatic Identification System (AIS), and similar systems. But smaller boats are not regulated by the same laws and are more likely to traverse shallow areas. With a low-cost GPS receiver in conjunction with digitized maps, it will be possible to classify areas as shallow and notify the user. By creating a mobile application, small boats can also get some of the information and warning systems as larger ships now have. Further, it can be possible to incorporate this into a standalone microcontroller with a GPS module. In order to maximize the number of users, the price of such a product needs to be sufficiently low in order to justify the investment. By implementing this concept with a smartphone application, the cost is reduced substantially, as the hardware is readily available. This paper will provide a mobile-based application that sends in coordinates using GPS and other information from the mobile device to the web-based server, which then returns depth data. The mobile application then decides whether you are approaching a safe or dangerous area. This application was tested on Elgeseter Bridge in Trondheim, Norway. Accuracy testing of the GPS modules on mobile phones and an external GPS module (Quectel L80) were carried out and the outcome of those tests are discussed in the result.

Keywords—*GPS; satellite navigation, mobile app; collision avoidance, AIS (automatic identification system)*

I. INTRODUCTION

As Norway has a long coastline, it is popular to own and use recreational boats. According to statistics, the number of islands in Norway is 239057, with an addition of 81192 skerries [1]. Due to these conditions, accidents happen frequently, and in the period from 2010-2015, 21.7% of boat owners reported having had one or more accidents at sea. The main type of accident is caused by boats running ashore, recording 35% of the total accident count [2]. These types of accidents cause damage worth 250 million Norwegian Krones every year [3].

Accidents within this category may be avoided with the use of proper equipment. A low-cost solution using GPS positioning data in conjunction with ocean maps will give the driver an opportunity to change the course before an accident occurs. The most important aspect apart from technical ones will be keeping the cost sufficiently low. In order to create a cost-efficient system for collision avoidance, GPS modules can be acquired at a low cost, or already built-in modules in smartphones may be used. These modules primarily decode the information transmitted by satellites and further transmits the decoded signals. The data received from the satellites are time stamped which makes it possible to find velocity based on two or more locations within certain limits of accuracy. With previously recorded location data in addition to the current location, the bearing can be calculated. Velocity combined with the bearing makes it possible to estimate the trajectory of a vessel.

By using this data in conjunction with digitized maps, valuable data regarding surrounding underwater terrain can be obtained. The trajectory of the vessel is estimated based on the previous location, while the digitized map is scanned for shallow areas in front of the vessel. The scanned area is based on the velocity of the vessel, to give the driver enough time to react. A warning is to be produced if the vessel is approaching a potentially dangerous shallow area.
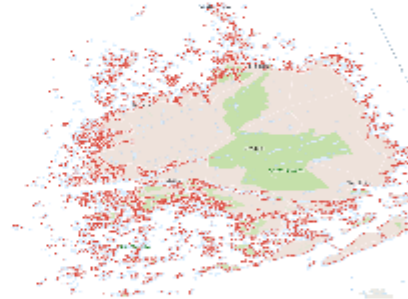

Fig. 1. Smøla – A place of a dense population of Skerries

As shown in Fig. 1, boats can be exposed to places with challenging driving conditions. The prototype suggested by this paper will make it easier to navigate through areas potentially dangerous with the assistance of GPS. The goal of this project is to design a system notifying the sailors well in advance when approaching a skerry or a shallow area. The rest of the article is structured as follows. Background theory related to this paper is described in section II. Section III & IV represent methodology & software implementation respectively. Results, data representation, future & conclusion are shown in section V, VI, VII & VIII.

II. BACKGROUND THEORY

A. Trilateration

When a receiver receives a signal from a satellite, it can calculate a distance - a distance from the satellite to the receiver. In order to determine a position at least three satellites are needed in theory. This is because a position has

Arduino UNO based Smart Irrigation System using GSM Module, Soil Moisture Sensor, Sun Tracking System and Inverter

Chandidas Karmokar
Department of Electrical and Electronic
Engineering
Stamford University Bangladesh
Dhaka, Bangladesh
engr.chandidas@gmail.com

Jakaria Hasan
Department of Electrical and Electronic
Engineering
Stamford University Bangladesh
Dhaka, Bangladesh.
jakaria287@gmail.com

Shaikhul Arefin Khan
Department of Electrical and Electronic
Engineering
Stamford University Bangladesh
Dhaka, Bangladesh
arefinkhn@yahoo.com

Md. Ibrahim Ibne Alam
Department of Electrical and Electronic
Engineering
University of Asia Pacific
Dhaka, Bangladesh
ibrahim.eee@uap-bd.edu

Abstract— In this paper, Arduino based Smart Irrigation System using GSM Module and Sun Tracking Solar system has been explored. This system is hoped to be very convenient and affordable for the people of rural areas. The module being targeted for the large population of the rural sector is hoped to be a huge contribution to the community. To meet the demand of efficient irrigation system, this paper presents the design and implementation of a low cost yet flexible smart irrigation system where with the help of cell phone the status of the submersible pump can be observed. The design is based on a standalone Arduino UNO board where the communication between the cell phone and the Arduino UNO board is wireless. The system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Thus the System is hoped to outperform current smart irrigation systems. It is believed that this paper will play a vital role for the rural people of the under developed and developing countries.

Keywords— *Arduino UNO, GSM Module, Soil Moisture Sensor, Submersible pump, Liquid crystal display (LCD), Polycrystalline type Solar Panel, Light Dependent Resistor (LDR), PWM charger controller, Single Pole Double Throw (SPDT) Relay.*

I. INTRODUCTION

In today's world, everything is about "smart" technology. As technology advances more and more, processes in the home will become more automated and smart. The reasons behind are, smart devices tend to decrease waste and increase efficiency which maximizes capabilities while minimizing cost. Smart irrigation systems offer a variety of advantages over traditional irrigation systems. Smart irrigation system tends to optimize resources so that everything receives what it needs without needless waste. Smart Irrigation systems can reduce water bills significantly. Whether someone is an irrigation installer, landscaper, maintenance worker or a home owner, these systems are affordable, they save precious water resources and keep landscapes in peak condition. Smart Irrigation systems enable weather-based watering which take into account seasonal variations, soil characteristics, plant and weather conditions to reduce over-watering while providing required water to maintain optimal moisture to the landscape. Thus the system, (1) Save Time – The system does all of the work, (2) Save water – The system is much more efficient than traditional time based systems, (3) Save money – Less water means lower cost and (4) Save the plants – plants will be kept in peak health. [1]

In the present era one of the greatest problems faced by the world is water scarcity and agriculture being a demanding ooccupation consumes plenty of water. Therefore a system is required that uses water judiciously. The main focus of this paper is to overcome this problem by using smart irrigation system. The system estimate and measure diminution of existing plant moisture and restore water as needed while minimizing water use. The whole process of irrigation done by the traditional way can be performed using around 20 percent of the water with the help of smart irrigation. Thus to reduce the large amount of water usage in irrigation, we need smart irrigation system that can save the 80% water being wasted right now. [2], [3]

In addition to the water wastage there are some other problems of traditional irrigation system. Since, the water is irrigated directly in the land, plants go under high stress from variation in soil moisture and therefore plant appearance is reduced. The absence of automatic controlling results in improper water control system. Nowadays farmers are facing the scarcity of water for irrigation. At present there is an emerging global water crisis where managing scarcity of water has become a serious job. This growth can be seen in countries which have shortage of water resources and are economically poor. So it can be said that the agricultural areas of those countries need a solution and therefore an optimized Smart Irrigation System is needed to be designed which will solve the problem gradually. [4]

Cost Aware Grid Energy Minimization in Heterogeneous Green Wireless Networks

[1]Md. Shamimul Islam, [2]Abu Jahid, [3]Md. Anwar Sadath
[4]Md. Kamrul Hasan Monjo, [5]Syed Rafiee Ahmed and [6]A.S.M Tanvir Islam
[1]Department of Electrical and Electronic Engineering, University of Information Technology and Sciences
[2,6]Department of Electrical, Electronic and Communication Engineering, Military Institute of Science and Technology
[3]Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology
[4]Department of Electrical and Electronic Engineering, Bangladesh University of Business and Technology
[5]Department of Electrical and Electronic Engineering, Islamic University of Technology
[*]Corresponding email: shamim142is@gmail.com

Abstract—Recent emphasis on efficient energy utilization in green mobile communication has become a paramount concern of reducing carbon footprints to make the network greener. Energy harvesting from ambient energy sources has the potential to reduce the dependency on grid power supply or diesel generators (DG), providing attractive benefits in diverse domains. This paper's aim is to minimize the on-grid power consumption with the integration of green energy generators such as solar PV modules while satisfying system constraints. We decompose the problem into two categories: grid energy minimization problem and the renewable energy system sizing problem, provisioning minimum net present cost. Extensive research has been carried out to address energy yield, cost movement, and greenhouse gas emissions aspects in the context of LTE heterogeneous cellular networks (HCN) in consideration of the intermittent nature of solar energy generation and temporal dynamics of traffic load demand. Numerical results illustrate a substantial improvement of on-grid energy savings and subsequent carbon footprints of the proposed network model compared to the conventional scheme.

Index Terms—Green cellular network, Renewable energy, Energy harvesting, Energy savings, Heterogeneous networks, LTE.

I. INTRODUCTION

From the very beginning of the human civilization, people are prone to exchange information for shaping their daily life. Recently, the need of communication has grown tremendously to support this omnipresent data demand in telecommunication which has led the network operator to employ an enormous number of base stations (BSs) [1]–[3]. Among all the components in the cellular network, the BSs primarily considered as the most electricity hunger types of equipment which avidly drain electricity up to 50 to 80 percent of the entire energy required for the whole communication network [4], [5]. This heavy electricity consumption results an immense pressure on the utility grid and discharges excessive amount of harmful greenhouse gas emissions to the environment. The production of CO_2 is expected to increase from 86 Mt to 235 Mt in 2020 compared to 2007 [6]. As an indication of this trend, this tremendous burden on the utility companies of developing country like Bangladesh has been led security of national demand apart from environmental implication.

Consequently, over the last decades, the grid energy savings is the superior concern for achieving significant energy efficiency (EE) performance and reduction of pollution-intensive toxic gas emissions in the cellular network. Due to
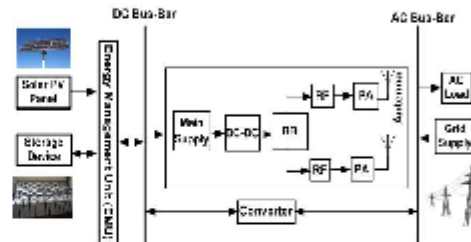

Fig. 1: Proposed network model.

the zero fuel cost and clean electricity, powering the radio access network by renewable energy (RE) is an outstanding solution and this has gained the monumental attention of network operators, industry, and academia [7]–[9]. Utilizing solar energy to the BSs has been recognized as a fruitful solution to the perspectives of cost-effectiveness and greening RAN infrastructure. However, the PV energy generation is not sufficient to support the BSs load demand due to the stochastic nature, sunlight intensity and hence, grid energy is kept as a secondary energy source to provide reliable supply to the BS. The PV energy has the potential to reduce grid consumption and shrink carbon footprints. Authors in [10] pointed out energy-cost performance for PV/grid enabled cellular networks without considering real traffic pattern. In addition, the carbon footprint aspect is not discussed in consideration with SRB regime. Reference [11] developed standalone solar power supply solution for LTE BS dimensioning regardless the cost analysis. Note that a single supply technology could lead to the outage effect during PV malfunctions. Han and Ansari [12] offered an energy optimization solution to reduce the on-grid power consumption utilizing solar energy in heterogeneous wireless networks supplied by hybrid energy sources. Nevertheless, this paper does not consider the tempo-spatial variation of green energy production and cellular traffic variability.

In this paper, a PV/grid hybrid power supply is introduced to maintain the network sustainability for the LTE heterogeneous cellular networks with adequate storage devices. The optimal dimension of the hybrid PV/grid system with allied cost is estimated using the hybrid optimization model for electric renewables (HOMER) software. An extensive simulation has been done to analyze the system performance in terms of bat-

Line Following Autonomous Office Assistant Robot with PID Algorithm

Mohammed Abdul Kader
Dept. of EEE
International Islamic University
Chittagong (IIUC).
Chittagong, Bangladesh
kader05cuet@gmail.com

Md.Zakaria Islam
Research and Development Division
Hyper Systems ltd
Dhaka, Bangladesh
zakariarai.mailbox@gmail.com

Jobair Al Rafi
Dept. of EEE
International Islamic University
Chittagong (IIUC).
Chittagong, Bangladesh
mjrafi7234@gmail.com

Muhammad Rasedul Islam
Dept. of Electrical and Mechanical
Engineering
Nagoya Institute of Technology
Aichi - ken, Japan
eee.rasel16@gmail.com

Fakir Sharif Hossain
Dept. of EEE
International Islamic University
Chittagong (IIUC).
Chittagong, Bangladesh
sharifo16@yahoo.com

Abstract— The involvement of assistive robot in every aspect of our life is immensely increasing in today's world. In this paper, a line following robot to assist an office is developed which can securely transfer hard copy of office file, tea snacks etc from one table to another inside an office autonomously as per user direction. Anybody can call the robot from any table by pressing a PUSH button. As a response of calling, the robot will come to the caller table following a path and a locker placed in the robot will be unlocked automatically. The caller then placed the file or any other materials in the locker and can direct the robot to another table by pressing another push button. The locker will not open until the robot reach at directed table to ensure the security. The robot also can detect obstacles and can produce alarm if someone stands in its path. The robot smoothly follows the path with the PID algorithm. The main components that are used to construct the robot are microcontroller, IR sensor module, RF Tx-Rx module, ultrasonic sensor, buzzer and DC motor. In every office there required a peon to transfer the files or other materials whereas they have to perform other tasks too. This robot can be useful to decrease the workload of office peons to involve him with more essential works.

Keywords— *line following Robot, office assistant robot, microcontroller, infrared Sensor, RF Tx-Rx, motor driver, DC motor, ultrasonic sensor*

I. INTRODUCTION

In a large corporate office the administrative personnel, executives or staff of several divisions work together. They need to share hard copy of different confidential files or documents or other things among themselves inside the office space. It is not convenient for them to run throughout the office to share these documents emancipating their important and busy working time. Therefore they depend on a peon as their helping hand. But in this era of technology an employee having responsibility of sharing files only is considered as wastage of human resource and also sometimes a peon can be a threat of confidentiality of the documents. In this situation, a robot can be an alternative solution to act as a office peon to share files as well as to serve tea, coffee or snacks among the employee.

The line follower robot is a good example of autonomous machine controlled by a feedback mechanism which follows a particular path or trajectory sketched either black line in a white area or white line in a black area (visible) or a magnetic field (invisible) [1]-[2]. The stunning and easy control mechanism of line follower robot encompass it in many applications like industrial logistics [3]-[4], public transport [5], restaurant [6], agriculture sector [7]-[8], fire safety [9], Library inventory management system (LIMS) [10] etc. Sandeep Bhat et. al. developed a line follower robot as a hotel waiter and military baggage carrier [11]. Rabiul hossen rafi et. al. proposed a line follower robot for irrigation based application to minimize the water loss in irrigation [8]. M.A Kader et. al. has also developed line follower based fire extinguisher robot for residential building and garments industry [9].

In this paper, we have proposed and implemented a new application of line follower robot named office assistant robot. The purpose of this robot is to share hard copy of files, documents or any other materials from one table to another inside the office and serving coffee, tea, snacks etc. to office employees. The robot follows line with PID algorithm which makes it smoother and low power consuming in following line compared to ON-OFF algorithm. The robot has a solenoid locker which remains locked throughout the path and unlocks automatically at the particular destination to ensure the security of the files or documents. It can also detect the obstacle in its path and give horn to the concern to clear its path.

II. SYSTEM OVERVIEW

The overall system alienated into two parts: Calling Circuit and Robot Circuit. The block diagram of the calling circuit is shown in "Fig. 1". The main function of the calling circuit is to call the robot and to know the status of the robot whether it is busy or not. A user can call the robot from any table by pressing a PUSH button placed in his table. Every table in the office has definite number of PUSH buttons and a number of PUSH buttons in each table is equal to the number of tables in the office space. The input of the PUSH buttons is scanned by microcontroller and microcontroller unit can send the sensed signal in an appropriate form to the robot circuit through the IR transmitter. The status of robot is received by RF receiver and indicated by busy state

A Demand Side Management Algorithm with Revision of Energy Usage Blocks for Residential Customers of Dhaka City

Abidur Rahman
Dept. of Electrical & Electronic Engineering
Northern University Bangladesh
Dhaka, Bangladesh.
Email: abidr92@gmail.com

Tareq Aziz
Dept. of Electrical & Electronic Engineering
Ahsanullah University of Science and Technology
Dhaka, Bangladesh.
Email: taziz@ieee.org

Abstract—The traditional grid system is evolving towards smart grid at a rapid rate. All possible measures are being taken in order to reduce the energy usage in residential, commercial & industrial feeders. Peak demand of the residential users of Dhaka city is growing rapidly over the last few years and it is mostly due to the extensive usage of heavy loads such as air conditioner, washing machines, electric cooker, room heater, geyser etc. This paper proposes a revision of the present residential tariff scheme of utility, which encourages the customers to shift their heavy loads to off peak hours. Results show that the proposed scheme successfully lowers the customer bills without burdening the low energy consumers.

Keywords—Demand Side Management; Meter; Time of use; Tariff

I. INTRODUCTION

New technologies are always being incorporated to progress towards achieving the challenges of implementing the smart grid. The transition from traditional grid system towards smart grid is one of the key challenges [1]. Two-way communications between consumers & utility providers with enhanced data managing software is required in order to facilitate advanced energy efficient distributed network [2]. Energy efficiency can be achieved whenever unpredictable load demands and renewable energies are maintained through the usage of data processing algorithms [3]. Demand side management (DSM) is a significant contributor of the smart grid concept. DSM enables the consumer and utilities to take necessary roles, which eventually balances demand and supply scenario of power industry. A large number of utilities around the world have already adopted DSM to advance towards smart grid. The authors of [4] conclude that pricing scheme is an effective tool to change the behavior of consumers.

Among various pricing methods under DSM, the time of use (TOU) pricing scheme is the most widely adopted approach which is based on different energy pricing at different time periods. In this method price can be different for a certain amount of hours in a day or can be different for a certain amount of days in a week. [5]. A large number of energy consumers in California, US are priced using the TOU method. They have three different intervals such as peak, off-peak and mid-peak [6]. The consumers may be rewarded with attractive incentives or may have lower energy rates if they shift their loads to off peak hours. According to [7-8], choosing TOU rates can reduce the peak demand by 8-13%.The low energy consumer gets the best out of TOU scheme if they run their loads in off peak hours. At the same time, if they are unable to shift their loads from peak hours, the low energy consumers will suffer due to high peak pricing. Their average bills are reduced by 10-20% [9]. These users may change their lifestyle due to the peak-off peak hours resulting in high discomfort. On the other hand, some high income groups may not get proper motivations since the change in their electric bills are only a small portion of their large income. Hence they do not shift their appliance usage to off peak hours. These consumers are labeled as "selfish consumers" in [10] since they are the prime reason for increased energy bill in peak hours. Critical peak pricing (CPP) method is similar to TOU method. It usually charges at a different rate in some occasions where the feeder is under stress [11]. Dominion Virginia Power company uses a CPP method in 25 different times per year each having an interval of 5 hours. That is equivalent to 125 hours per year [12]. In the peak load pricing (PLP) scheme, there are different rates for different time intervals of a day. These rates are declared to the customers before each day [13]. In Auckland, New Zealand, the consumers are highly involved in the PLP method because of the increased peak price [14].

As new methods are being adopted for DSM, new challenges are also introduced along the way. Most of the methods in DSM program require expensive smart meters, two-way communication system between utilities and customers, voltage/var controller etc. On the other hand, the desire to change one's lifestyle creates unresponsiveness in the consumers which affects DSM program. Asymmetric implementation of DSM in different phases may create voltage volatility [15]. Furthermore, the volatility in electricity pricing is because of the low-income groups who have low level of consumption and also because of the high income groups who are unresponsive towards increased energy price [16].

Bangladesh is a developing country where the demand for electricity usage is growing rapidly. The current population of Bangladesh is 166,317,810, population density is 1278 per sq km and population growth rate is 1.03% [17]. Wide-scale constructions of new infrastructures in Dhaka city along with large usage of energy intensive appliances by customers endanger the future energy security. Each year, the demand for electricity in Bangladesh is increasing by around 500MW according to [18]. Similar to many other countries,

Energy Sustainable Traffic Aware Hybrid Powered Off-Grid Cloud Radio Access Network

[1]Mst. Rubina Aktar, [2]Abu Jahid, [3]Md. Farhad Hossain and [4]Md. Al-Hasan
[1,3]Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology, Dhaka-1216,
Bangladesh, [2]Department of Electrical, Electronic and Communication Engineering, Military Institute of Science
and Technology, Dhaka-1216, Bangladesh, [4]Department of Computer Science & Engineering, Bangladesh Army University
of Science & Technology, Saidpur Cantonment, Bangladesh
Email: [1]rubi07eee@gmail.com, [2]setujahid@gmail.com, [3]mfarhadhossain@eee.buet.ac.bd, [4]al-hasan@baust.edu.bd

Abstract— The aggregate power supply of solar photovoltaic (PV) and diesel generator (DG) is an attractive solution for the next generation off-grid cellular network where the electricity is not available. In this paper, we emphasized on energy efficiency (EE) for cloud radio access network (C-RAN) architecture in the context of 5G cellular networks with hybrid supply. The intermittent nature of PV generation is counter balanced by the DG supply which has emerged as a promising option for energy sustainability. The prime aim is to maximum utilization of green energy harvested from installed PV panels for greener the envisioned network. In addition, the environmental effect such as carbon footprint has been comprehensively analyzed by varying solar capacity. An extensive simulation has been carried out for evaluating EE performance of the proposed network varying different system parameters such as transmission power, solar module capacity in consideration of the real traffic demand. Numerical results justify the effectiveness of the proposed scheme.

Keywords—Energy efficiency, Hybrid power supply, C-RAN, Sustainability, Renewable energy.

I. INTRODUCTION

During the last decade, there has been remarkable development in cellular networks market due to the ubiquitous availability of internet access in worldwide. The number of users and corresponding cellular traffic has escalated astronomically [1]. To cope with the tremendous growth of data demand across the globe, cellular networks are deploying an increasing number of base stations (BSs) which leads to a voluminous inflation in energy consumption and incurs high operational expenditure (OPEX). Also, network densification places an extensive burden on the electric grid system as well as fuel consumption in DG set. The rapid growing energy consumption has not only increase cost and but also has a direct effect on carbon emission. It is estimated that about 2%–2.5% of total global carbon emissions are from Information and Communication Technology (ICT) industry and this is expected to increase every year through 2020 [2], [3]. Therefore, concerns of global warming and up trending energy costs due to the rising energy consumption have stimulated the researchers in green cellular communication networking for future wireless networks.

Being motivated by environment aware energy savings considerations, many operators are using renewable energy (RE) sources e.g., solar panels, at the BSs sites [4]-[6]. However, the energy production from RE sources offers low cost electricity to mobile network operators. But, the mismatch between traffic distributions and harvested energy may severely deteriorate the energy sustainability performance. As the cellular systems are expected to provide reliable services with guaranteed quality of service (QoS), powering the BSs by hybrid supplies combining renewable energy sources with non-renewable DG power source has become a promising alternative.

In traditional cellular architecture, BS consumed about half of the total power in radio access network (RAN) infrastructure, while other half is used by other equipments such as cooling device, RF unit, baseband signal processing unit etc. [7]. C-RAN is a newborn mobile network architecture whose concept was first proposed in [8] has the capability to reduce the power consumption compared to the traditional RAN network architecture. C-RAN inaugurate a new concept in mobile networks, by pooling the baseband processing units (BBUs) in a centralized data processing centre known as BBU pool [9]. Since in C-RAN the BSs are located in a common place so the number of cell sites is reduced, hence it reduces power consumption of the air-conditioning and other site support equipments. Also, the centralized BBU pool reduces the cost of BSs deployment and operation. From the view of energy efficiency, densely deployed remote radio heads (RRHs) increase energy consumption of C-RANs, leading high OPEX and produce pollution intensive carbon footprints. Being inspired to this issue, we are motivated to propose a hybrid powered C-RAN for achieving an increased level of energy efficiency.

Being dealt with aforementioned up trending energy consumption, researchers are searching way to improve EE in the cellular networks. Authors in [10] have proposed an energy minimization method in a green heterogeneous cellular network with hybrid energy supplies for peak arrivals. In [11], Authors investigated the benefits of the incorporation of renewable energy sources in conjunction with traditional grid supply to power up the BSs. However, the EE analysis is not comprehensively analyzed for transmission power, PV array capacity. Furthermore, carbon emissions parameter has not been widely studied. The feasibility study and cost optimization of a hybrid power generation system compatible for a LTE BS is presented in [12]. But the authors do not focus on EE metrics performance. The energy cooperation mechanism with renewable energy assisted hybrid power networks have studied in [13].

An Optimization Framework to Implement Demand Side Management in Hybrid Buildings

Mir Muntasir Hossain
Department of Electrical and Electronic
Engineering
Northern University Bangladesh
Dhaka, Bangladesh
mirmuntasir.eee@gmail.com

Kazi Rehnuma Zafreen
Department of Electrical and Electronic
Engineering
Bangladesh University
Dhaka, Bangladesh
rehnumazafreen@gmail.com

Tareq Aziz
Department of Electrical and Electronic
Engineering
Ahsanullah University of Science &
Technology
Dhaka, Bangladesh
taziz.eee@aust.edu

Md. Salehin Ferdous Kader
Department of Electrical and Electronic
Engineering
Fareast International University
Dhaka, Bangladesh
princemahin4@gmail.com

Abstract—In recent times, immense research and initiatives have been carried out to transform the traditional gird into supremely efficient smart grid (SG). An essential section of SG is demand side management (DSM) that facilitates to utilize energy in a prudent way by maneuvering the loads besides following the mainstream concept of augmenting the power production capacity, and also commensurately curbs the noxious carbon dioxide and sulfur dioxide production. In this paper, the prime motive is to bring the peak to average ratio (PAR) closer to unity of a hybrid building consisting of both residential and commercial customers, which has been an emerging sector in developing countries, by implementing smart strategies of DSM. An effective algorithm based upon DSM methodologies has been formulated keeping in consideration the cardinal comfort constraints of users. The proposed algorithm's efficacy to minimize PAR of a hybrid community has been demonstrated through MATLAB simulation results. The propitious outcomes have shown that DSM strategies could be adopted for hybrid sector by the utility providers with the help of smart energy meters in future without the necessity of manual load controlling during exigencies and avoiding the most undesirable approach of load shedding.

Keywords—hybrid building, commercial load, peak to average ratio, demand side management, load shifting

I. INTRODUCTION

The smart grid's evolutionary technologies are superseding the orthodox power grid's inefficient and backdated establishments with automation, interactive communication, real-time information, distributed generation, storage facility, auto recovery from failure, quality power, optimization, consumers' active participation, electricity market liberalization, etc. [1], [2]. In SG, the exigency of fulfilling sudden energy demand, power dearth, volatile load changes are occurred to minimal and correspondingly the supply reliability and security are ensured [3]. DSM is an imperative sector of the SG which is a combination of strategies for load governance, mitigation of peak to valley load discrepancy, judicious use of energy, utilization of intermittent renewable sources more efficiently, electricity market management [4]. Alongside DSM, incentive or price based Demand Response (DR) programs are emerging for quite a while. An agreement is initially reached between the end users and grid operators to encourage the consumers to modify their usual consumption habit regarding the varying price of electricity during different hours. In some programs, customers voluntarily reduce their consumption in response to operator's signal for achieving monthly bill credit [5].

In [6], [7] various models of DSM have been discussed to reduce the cost of electricity bill which is the most desired objective whereas, some researchers have emphasized on the comfort of users [8], [9]. A crucial part of DSM is the optimization algorithm. A genetic algorithm is implemented in combination with real time pricing scheme in [6] for the minimization of appliance delay and consumption cost. In [10], Johanna et al. have proposed a technique for load profile analysis and DR implementation aftermaths. In [11], to explore the outcomes of DR programs, residential appliances are classified. For several smart houses, Li X et al. in [12] reviewed various control methods of building energy modeling. In [13], DSM optimization algorithms and pricing for the residential, commercial and industrial areas have been extensively discussed. In [14], HVAC pre-cooling operation, lighting and water pump controllability in commercial buildings have been mentioned. An assessment of consumer based DSM impacts on a commercial building is shown in [15]. M. Lemay et al. in [16] have presented a control method for diverse apparatus in a central building and pointed contrast in apparatus control regarding their controllability.

Power demand at residential level is very complicated and mercurial comprising of various aspects like customers' habitual propensity, human occupancy, appliance categories, operating cycle of loads and uncertain weather changes, etc. [17]. For commercial sector, the power consumption is correlated with the business or office hours which is mainly during day times and the time frame is alike in most organizations. Moreover, multi-storey hybrid buildings consisting of both residential and commercial sectors are emerging in cities, especially in developing countries. Hence for these hybrid sectors, extensive analysis need to be carried out. In order to manage the peak demand problem and obtain efficient regulation of power consumption, adequate research is essential to motivate users for active participation in DSM.

In this paper, a smart DSM outline has been proposed for overcoming the prevailing energy management issues of residential and commercial sectors. To implement DSM, load

Design and Testing of Microcontroller Based Versatile Firing Pulse Generation for Thyristor and Insulated Gate Bipolar Transistor (IGBT)

Md. Saiful Islam
American International University-
Bangladesh (AIUB)

Md. Rifat-Ul-Karim Shovon
American International University-
Bangladesh (AIUB)

Mohd Muinul Haq Mamun
American International University-
Bangladesh (AIUB)

M A G Khan
Rajshahi University of Engineering &
Technology (RUET)

Abstract— Thyristor based controlled power is very popular in industrial applications. This paper represents design and implementation of firing pulse generation for a single phase converter using microcontroller for both Thyristor and IGBT. Different types of firing pulse generation for single phase converter are available for Thyristor only and inadequate work has been found for Insulated Gate Bipolar Transistor (IGBT). In this paper, a digital controlling system has been developed using microcontroller to generate the firing pulse. The performance of the proposed circuit is checked by simulating the model on Proteus Simulations packages. Then a prototype is developed in the lab and tested for successful operation. Experimental results obtained from oscillographic displays are found to be in good agreement with the theoretical expectation and simulation results.

Keywords— *Microcontroller, firing pulse, opto-coupler, ZCD, thyristor, IGBT*

I. INTRODUCTION

For the control of electric power or power conditioning, the conversion of electric power from one form to another is necessary and the switching characteristics of the power devices permit these conversions [1]-[3]. Power converters perform these functions of power conversions. A power converter is an electrical or electro-mechanical device for converting electrical energy which could be as simple as a transformer or far more complex systems. As the technology for the power semiconductor devices and integrated circuits develops, applications of power electronics potentiality becomes wider. Although many power semiconductor devices are commercially available; however, progress in this field is continuing. In power electronics engineering power converters can be classified into six categories, among them AC-DC converter or rectifier is one of them. Power diodes, Thyristor and Insulated Gate Bipolar-Transistor (IGBT) plays an important role in AC-DC conversion of electric power. Among them uncontrolled rectification done using power diodes and fully controlled rectification can be obtained using Thyristor and IGBT. The major challenges in AC-DC converter is the generation of firing pulse cirucuit precisely. Different types of firing pulse circuits are available in this field and most of them are electronically controlled circuits using thyristor only.

Thyristors and IGBT both are extensively used in power electronic circuits. They are operated as bistable switches, operating from nonconducting state to conducting state. Thyristor and IGBT both are four layer three terminals semiconductor device. In 1978, Hoang Le-Huy developed a digitally controlled high performance trigger circuit using Phase-Lock Loop principle in which the delay angle was controlled by an eight bit digital input [4]. In 1982, Pei-Chong Tang, Shui-Shong Lu, and Yung-Chun Wu proposed and implemented a firing scheme prototype based on a microprocessor to control an antiparallel-connected three-phase thyristor dual converter [5]. Table-look-up algorithm was applied to speed up the firing angle response. In 1986, Fang L. Luo and Roland J. Hill, developed a digitally controlled thyristor converters using fast response and optimum methodology [6]. In 2009, XU Wuxiong proposed and implemented a microcontroller based three phase 6 pulse (α= 60°) digital gating circuits using thyristor only [7]. Hardware implementation of six channel triggering pulse generation was done by microcontroller and other electronic components with a delay angle of 60^0. No laboratory test done with load. In 2011, Richard W. Wall et.al design and fabricate a single processor based firing pulse generation circuit using Phase -locked loop algorithm. An embedded microcontroller on the processor chip (87C196KD) is responsible to generate the triggering circuit for three phase system [8]. In 2013, Mukesh Gupta et.al proposed and implemented a gating circuit by using cosine control technique [9]. Simulation was done using MATLAB software and experimental results were verified for different resistive and motor load. In 2014, Arifur Rahman et.al developed a microcontroller based phase angle controlled prototype as well as accommodates soft start capability for single phase induction motors [10]. In this prototype two microcontroller is responsible to generate the PWM signals and calculation of RMS output voltage respectively. The prototype was tested with pure resistive loads. In the same year, Zameer Ahmad and S.N Singh implemented a 8051 microcontroller based advanced triggering circuit whose delay angle is controlled by the feedback signal given by Analog to Digital Converter (ADC) to microcontroller unit [11]. Simulation results were verified successfully with experimental results. In 2015, Arvind Kumar Singh developed a single phase 2-pulse triggering circuit using

Electrical and Optical Properties of Zinc doped Titanium dioxide Thin Films

Fariha Anjum
Department of Physics
University of Dhaka
Dhaka, Bangladesh
farihamoni08@gmail.com

Muhammad Samir Ullah
Department of Physics
Bangladesh University of Engineering
and Technology, Dhaka, Bangladesh
samirullah@phy.buet.ac.bd

Jiban Podder
Department of Physics
Bangladesh University of Engineering
and Technology , Dhaka, Bangladesh
jpodder@ phy.buet.ac.bd

Md. Shahjahan
Department of Physics
University of Dhaka
Dhaka, Bangladesh
mjahan@univdhaka.edu

Md. Mizanur Rahman
Department of Physics
University of Dhaka
Dhaka, Bangladesh
mmizan@du.ac.bd

Abstract-We have prepared pure Titanium dioxide (TiO_2) and Zinc (Zn) doped TiO_2 thin films by spray pyrolysis deposition (SPD) technique. The deposition temperature of the prepared thin films was maintained at $450°C$. The structural property of the prepared thin films was characterized by X-ray diffraction (XRD) method. The results of XRD data showed that the structure of the as-deposited thin films was amorphous phase. The surface morphology and composition of the thin films were investigated by scanning electron microscope (SEM) and energy dispersive X-ray Spectroscopy (EDS), respectively. The electrical property, in particular, electrical resistivity was observed by four-point probe method as a function of temperature. It is depicted that the resistivity decreased with increasing temperature and exhibited semiconducting nature of the sample. The optical transmittance was measured by the UV-visible spectrometer. The transmittance for the pure TiO_2 was found about 70% in the visible region.

Keywords- Spray pyrolysis deposition, amorphous phase, doped TiO_2, electrical resistivity, semiconductor, optical transmission.

I. INTRODUCTION

Titanium dioxide is one of the most well known transparent conductive oxides (TCOs) which has potential applications in both science and technology [1]. It becomes an attractive material for its wide applications in different areas such as solar cell, sensors, photo catalysis, microelectronics and ultraviolet blockings, ceramic membrane, etc, [2-4]. From the environmental point of view, it is used in photodecomposition of water and purification of pollutants in environment and wave guide and hence reduces the harmful impact of different chemicals on environment [5]. From the biological point of view, TiO_2 has antibacterial agents which are extensively used in hospitals and healthcare setting [6]. So it can be considered as a safe material of human beings and animals. On the other hand, TiO_2 is an n-type semiconductor having three crystal phases: anatase, brookite and rutile. Among them anatase and rutile have tetragonal structure and brookite has orthorhombic structure [7]. Many studies have been reported regarding the characterization of TiO_2 [8-9]. To get more desired behavior or to improve interesting properties of semiconducting thin films, adding of impurities (metals or non-metals) has been initiated in the research field. As a result the incorporation of the dopant atom in the lattice structure of the compound reveals a more effective output. To enhance the effects of TiO_2 thin film, different dopants like Sn , V, C , B etc. have been added in the microstructure of TiO_2 [10-13]. Among the metal ions, Zn is a sustainable supply of dopant materials because of its availability, low price and non-toxicity. The ionic radii difference between Zn^{2+} (0.74Å) and Ti^{4+} (0.68 Å) is very much small and this attributes Zn as an effective dopant. The incorporation of Zn^{2+} ion in TiO_2 matrix tends to create substitutional and interstitial surface defects on and into the surface [14]. The poor biological toxicity of Zn doped TiO_2 has been investigated [15]. Moreover, previous study shows that Zn retards the recombination rate of electron-hole pair and increase the electron lifetime [16]. It has been also reported that Zn doped TiO_2 shows good optical transparency and improved photocurrent and open circuit voltage can be obtained from this alloyed TiO_2 based electrodes [17-18]. Among various techniques, we have selected spray pyrolysis method for the thin film deposition because it has some prominent features like no vacuum requirement, low cost, simple, allowing large scale deposition area, etc. There is a scanty of data on the properties of sprayed as-synthensized Zn doped TiO_2 thin films. Therefore, an attempt has been made to investigate the electrical and optical properties of as-synthesized Zn doped TiO_2 thin films by spray pyrolysis deposition method.

II. MATERIALS AND METHOD

The TiO_2 precursor solution for the deposition of the thin films was prepared by butyl titanate ($C_{16}H_{36}O_4Ti$) (reagent grade: 99%), hydrochloric acid (HCl) and distilled water. Pure aqueous solution was prepared by mixing 0.10M $C_{16}H_{36}O_4Ti$, HCl (2mL), ethanol (2mL) and water (96mL). Zn doped Ti solution was prepared by adding Zinc Acetate ($C_4H_6O_4Zn$) (reagent grade: 99.99%) into the starting solution. The doping percentage of Zn was varied from 0, 2, 4, 6 and 8 at% which were all dissolved smoothly in the solution. The 100mL mixture of working solution was stirred using a magnetic stirrer for about 3 hours at room temperature. Whenever the solution looked transparent and homogenous, it was then filtered by filter paper and became ready for to be deposited. The films were deposited onto the glass substrates. Before the preparation of films, the substrates were well cleaned by acetone and distilled water for fifteen minutes to remove impurities on the surface. Then the substrates were dried in the oven properly. On the prior to starting deposition, the substrates were set to a temperature of $450°C$. Then, the working solution was sprayed onto the pre-heated glass substrate for about 20 minutes. After deposition, the film was kept on the hot plate for about 5 minutes for pyrolysis. Then the film was allowed to cool slowly to room temperature. After that the film was kept for characterization at a vacuum condition for prevention from any surface contamination. The structural properties of the prepared films were studied by X-ray diffraction measurements (Philips X'Pert Pro XRD, PW3040) with CuKα monochromatic radiation ($λ$= 1.54Å).

Comparison of Electromagnetic Absorption in Human Head for Dipole and Microstrip Patch Antenna

Arnab Chowdhury
Department of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
arnabchowdhuryeee@gmail.com

Nissan Paul
Department of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
nissanpauleee@gmail.com

Dr. Sikder Sunbeam Islam
Department of Electrical and Electronic Engineering
IIUC
Chittagong, Bangladesh
sikder_islam@yahoo.co.uk

Md. Iqbal Hossain
Department of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
ipk_eee@yahoo.com

Abstract— The paper presents, the investigation of electromagnetic (EM) absorption in the human head using dipole and microstrip patch antenna (MPA). Both antennas are designed for working in wireless devices at 2.2 GHz. Two parameters are used for the investigation of electromagnetic absorption- peak specific absorption rate (SAR) in the human head tissue and aggregate retained power from the wireless device user. Both antennas are set at a fixed distance to analyze the effects on human head for electromagnetic absorption for MPA and Dipole antenna. Transmission line method was adopted to find out the parameters of MPA. Both antennas are designed and simulated via CST microwave studio. The outcomes demonstrate that, in human head MPA provides a lower peak SAR value than Dipole antenna. So, total absorbed power of Dipole antenna is higher than MPA. Therefore, MPA is a better option for wireless devices regarding EM absorption reduction.

Keywords— EM absorption, Specific Absorption Rate (SAR), Microstrip Patch antenna, Dipole antenna, FDTD.

I. INTRODUCTION

In the field of mobile communication implementation of wireless technology with human body is a rising inclination. The electromagnetic (EM) radiation created by the cell phone may hamper the regular operation of human limbs [1]. The EM radiation effects in human parts may be classified in categories: thermal and non-thermal. EM radiation in human tissue generates heat inside. At the point when this heat exceeds the normal organism heat range, temperature will begin to rise and this is known as thermal effect [2]. On the other hand, the non-thermal effects might cause the cells to activate the genetic factor manifestation systems. The utilization of a cell phone for an extensive stretch of time may prompt to various severe diseases like, brain tumor, cancer, the Deoxyribonucleic Acid (DNA) damage etc. [3]. Absorption of power in human body is usually defined by the factor called specific absorption rate (SAR). It involves distribution of field (both magnetic and electric) in the muscles of human body [4]. The SAR, defined as:

$$SAR = \frac{d}{dt}\left(\frac{dE}{dm}\right) = \frac{d}{dt}\left(\frac{dE}{\rho dV}\right)$$

(1)

where incremental energy is denoted by the symbol dE and incremental mass is symbolized by dm. The ρ and V indicates the mass density and volume correspondingly [18]. The modern cellular phone should not exceed the threshold level of averaged SAR over the tissue mass of 1gm or 10 gm specified by the radiation protection body. The safety strategies for EM wave revelations have been recognized by international adjustment bodies [5], [6].

This SAR value could be influenced by several parameters of antenna like, radiated power, positions of antenna relative to the human body, and radiation patterns of the antenna. SAR of cell phone consumed by people is exceptionally reliant on the mobile network carrier, characteristics of cell phone and antenna, antenna positioning, and the radiated power from the cell phone [8-10]. Other factor which influenced the EM absorption is the positioning of the mobile phone or the phantom itself [11-13]. The dielectric properties of human also effect SAR values [14]. The effect of SAR majority depends on the antenna position on the cell phone. A cell phone with mounted antenna on top and hold in tilt position results in more absorption of EM radiation by the head [15]. This happens when the antenna becomes closer proximity to the head. Moreover, SAR values can change with variation of holding position of mobile phone. Cheek and tilt are two pervasive methods of holding a cell phone. Cheek position of cell phone is parallel to the head of the user and closely located to the user's pinna. This position is the most frequently applied by the users [16].

In life tissue the SAR can be decreased by reducing the amount of power released by the mobile antenna toward the human head. The limit of SAR has already been demarcated by the international regulatory body for any electromagnetic devices utilized near human body for the safety of human health. The SAR limit was set 1.6 W/kg per 1g of tissue jointly by Federal Communication Commission (FCC) and American National Standards Institute (ANSI) [10]. IEEE also has set the limit of SAR for 2W/kg per 10g of tissue.

II. MODELS AND METHODS

A. Design Method:

Various patch shapes of MPA are found [17]. In this investigation, rectangular shape is utilized. We additionally utilized a cylindrical shape dipole antenna. The model named Transmission line has been adopted for designing the MPA. This model is popular and easy understandable.

To decide the parameters of the proposed MPA, the following equations are employed [17].

Fabrication And Characterization Of A P-N Junction For Large Area Silicon Solar Cell

Khorshed Alam[1], Tanisha Mehreen[1], Mohammad Khairul Basher[2], Mohammod Abu Sayid Haque[2],

Subir C. Ghosh[3], Khandker S. Hossain[1]

[1] Department of Physics, University of Dhaka, Dhaka-1000, Bangladesh
[2] Institute of Electronics, Atomic Energy Research Establishment, Savar, Bangladesh
[3] Department of Mathematics and Physics, North South University, Dhaka, Bangladesh

Abstract— A solar cell is basically a p-n junction that generates current upon the incidence of solar radiation. The property of a solar cell is strongly influenced by the electrical properties of the junction and the optical property of the n-type surface, which is fabricated by a process called diffusion. In this paper, we report the chemical processing and fabrication of a p-n junction on a large area P-type silicon wafer at three different temperatures 850ºC, 875ºC, and 900ºC using POCl₃ as a precursor gas. After each step of processing, the wafers were subjected to optical, electrical, and morphological characterization. It has been found that the reflectance as well as the morphology of the wafers not only changes with chemical processing but also with doping temperature as well. Moreover, Hall-effect measurement for carrier type and concentration as well as I-V characterization of the doped wafers confirms the formation of a p-n junction.

Keywords: Solar cell, Diffusion, p-n junction, Reflectance.

I. INTRODUCTION

Global primary energy consumption has increased at an alarming rate during the last three decades. The current electricity consumption is about 12-13 TW-h [1], which is 50% greater than that of in 1971[2-3]. Due to depleting fossil fuel resources and concern about global warming as well as energy security, countries all over the world are moving toward renewable energy based electricity production system. Photovoltaic cell – commonly known as solar cell - is playing an important role in world's electricity demand. Nowadays, there are many types technologies available, but crystalline, polycrystalline and thin film solar cells are used for commercial electricity generation. However, silicon solar cells dominates the market with a market share of about 90% [4].

The working principle of a solar cell relies on photovoltaic effect, which refers to the generation of electric voltage and current as it is exposed to solar radiation. A solar cell is basically a p-n junction, which is fabricated by doping a p-type wafer to n-type and subsequent contact formation with suitable materials. However, of all processing steps, fabrication of a p-n junction is one of the most important steps in solar cell fabrication. Phosphorus (P) diffusion is currently the primary method of fabrication of an n-type emitter on a p-type silicon (Si) wafer [5] by a process called thermal diffusion of phosphorus [6].

Han et al. fabricated a monocrystalline silicon solar cell at a doping temperature of 850ºC. They found that the reflectance for bare and textured silicon wafer is 31.1 % and 14.1 %

respectively [7]. Hongzhao et al. studied the impact of deposition gas-flow ratio, drive-in temperature and duration, drive-in O₂ flow rate, and thermal oxidation temperature on emitter formation and electrical performance [8].

The process of diffusion depends on various factors such as temperature, time, and gaseous environment during deposition [9]. For the fabrication of solar cell, p-type silicon wafers are used as the starting material, which, after chemical processing, are doped to n – type material for the fabrication of a p-n junction at the interface. For silicon, phosphorus is widely used as the dopant material and utilizes phosphorus oxychloride (POCl₃) - a liquid source of phosphorus – as the source of phosphorus and nitrogen (N₂) is used as carrier gas [10-11]. The boiling point of phosphorus is 105.8 ⁰C [12] and if the temperature is increased to 850-900⁰C in the diffusion chamber, POCl₃ is decomposed into simple phosphorus compounds like P₄, P₃, P₂O₅ etc. The fabrication of crystalline silicon solar cell with phosphorus diffusion leads to the formation of n+ type emitter at the top surface of the wafer.

Generally, the process of phosphorous diffusion process occurs in two steps. The first step is called pre-deposition step, which involves the formation of phosphorous-rich oxide films on the silicon substrate and in the second step – known as drive-in step - phosphorous-rich oxide film acts as an infinite source for the diffusion of phosphorous into the Si substrate. [13-15]

It is required that an efficient solar cell must have high absorbance and low reflectance which depends, among other parameters, on surface cleaning, surface texturing, emitter formation etc. In this paper, we report a comprehensive study of morphological, optical, electronic as well as electrical properties as the silicon wafers are chemically polished and diffused to fabricate the p-n junction of a solar cell.

II. EXPERIMENTAL

Solar-grade unpolished boron-doped p-type single crystalline silicon wafers with sizes of 125 mm × 125 mm, thickness 190-210 μm , and resistivity 1 - 3 Ω-cm were used in this study. The raw wafer were chemically polished with 10% NaOH at 70⁰C for 10 minutes and then rinsed with deionized water for 3 - 4 minutes. Then the wafers were vertically placed into a diffusion chamber. The chamber was heated at temperature 850⁰C. Nitrogen(N₂) was used as a carrier gas passing through a bubbler filled liquid phosphorus oxychloride (POCl₃). In the pre-deposition step vapor of POCl₃ gets mixed with a gas mixture containing N₂ and O₂,

K-cyclic Smith iterative method for model reduction of index-2 periodic control systems

Ekram Hossain Khan
Dept. of Elect. and Comp. Engineering
North South University
Dhaka, Bangladesh
ekramhossainkhan@gmail.com

Mohammad-Sahadet Hossain
Dept. of Mathematics and Physics
North South University
Dhaka, Bangladesh
mohammad.hossain@northsouth.edu

Sufi Galib Omar
Dept. of Elect. and Comp. Engineering
North South University
Dhaka, Bangladesh
galib.omar@northsouth.edu

Aniqa Tahsin
Dept. of Elect. and Comp. Engineering
North South University
Dhaka, Bangladesh
atahsin1828@gmail.com

Mohammad Monir Uddin
Dept. of Mathematics and Physics
North South University
Dhaka, Bangladesh
monir.uddin@northsouth.edu

Abstract—In this paper, we present a structure preserving Smith based iterative method for the model order reduction of index-2 periodic descriptor systems. The work of this paper is twofold. The first half of our work focuses on reformulating a discrete-time descriptor system into a discrete-time generalized system by manipulating the system structure. Once the transformed generalized system is obtained, it is expressed in a cyclic lifted representation to make it into the framework for balanced truncation-based model order reduction. The latter half of our work is dedicated to the application of our proposed Smith based algorithm to estimate the solutions of the lifted discrete-time algebraic Lyapunov equations (LDALEs) associated with the system. Cyclic permutation strategies are employed in our proposed algorithm which allows us to hold onto the original block diagonal structure of the solution in the iterative computations. The efficiency and accuracy of our proposed algorithm is verified using results obtained from numerical simulations.

Index Terms—Index-2 periodic descriptor systems, cyclic lifted form, Smith method, balanced truncation.

I. INTRODUCTION

In recent years, a great deal of attention has been devoted to periodic systems and control theory. The surge of interest was triggered by the increasing number of processes that can be modeled using linear discrete-time periodic systems. Such processes include chemical processes, multirate sampled-data systems, periodic time-varying networks [1]–[3]. Due to the complexity and large dimensions of the systems, numerically simulating and optimizing these models can be challenging because they require time-consuming simulations and sufficient memory space [11]. To eliminate these computational burdens, model order reduction (MOR) can be used to approximate a smaller but precise model of the original system [7], [8]. In addition to preserving all the significant and necessary

characteristics of the original system, the smaller system also mimics the input-output behavior of the original system.

Linear-time varying (LTV) systems in discrete-time setting have received a huge attention in the last few decades because of their wide range of applications in different fields of science and engineering, e.g., in circuit model with periodic control dynamics, altitude control of satellite, helicopter rotor design, etc. Let us consider the LTV discrete-time descriptor system in general form,

$$
\begin{aligned}
E_k x_{k+1} &= A_k x_k + B_k u_k, \\
y_k &= C_k x_k, \quad k \in \mathbb{Z},
\end{aligned}
\tag{1}
$$

where the matrices $E_k, A_k \in \mathbb{R}^{n_k \times n_{k+1}}$ are the system matrices, $B_k \in \mathbb{R}^{n_k \times m_k}$ is the input matrix, $C_k \in \mathbb{R}^{p_k \times n_k}$ is the output matrix, $x_k \in \mathbb{R}^{n_k}$ is the state vector, $u_k \in \mathbb{R}^{m_k}$ and $y_k \in \mathbb{R}^{p_k}$ are the input and output of the system with a periodicity $K \geq 1$, respectively and $\sum_{k=0}^{K-1} n = \mathbf{n}$, $\sum_{k=0}^{K-1} m = \mathbf{m}$, and $\sum_{k=0}^{K-1} p = \mathbf{p}$. A descriptor system is a special form of a generalized state space system (1) where E_k consists of singular matrices i.e. $\det(E_k) = 0$ for $k = 0, 1, \ldots, K-1$. In this paper, we focus on an index-2 periodic discrete-time descriptor system. A linear time-invariant (LTI) index-2 descriptor system arises from the spatial discretization of Navier-Stokes or Oseen equations, or a damped mass-spring systems with holonomic constraints [5], [6]. In this paper we focus on index-2 periodic discrete-time descriptor system which has the form

$$
\underbrace{\begin{bmatrix} E_{1,k} & 0 \\ 0 & 0 \end{bmatrix}}_{E_k} \underbrace{\begin{bmatrix} x_{1,k+1} \\ x_{2,k+1} \end{bmatrix}}_{x_{k+1}} = \underbrace{\begin{bmatrix} A_{1,k} & A_{2,k} \\ A_{2,k}^T & 0 \end{bmatrix}}_{A_k} \underbrace{\begin{bmatrix} x_{1,k} \\ x_{2,k} \end{bmatrix}}_{x_k} + \underbrace{\begin{bmatrix} B_{1,k} \\ 0 \end{bmatrix}}_{B_k} u_k,
$$

$$
y_k = \underbrace{\begin{bmatrix} C_{1,k} & 0 \end{bmatrix}}_{C_k} \begin{bmatrix} x_{1,k} \\ x_{2,k} \end{bmatrix}, \quad k = 0, 1, \ldots, K-1,
\tag{2}
$$

Design of a Miniaturized Slotted T-Shaped Microstrip Patch Antenna to Detect and Localize Brain Tumor

Md. Siddat Bin Nesar
Department of Electronics and Telecommunication Engineering
Chittagong University of Engineering & Technology
Chittagong, Bangladesh
Email : mdsiddat12@gmail.com

Nishako Chakma
Department of Electronics and Telecommunication Engineering
Chittagong University of Engineering & Technology
Chittagong, Bangladesh
Email : nishakochakma.23@gmail.com

Md. Abdul Muktadir
Department of Electronics and Telecommunication Engineering
Chittagong University of Engineering & Technology
Chittagong, Bangladesh
Email : abdulmuktadir28@gmail.com

Akash Biswas
Department of Electrical and Electronic Engineering
American International University-Bangladesh (AIUB)
Dhaka, Bangladesh
Email : akshbiswas101@gmail.com

Abstract—This paper presents a miniaturized, single-fed, slotted T-shaped, body worn antenna mainly designed for detecting and locating brain tumor which operates in the frequency band 902-928 MHz of Industrial, Scientific, and Medical (ISM) band. The key prominences of the proposed antenna are its minuscule dimension, vast bandwidth, good parameter results to identify affected and unaffected human brain tissue. The dimension of the proposed antenna is 29.99 mm x 29.99 mm x 0.59 mm, which has been placed over a complete human head phantom model consisting of six different layers; designed in CST Microwave Studio without altering their dielectric properties to carry out the simulation. Several performance measurements have been performed for both normal condition and tumor affected conditions changing the tumor positions with respect to the antenna. Analyzing these data, the location of the tumor can be estimated. A tumor having a radius of 5 mm with conductivity and permittivity of 7 S/m and 55 respectively, has been taken into consideration for the simulation process. The maximum SAR (specific absorption rate) of the proposed model measured 0.332 W/ Kg which satisfies the required safety guidelines.

Keywords—Brain Tumor, Human Head Phantom model, ISM band, 910 MHz, SAR.

I. INTRODUCTION

A brain tumor is a mass of anomalous tissue within the brain that can disturb the natural function of the brain. It is one of the deadly diseases which counts for 85% to 90% of all Central Nervous System (CNS) tumors [1]. Several types of diagnostic system like Computed Tomography (CT) scan, Magnetic Resonance Imaging (MRI) etc. are most frequently used for tumor detection [2], which have the heavier appearance, high cost, and complexities to establish in other places rather than a hospital. Microstrip patch antennas are widely considered for biomedical implementation as of the dynamic properties like higher bandwidth, low profile, portability, tiny dimensions with easy portability. These biomedical antennas are easily compatible with on-body as well as implantable applications considering patients' safety [3-7].

For biomedical applications, microstrip patch antennas are more suitable as a body worn device by reason of its easy

fabrication, well directivity and considerable gain. Micro-strip patch antennas also have the advantage of increasing the bandwidth by imposing various shape of slots to the antenna which is also applied in this novel design [8-9]. Most of the body-worn antenna designs use planar structure which are founded on a microstrip or coplanar waveguide (CPW) [10-12]. These designs are compact and low profile but require an EBG substrate or ground plane with a colossal plane to protect the host body from the radiation. Without using such a technique may cause the host body affected by harmful radiation and excessive specific absorption rate (SAR) values while using the antenna [13-14]. This novel design use ground plane rather than electromagnetic band-gap (EBG), as it makes the design more robust, small, and simple than EBG substrate [10] to isolate the body from the antenna, also maintain better radiation performance and low SAR values.

In literature [15], a UWB antenna with standard (30 mm × 25 mm × 1.6 mm) dimension was designed which has decent return loss, large bandwidth but SAR value of the antenna was not estimated. With a very simple design and low profile, an antenna proposed in the article [16] displayed comparatively low return loss (-26 dB) than other related design. Another wearable antenna with smaller dimension (33 mm x 23 mm x 1 mm) presented in [17], have better return loss, but for different positions of the tumor the effect have not been measured and the e-field density obtained for cancerous tissue and healthy tissue are hard to differentiate. A UWB Vivaldi antenna was demonstrated in the article [18]. Despite it had well-preferred frequency band for biomedical uses, but its practical implementation would be difficult because of its bulky appearance (329.25 x 153 x 1.6 mm³). The antenna's measurement [19] is comparatively bigger (80 mm x 45 mm), but it demonstrates great directivity of 12.12 dBi. The profile of [20] is low (25 mm × 25 mm × 10.5 mm), however, the directivity and particular estimation of return loss are not specified. In both cases, SAR esteem hasn't been figured.

In this paper, a microstrip patch antenna with slotted T-shape is propounded and its performance is analyzed on a six-layered (Brain, Cerebrospinal Fluid (CSF), Dura, Skull, Fat, and Skin) human head phantom model with their relative properties to detect brain tumor using CST Microwave Studio

Evaluation of antioxidant activity and brine shrimp lethality bioassay of *Randia dumetorum* stem extract

Mizanul Hassan
Department of Chemistry
Bangladesh University of Engineering and Technology
Dhaka, Bangladesh
md.mizanulhassan@gmail.com

Abdullah-Al-Ragib
Applied Chemistry and Chemical Engineering
Noakhali Science and Technology University
Noakhali, Bangladesh
ragibnstu@gmail.com

Md. Tanvir Hossain
Applied Chemistry and Chemical Engineering
Noakhali Science and Technology University
Noakhali, Bangladesh
tanvir@nstu.edu.bd

Sazaul Morshed Sazib
Department of Pharmacy
Noakhali Science and Technology University
Noakhali, Bangladesh
Sazaulmorshed.nstu5@gmail.com

Muhammad Zukaul Islam*
Department of Chemistry
Bangladesh University of Engineering and Technology
Dhaka, Bangladesh
fmsdbuet04@gmail.com

Abstract— This research study accomplished to explore the antioxidant activity as well as cytotoxicity assessment like brine shrimp lethality bioassay of distinct fractions of *Randia dumetorum* stem extract. Besides, this research was also assessed to observation the proximate analysis and phytochemical screening by following the conventional method. To fractionate through soxhletion using sequential extraction techniques where the plant stem used as a powdered form with some specific solvents treatment.The most common solvents are n-hexane, chloroform, methanol and distill water. Here, we used to evaluate antioxidant activity, total antioxidant capacity determination, reducing power assay, ferric ions reduction using a simple method named ortho-phenanthroline color , determination of total content of phenol and total flavonoids contents by aluminium tricholoride method. In these studied we incorporate Ascrbic and Gallic acid as a antioxidant compound. It observed that, the content of proximate analysis moisture is 10.3%, total ash value is 4.76%, acid insoluble ash is 4.30% and water soluble ash value is 3.21%. For phytochemical screening, different extract of those solvents were utilized that disclosed the existence of alkaloids, reducing sugar, flavonoids, saponin, phenols, Tannic acid, amino acid and protien. The consequence reveals a remarkable antioxidant activity of Randia dumetorum stem extract. In the case of brine shrimp lethality bioassay, methanol extract of stem effect to brine shrimp nauplii and exhibiting highest toxicity having LC$_{50}$ value 1.32 µg/ml as compared to standard dimethyl sulfoxide (LC$_{50}$ 1.31 µg/ml). These evaluations suggest that Randia dumetorum stems indicated a better source of antioxidants and hold important cytotoxic effect.

Keywords— *Randia dumetorum*; antioxidant; DMSO; cytotoxicity;

I. INTRODUCTION

Human body gradually faces various diseases from early to the old stage of life because of the oxidation reaction. In our body unstable free radicals gradually created because of natural biological and chemical process which is also called oxidative stress is the main culprit of cell damage. This cell damage is directly related to decay, diseases and death of human civilization [1]. From the dawn of civilization human are interrelated with various disease, decay and death. When they want to cure from different kind of illness then they start using plants as a medicine, as a consequence, they get outstranding therapeutic tools against diseass [2,3]. Free radicals which are dangerous products created during normal biological process in our body. If the free radicals or reactive oxygen molecules is gradually created in our body which are detrimental for human cell is the initial responsible for various diseases and human life comes to an end in a moment of time . The antioxidant is a reducing agent suppresses the human cell damage induced by reactive oxygen species and try to minimize the oxidative stress in human body [4]. It is important factor to balance between reactive oxygen species and the inherent antioxidant potential activity of the body for maintaining a good health. During the attack of diseases, the use of medicinal supplements which are prepared from various medicinal plants certainly is used to balance the condition between free radicals and inherent antioxidant potential and improve the protective cellular defence system for leading a long period of human life in a better way. Now many of the pharmacists, doctors and researchers or scientists have attention an appreciation of antioxidants extracted from various alternative plants for the contribution to the indigenous systems of the world for the maintenance of the population health [5].

Randia dumetorum Lam. is a plant of medicinal important mostly neotropical genus of thorny shrubs or small trees grows up to 5 meters of height belongs to the family Rubiaceae popularly known as emetic nut [6]. Ripe fruits retain glycosides, essential oil also resin acid. Bark retain two coumarin glycosides, mannitol and saponins. Seed retain Pb (lead) . Six saponins retain oleanolic acid as a glycone they identified as dumetoronins A, B, C, D, E and F [7]. In the case of Ayurveda, different parts of *Randia dumetorum* are employed to mollify vitiated pitta and kapha/mucous as well as to cure from skin diseases, cough, asthma, flatulence, ulcers, colic etc. The fruit of plant give rise to anti-inflammatory, emetic/inducing vomiting and abortifacient properties. To relieve pain of bruises and rheumatism tree bark is used externally [8]. Leaf parts of this plant was also investigated in

Detecting Abusive Comments in Discussion Threads Using Naïve Bayes

Md. Abdul Awal, Md. Shamimur Rahman, Jakaria Rabbi
Department of Computer Science and Engineering
Khulna University of Engineering & Technology
Khulna-9203, Bangladesh
E-mail: awal.kuet@yahoo.com, shamimur052@gmail.com, jakaria.rabbi@yahoo.com

Abstract— Comments are supported by various websites and provide a simple approach to increment user involvement. Users can generally comment on different types of media such as: social networks, blogs, forums and news articles. As discussions increasingly move toward online forums, the issue of insulting and abusive comments is becoming prevalent. In addition, a lots of comments are available due to these social media. Hence, it is not feasible for a human moderator to check each comments one by one and flag them as abusive or not abusive. For this reason, an automated classifier which is quick and efficient is necessary to detect such type of comments. To fulfill above purpose, in this paper a Naïve Bayes classifier is designed to detect abusive comments expressed in Bangla. Using a training corpus collected from "Youtube.com", the Naïve Bayes classifier is employed to categorize comments as abusive or not abusive. Finally, the performance is evaluated by using 10-fold cross-validation on unprocessed data.

Keywords— *Abusive comments, Naïve Bayes, machine learning, text classification, 10-fold cross-validation.*

I. INTRODUCTION

Human interaction with social networks, blogs, forums and online news portals has been increased drastically in the previous couple of years. Social networks, blogs, forums and online news portals unite users to form a strong association generally based on a way of communication via messages, chats and comments. Comments capacitate a casual and interactive way of providing personal point of view. Generally commenters are unopposed to express their sentiments, share their responses, and offer their learning. Readers obtain additional facts over the article from comments and usually they also react to comments by giving reply. Users generally utilize "thumbs up" or "thumbs down" sign in order to short response to a comment [15]. In addition detailed responses are also feasible – prompting to "comment threads". Consequently comments give a feeling of group interest by a low passage obstruction.

The comments can appear as any composed content whether it is in English, Bangla or something else. Most of the time, the commenting framework is an essential part of making a group in a website. This framework normally allows anonymous posting that gives users the chance to misconduct the commenters or posters on the framework. So simply like some other community feature, comments are defenseless to manhandle. That's why, identification and blocking of abusive comments are indispensable for the transparency of comments. The consequences of abusive comments are multifarious [15].

- Since readers need to filter through comments spam

to get good comments, they can lose their enthusiasm to a website.
- Normally commenters are discouraged to comment in an environment which may be full of spam and their comments are probably going to be suffocated in an ocean of spam.
- The owners or proprietors of sites may observe less user involvement and gradually poor quality traffic.

Abuse or misconduct on a commenting framework varies from spam to comments which are infelicitous. Users often recognize this content highly invective. As a result, the websites can obtain negative feedbacks from users and also lose their traffic. So the moderators have a critical undertaking in securing the fairness of a website [21]. They impose particular rules and regulations about what types of comments are allowed to post. Suppose, an abusive comment could assault a user utilizing pejorative terms, then it is the responsibility of a moderator to decide if this comment should be allowed or not for posting. Generally human being plays the role of a moderator, who have to read each of the comments to categorize them as abusive or not. However, manually reviewing and detecting offensive comments are tiresome and time killing task and hence not feasible, reliable and usable in practical sense.

In order to identify and block abusive and offensive contents of a website, some automated software such as "Appen" and "Internet Security Suite" have been used [2]. These software packages just stopped webpages from loading into a web browser which contained scurrilous contents. The method both interrupts the readability and usability of website and fails to identify exquisite insulting contents. The purpose of this research is to detect abusive comments expressed in Bangla. At first, the dataset of English comments is collected from "Youtube.com" [4]. Then the annotated Bangla dataset is generated from this collected dataset. Naïve Bayes classifier is trained on this dataset. Finally 10-fold cross-validation technique is applied to measure the accuracy of the classifier.

The organization of the paper can be described as below: previous works are presented in section II and research methodology is described in section III. Section IV shows the results of the experimental analysis. Finally, the conclusion is presented in section V.

II. EXISTING WORKS

The task of textual annoyance or abusive comments identification in text has been marked by scientists as a classification task. Abusive comments classification research with machine learning began with Yin et al.'s [5] paper. The

Performance of Classifiers in Bangla Text Categorization

Ankita Dhar
Dept. of Computer Science
West Bengal State University
Barasat, India
ankita.ankie@gmail.com

Himadri Mukherjee
Dept. of Computer Science
West Bengal State University
Barasat, India
himadrim027@gmail.com

Niladri Sekhar Dash
Linguistic Research Unit
Indian Statistical Institute
Kolkata, India
ns_dash@yahoo.com

Kaushik Roy
Dept. of Computer Science
West Bengal State University
Barasat, India
kaushik.mrg@gmail.com

Abstract—Automated text categorization or text classification has become an important text mining task especially with the speedy development and increase of the number of on-line documents. Automatic text classification system aims to assign the text documents to their predefined categories based on some linguistic characteristics. Although research has progressed significantly for languages like English, Arabic, Chinese, etc., there has not been much development for the Indian Languages especially for Bangla which is one of the most popular languages of India and Bangladesh. One reason for this is the inherent complexity of Bangla which is accompanied by the unavailability of standard datasets and resources. In this paper, the performance of different classifiers is presented for the task of text classification based on 'term association' and 'term aggregation' feature extraction methods and an accuracy of 98.68% has been obtained on dataset of 8000 Bangla text documents procured from various web sources.

Index Terms—Text categorization, Term association, Term aggregation, Text mining

I. INTRODUCTION

The emergence of technology has rekindled the interest in text categorization problems. Huge amount of text documents are available on-line, and classifying them efficiently into their respective semantic categories is a beneficial as well as challenging task. If the text documents are classified among their respective categories then search and retrieval of information will be fast and efficient. Automatic text classification is basically a machine learning task that automatically assigns a given document to its category based on the features extracted from its textual content. It has several major applications such as contextual search, sentiment analysis, opinion mining, product review analysis, email spam filtering, to name a few. Text classification task mainly performs in two scenarios: single label and multi-label text classification. Single label classification classifies the document that belongs to only one class and multi label classification classifies the document that may belong to more than one classes. In this paper we mainly consider single label text document classification.

Automated text classification has reached its advanced stage with the use of many skilled machine learning techniques. However, these research in text classification has reached its pinnacles only on specific languages such as English, Arabic, Chinese, etc., but not much significant progressed has been made for the Indian Languages especially for Bangla. Bangla is the 6th most popular language worldwide having approximately 243 million first language speakers and it is also one of the popular languages of India and Bangladesh [1]. Also Bangla based system can help users to use information technology effectively who are not proficient in western languages. These fact inspired us to work in this field. In real world data disparate variations are observed. Different machine learning techniques/classifiers have emerged to handle such disparity. In this paper, the performance of different classifiers for the task of Bangla text classification is presented. The experiments have been performed on the obtained dataset of 8000 Bangla text documents covering eight different domains or text categories from various web news corpus. The text documents were pre processed and then put through the feature extraction scheme. The dimensionality of the feature vector was then reduced using PCA. Both the reduced and non reduced feature vectors were independently fed to different classification algorithms for performance analysis. The details of these steps is presented in section III

The rest of the paper is organized as follows: Section II gives a brief survey on the recent works done on text classification; Section III cast lights on the proposed methodology; Section IV presents the analysis of the results; Section V concludes the paper showing some future directions.

II. RELATED WORK

From the literature survey being carried out, it is observed that researchers have paid great attention in this field for English and Arabic followed by Chinese but very few works have been performed for Indian languages especially for

Automatic Generation Control of Two Area Reheat Thermal Power System Using Differential Evolution Based Controller

Muhammad Ahsan Zamee
Department of Electrical and Electronic
Engineering
Islamic University of Technology
Gazipur, Bangladesh
zamee.official@gmail.com

Mir Muntasir Hossain
Department of Electrical and Electronic
Engineering
Northern University Bangladesh
Dhaka, Bangladesh
mirmuntasir.eee@gmail.com

Kazi Rehnuma Zafreen
Department of Electrical and Electronic
Engineering
Bangladesh University
Dhaka, Bangladesh
rehnumazafreen@gmail.com

Kazi Khairul Islam
Department of Electrical and Electronic
Engineering
Islamic University of Technology
Gazipur, Bangladesh
kkislam@iut-dhaka.edu

Abstract—Frequency fluctuation and deviation in tie-line power flow are occurred in a large power system due to unanticipated imbalance between energy production and consumers load demand. A crucial task is carried out by the Automatic Generation Control (AGC) to regulate the generators output power within an acceptable limit due to load perturbation for maintaining the stable system frequency and power flow. This paper illustrates the performance analysis of two area reheat thermal power system through simulation by employing a Proportional-Integral (PI) controller which is being optimized by Differential Evolution (DE) algorithm. DE is used for determining the optimal set of PI controller's gain parameters (K_p and K_i) which depends on the eigenvalue of system matrix of state space equation and objective function's minimum value. Applying load variation in either or both of the areas, the performance of the controller is evaluated by analyzing the transient response of the system. Genetic Algorithm (GA) based PI controller has been considered for comparing the efficacy with the suggested controller which shows the proposed controller's supremacy in most of the cases. Moreover, the proposed controller has performed satisfactorily over variation of system parameters. Required simulations are performed in MATLAB/SIMULINK environment.

Keywords— automatic generation control, load frequency control, differential evolution algorithm, eigenvalue, proportional integral controller

I. INTRODUCTION

Power grid engineers' one of the major concerns is to ensure the stability of the grid by continually equalizing the load demand and transmission losses with the generated energy [1]. Sudden faults, diversity in power demand in different time periods, weather uncertainty, etc., causes variation in real power requirement which directly affects the system frequency and power flow in tie lines that put at risk the grid stability [2]. Generators' power production is adjusted in this regard by Automatic Generation Control (AGC), a real-time quick responding control mechanism, during tie-line power flow imbalance and frequency fluctuation. Any discordance between power production and requirement can deviate the system frequency from the regular operating condition that may eventually lead to progressive generator trips and at last system breakdown [3], [4]. From the establishment of power system, many developments have already taken place to resolve this issue. In today's world, generally the power utilities operate in an interconnected way due to various reasons, and they are classified upon economical, technical and environmental considerations. So, majority of the utilities permit proportional-integral (PI) controllers to successfully implement AGC strategies. Although achieving the best performance together with massive renewable energy penetration and dynamic load variation is quite difficult, but it is simpler to implement. A smart parameter tuning is important to obtain the best performance from AGC [5].

Over the last few decades, the literature study of many researchers showed that numerous control schemes for AGC implementation have been suggested. The LFC of two-area reheat thermal power system was proposed by Hemeida A.M. in 2010, where generation rate constraint (GRC) and dead zone were considered with superconducting magnetic energy storage (SMES) in both areas [6]. Tsay Tain-Sou analyzed the reheat thermal power systems dead zone of the governor [7]. In 2012, Sudha K.R. et al. represented the reheat thermal power system with GRC. An optimal fuzzy rule for distributed LFC in two-area reheat thermal power system with GRC, based on fuzzy C-means clustering, was generated [8]. In the same year, Sudha K.R. and Santhi R.V. did another research on two-area reheat thermal power system. They considered a model containing interlinked two-area reheat thermal power system [9]. GRC, dynamics of boiler and SMES divisions were included for the discussed model. The researchers confirmed the fitness of the designed SMES controller against different instabilities and system volatility in contrast with SMES. Moreover, LFC for two-area interconnected thermal reheat power system with Interline Power Flow Controller (IPFC) and Redox Flow Batteries (RFB) was discussed in [10]. In case of non-linear systems, PID controller founded upon fuzzy logic can be utilized for all systems, but for selecting appropriate parameters of fuzzy there is no proper mathematical equation

Monitoring of strut force in excavation for bridge pier using vibrating wire strain gauge

Sarah Tahsin Noor
Department of Civil Engineering
University of Asia Pacific
Dhaka, Bangladesh
sarah@uap-bd.edu

Md. Shamsul Islam
Prosoil Foundation Consultant
Dhaka, Bangladesh
prosoil_9@hotmail.com

Md. Aminul Islam
Prosoil Foundation Consultant
Dhaka, Bangladesh
aminbuetce@gmail.com

Abstract—This paper employs vibrating wire strain gauge in the investigation of lateral movement of water and soil supported by sheet pile wall with eight horizontal struts. The struts were installed at the corners of two different levels of excavation. The forces in all the eight struts were estimated from frequency reading taken in every five seconds over a period of six months. Different patterns of strut force variation and lateral soil movement were observed with time passed and the panel temperature. The variation in strut forces at a given level demonstrates the importance of continuous monitoring of excavation using such an advanced technology. The outcome of this study will encourage the practicing engineers to employ monitoring devices to ensure safety at the construction site.

Keywords— vibrating wire strain gauge; frequency; strut load; excavation

I. INTRODUCTION

Globally, the use of sensors in measuring strains, tilting, etc. from vibration frequency, is a recent intervention in civil engineering practice, while safety becomes the most urging concern of engineers and the society. Deployment of instrumented monitoring program for construction (in progress) and structures (functioning under sensitive variables) is inevitable in regions, where growth, development and urbanization are going on rapidly [1]. Different types of sensors, such as acoustic, sound, automotive, electric, magnetic, chemical, pressure, optical, thermal, weather, ionizing radiation, navigation, etc. have been chosen by the practitioners and researchers of different disciplines. Among all these instrumentations, vibrating wire strain gauge (VWSG) has gained remarkable attention in civil engineering applications to measure strains in concrete beams, pre-stressed elements of concrete structure, steel beams and members of mega-truss [2-6]. Recognizing its advantages in professional practices, efforts are being given for developing wireless vibrating wire sensor node to facilitate continuous structural health monitoring [7]. Tunnel construction projects often employ VWSG for continuous monitoring of strut forces due to its close adherence to crucial safety concerns [8-11]. Moreover, the performance of deep excavations is monitored frequently in soft clay [12-16] and rarely in sand-silt [17]. Temperature effect on strut load was also investigated using VWSG [14, 18]. It was revealed that the effects of temperature change on strut load are more significant in stiff clay, dense sand and rock than that in soft clay [18]. The effect of thermal stress in tunnel liner constructed in rock was studied through VWSG installation [9]. It has also been applied for observing the performance of slurry wall, wales of earth retention system, slurry-diaphragm wall, etc. for ensuring safety and quality of construction projects [16, 19-20].

In late 60's and 70's, performance monitoring of excavations was carried out using mechanical strain gauge, while vibrating wire strain gauge was discarded for being expensive [21-22]. According to the published literature (to the best of our knowledge), vibrating wire strain gauge was introduced in field monitoring of strutted excavation in some important projects carried out in Canada, Taiwan, China and Singapore [10, 24-28], and this should be given the utmost priority in the civil engineering applications in Bangladesh (heavily dense populated region) as well. To date, there is a number of case- histories of inadequately braced-excavation failures in Bangladesh, while extensive excavation works are being carried out for large development projects at the same time. This paper presents the first attempt in Bangladesh (to the best of our knowledge) to monitor the performance of sheet pile wall equipped with vibrating wire strain gauges to measure strut loads installed at the corners of the cut. This excavation was carried out to facilitate the construction of a bridge pier of 2nd bridge across Gumti river. The monitoring was carried out over a period of 6 months, from November 2017 to April 2018.

II. VIBRATING WIRE STRAIN GAUGE: THEORY OF OPERATION

To date, several vibrating wire instruments have been invented based on the resonant frequency of steel wire as its fundamental principle of operation. Frequency, tension in the wire are related by the following equation:

$$f = \frac{1}{2L}\sqrt{\frac{T}{w}}$$

where L = length of the steel wire, w = unit weight per length; T = tension in the steel wire and f = resonant frequency. Vibrating wire strain gauges are designed to measure strains in or on pipelines, bridge components, buildings, tunnel linings, piles, reinforcement bars, strut, etc. for monitoring purposes. A vibrating wire strain gauge consists of a steel wire tensioned between two mounting blocks. The wire is kept secured inside a thin-walled tube. These blocks can be spot welded or epoxy mounted on the surface of the object whose deformation is to be investigated. These mounting blocks move relative to one another as the structural object deforms or elongated. The strain of the wire causes change in the tension as well as change in the resonant

Selective Harmonic and DC Offset Elimination in Grid Connected Single Phase Inverter by Using Optimal Controller and Modified EPLL

Md. Khurshedul Islam*, Farhina Haque*, Md. Monirul Islam**, Khondokar Abdullah Al Mamun**

* Department of Electrical and Computer Engineering
Mississippi State University, Mississippi, USA
khurshedeeeiiuc@gmail.com, farhina_meghna@yahoo.com

** Department of Electrical & Electronic Engineering
International Islamic University Chittagong, Bangladesh
monirliton@yahoo.com, k.a.a.mamun@gmail.com

Abstract— this paper proposed a modified Enhancement Phase Lock Loop (EPLL) and an optimal controller to efficiently operate grid-connected inverter for distributed renewable energy application. Conventionally, a basic EPLL structure is used to generate the inverter reference signal and a proportional (P) or proportional integral (PI) controller is used to meet the system specifications. In the presence of small dc offset or lower order harmonics in the grid, this EPLL cannot generate a pure sinusoidal reference signal. Furthermore, P or PI controller is not robust enough to eliminate the disturbance due to the inverter or system uncertainties. In this paper, 1) an optimal controller is designed by using linear quadratic regulation (LQR) technique based on state space approach to remove the effect of the inverter and system uncertainties; and 2) it also presents a systematic design approach of a modified EPLL to eliminate the unwanted dc offset and selective lower order harmonics from the grid. A MATLAB simulation model is developed for the proposed system to investigate the performance of the optimal controller with the modified EPLL. The proposed control system shows better performance compare to the conventional control model in the presence of various system uncertainties and lower order harmonics in the grid.

Keywords—DC offset, Harmonic, Optimal Controller, EPLL, THD, Grid connected inverter, Voltage Source Inverter (VSI).

I. INTRODUCTION

The enormous improvement in the technology of solar energy increases the use of Photovoltaic (PV) system exponentially. An inverter is used to interface this PV system with the grid, which converts the DC power to the AC [1]. To maintain a desirable power supply, a high efficient inverter system is required. The conventional inverter system contains small amount of DC offset while converting the DC power into AC, which can cause corrosion in the cable. Furthermore, inverter with high frequency pulse width modulation creates lower order harmonics, which need to be attenuated to meet the photovoltaic inverter standards of IEEE 519-1992 and IEEE 1547-2003 [2].

DC offset and lower order harmonics injection in the grid can be avoided by using a power transformer while interfacing with the AC system. However, it will increase the power loss, cost, and weight of the converting system [3] [4]. Transformer less dc controlled system had been proposed in [5] to eliminate dc where dc offset voltage was sensed at the output of the grid connected inverter and used to drive the feedback system to control the operation. To estimate the amount of lower order harmonics LMS adaptive filter can be designed and compensated by designing a proportional (P) controller [6]. The use of PLL for synchronizing the signal with a reference is very popular. In the PLL pre-filter technique can be used to remove dc and harmonics. The transfer function of the filter could be band pass filter, delay signal cancellation, or moving average filter. But PLL causes a double frequency component having large magnitude. This ripple in signal phase system causes distortion. Hence, an EPLL is used instead of basic PLL to overcome the problem of double frequency ripple [7] [8].

In section II, Grid connected inverter topology is discussed. An optimal controller design process by using LQR technique and a systematic design procedure of modified EPLL are explained in section III and IV respectively. In section V, a comparative study is shown between conventional and proposed system.

II. GRID CONNECTED INVERTER TOPOLOGY

A simple single-phase grid-connected inverter topology consists of a single-phase inverter with an inductive filter, current controller, and a phase lock loop (PLL). Fig. 1, shows a commonly used single phase grid connected inverter block diagram.
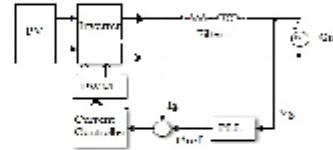

Fig. 1. A typical Grid connected inverter system.

A voltage source inverter is fed from a DC power supply for example - photovoltaic system or buck/boost converter or battery storage. The output of the inverter is connected to the grid system through a filter. A PLL is used to obtain synchronism between the phase angle of grid voltage and inverter output voltage. This PLL provides the reference signals to the controller. By using this reference signal and power demand the controller generates the gating signals for inverter with the help of pulse width modulation.

III. OPTIMAL CONTROLLER DESIGN

Voltage Source inverter (VSI) is an important part of power electronic systems especially for integration of distributed and renewable energy resources application [9]. Fig. 2, shows a single-phase pulse-width modulation (PWM) full-bridge voltage-source Inverter (FB-VSI) with DC-side voltage of V_{dc}.
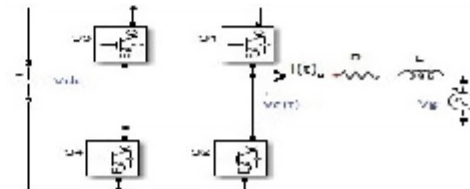

Fig. 2. Single phase FB-VSI

An Analysis of Bangladesh One Day International Cricket Data: A Machine Learning Approach

Md. Muhaimenur Rahman
Computer Science & Engineering
Sylhet Engineering College
Sylhet, Bangladesh
tanmoy.cse90@gmail.com

Md. Omar Faruque Shamim
Computer Science & Engineering
Sylhet Engineering College
Sylhet, Bangladesh
omarfaruque94bd@gmail.com

Sabir Ismail
Computer Science & Engineering
Shahjalal University of Science &
Technology
Sylhet, Bangladesh
sabir-cse@sust.edu

Abstract— Nowadays Data mining is an emerging field in sports analysis. To choose a most effective team or to predict suitable formation for winning a game or to analyze weakness of the opponent, data mining plays a vital role. However, no research has been done yet for the Bangladesh cricket team. So, we analyzed One Day International cricket data of Bangladesh, based on seventeen features and find out the most important features that are enough for better prediction, not only important features but also can take much decision in our analysis. Our analysis divided into three sections; before starting the game, after one innings played and continuous fall of wickets which leads to the probable prediction of the chances of winning and losing even while the game is in progress. In our analysis, we used the latest version of the decision tree algorithm that is C5.0 on our own collected data set and successfully get the effect of the accuracy of 63.63% for before starting the game, 72.72% and 81.81% when Bangladesh played in the first and second innings, finally 80% and 70% for fall of wicket analysis. We also used other classification algorithms and shown the accuracy level of our data set.

Keywords— *Decision Tree, C5.0, Naïve Bayes, KNN, Random Forest, SVM, Cricket, Prediction, Classification*

I. INTRODUCTION

Cricket is the most enjoyed game in Asian Subcontinent. Test match, One Day International (ODI) and T20 are three internationally recognized formats of cricket matches. The main differences between these three formats are the match duration of the game. ODI cricket is a form of limited over game usually played in 50 overs and complete in a Day or Day-Night combination. Test cricket duration is five days and at least 90 overs played per day. T20 is a shorter version where they play only 20 overs each team. Cricket is a sport that contains lots of statistical data like batting and bowling record of the team, an individual player's record, a scoreboard of different matches played, fall of wickets, run rate during the match and many others. Before starting a cricket match, opposite team does some analysis based on this statistical data, to find the weakness of the opposite team so here comes the field of Data mining. Data mining is the computing process of discovering pattern in large data sets. Using data mining, one can find many patterns such as most crucial point to win a game or match prediction etc.

II. BACKGROUND STUDY

For our cricket data analysis, we have studied a quite number of research papers related to our task, which is shortly discussed here.

Vignesh Veppur Sankaranarayanan et al. [1] used 6 features and got the accuracy of between 68% and 70% almost. Michael Bailey, Stephen R Clarke [2] predicted the run scored by the team batting first and accuracy is 71%. Maral Haghighat et al. [3] found that some predictions are not reliable for data set and 72% of incident does not have major impact whereas 24% of incidents have a large impact. Neeraj Pathaka, Hardik Wadhwa [4] described that the outcome of ODI match depends on mainly four factors such as (1) Toss outcome, (2) Home Game Advantage, (3) Day/Night Effect, (4) First Batting. Ananda Bandulasiri [5] works on home field advantage, winning the toss, game plan (batting first or fielding first), match type (day or day & night), and the effect of the Duckworth-Lewis method for matches shortened due to weather interruptions. Hermanus H. Lemmer [6] created a model that helps to find the players ranking. De Silva et al. [8] described that breaking ties in the tournament isn't an appropriate method (if run rate is greater than another team, then the greater run rate team will win). PPG Dinesh Asanka [9] wanted to discover that, the extra delivery matters on any team. De Silva et al. [10] provides a statistical analysis of 427 ODI matches from 1990 to 1997 Asia Cup & found that Winning the coin toss of a match provides no extra advantages and Playing on one's "Home Field" increases the probability of winning by approximately 0.5. Kamble A.G, et al. [11] builded a straightforward decision-making tool to touch upon complex, unstructured and multi-attribute problems (It helps in the choice of an appropriate cricket player from amongst an outsized variety of obtainable players for a cricket game).

III. PROBLEM DEFINATION

In the match, all teams want to win, but for winning a match, there are several issues needed to be considered such as select some good players in the specific opposition. One player may be very good in your team, but his/her performance against specific country or player may not be good. Again, a specific opposition may have weakness with playing in specific venues. In this paper, we analyze various statistical data and try to find out most influencing or favorable conditions and features to be considered for winning.

IV. METHODOLOGY

Data of ODI matches are collected during the time 2005-2017. We collected all the records of the matches that were played without any rain interruption. When we

Evaluating Alpha Relative Power of EEG Signal during Psychophysiological Activities in Salat

Farzana Khanam
Dept. of Biomedical Engineering
Jessore University of Science and
Technology (JUST)
Jessore-7408, Bangladesh
farzanabme@just.edu.bd

Md. Asadur Rahman
Dept. of Biomedical Engineering
Khulna University of Engineering &
Technology (KUET)
Khulna-9203, Bangladesh
bmeasadur@gmail.com

Mohiuddin Ahmad
Dept. of Electrical and Electronic Eng.
Khulna University of Engineering &
Technology (KUET)
Khulna-9203, Bangladesh
ahmad@eee.kuet.ac.bd

Abstract— To investigate human brain activities regarding EEG signal during psychophysiological activities in Salat (Muslim Prayer), several facts have been analyzed in this study. This research work investigated relaxed condition with eyes open and eyes closed and compared with 2 raqat (a single unit of Muslim prayer) Salat. Consequently, we have proposed that Salat provides a more relaxed state of mind than that of relaxing with either eye opened or closed. EEG data were acquired through the B-Alert system from several participants. The effects of EEG alpha band were determined using Welch's power spectral density method. Using student's *t*-distribution, the *p*-value was calculated to determine the difference between the alpha relative power of Salat and other relaxed states. During psychophysiological activities in Salat, a significant ($p<0.05$) increase in alpha RP has been observed in the frontal and parietal regions than other two relaxed sessions. This result reflects the relaxed condition of body and soul which raises parasympathetic activity and lessens the sympathetic activity. Therefore, this proposed work concludes that Salat can support proper relaxation and reduce anxiety than the regular relaxed situations.

Keywords— *Salat; EEG signal; power spectral density (PSD); alpha relative power; psychophysiological activity.*

I. INTRODUCTION

In the modern world, due to our ambitious lifestyle stress, emotional disruption, jealousy, etc., are increasing in exponential order. For this reason, people are bound to go for counseling in the quest of the mental healing process. For providing appropriate and adequate counseling, the therapists are looking for novel and integrative approaches to meet the challenges. Scientists from several branches have evolved into a varied source of techniques and therapies for the treatment of different mental disorders. Different therapeutic attempts from diverse sources such as alternative and complementary treatment modalities, the use of spiritual healing processes, yoga, reiki, etc., have yielded mixed results [1]-[2]. In this regard, counselors and therapists have looked upon religious texts and acts of worship for helping in their practices to address the specific needs of religious minority patients [3].

As a major religion, Islam is followed by billions of people and Muslims perform the prayer (Salat) five times daily. It is a religious mental-physical activity that is involved with various Quran (the holy book of Muslims) recitations and the performance of specific postural positions, such as standing, bowing, prostration, and sitting [4]. A properly performed prayer from the Islamic point of view, generally, produces a deep calmness and spiritual feelings the person who prays. By the means of this prayer the person wishes to reach the closeness to Allah (the God) (*"Those who have believed and whose hearts are assured by the remembrance of Allah. Unquestionably, by the remembrance of Allah, hearts are assured.*[5]*"*). Since Islam believing people pray five times a day, the scientific benefit of the psychophysiological tasks associated with this prayer will encourage them more to devote themselves to praying. Our main objective is to investigate the neuro-electric changes in the brain due to the psychological and physiological activities during Salat and how this process can help a prayer to reach a mental calmness.

Electroencephalography (EEG) reflects the neuro-electric action of human brain activities[6]. It is an electrophysiological monitoring method to record the electrical activity of the brain. EEG data is recorded with the electrodes placed along the scalp through noninvasive techniques. EEG depicts a variety of oscillations due to the summation of the synchronous activity of neurons of the human brain. The EEG is typically described in terms of (1) rhythmic activity and (2) transients. Most of the cerebral signals observed in the scalp, EEG fall in the range of 1–31 Hz. Waveforms are subdivided into bandwidths known as alpha (8-15 Hz), beta (16-30 Hz), theta (4-7 Hz), and delta (1-3 Hz) to signify the majority of the EEG used in clinical practice [7]. The alpha wave signal is one of the most dominating brain waves in a meditation state. Alpha wave is associated with inhibition control, seemingly with the purpose of timing inhibitory activity in different locations across the brain. The alpha wave activities of EEG signal can be measured in all regions of the brain [8]-[9].

It is explained in [10] that, the alpha rhythm tends to decrease in amplitude during mental load and tend to increase in mindfulness meditation. Therefore, mental calmness or more relaxed state relatively increases the power of alpha band which is also termed as alpha relative power (RP). Several studies have been published regarding task-related modulation of human EEG signals variation. The handful of previous studies on neural activities regarding the psychophysiology of Salat made us encouraged to conduct research to verify what the effects of neuro-electric changes are on the human mental state while a person performs Salat.

By this research work, we have investigated three relaxing conditions those are relaxing with eyes opened, relaxing with eyes closed, and performing 2 raqat Salat with full concentration from five male participants. For these three conditions, the EEG data were acquired by 9 channel B-Alert system. These 9 channels cover the frontal, central, and parietal lobe of the brain. The acquired signals all subjects were filtered to extract alpha band and calculated alpha RP through Welch's power spectral densities (PSD) method. Generally, it is considered that if any task gives the higher alpha RP, the task provides more relaxation to our body and mind. We have found by our research work that during Salat,

IoT Based Automated Fish Farm Aquaculture Monitoring System

1st Sajal Saha
Departement of Computer Science and Engineering
Patuakhali Science and Technology University
Patuakhali, Bangladesh
sajal.saha@pstu.ac.bd

2nd Rakibul Hasan Rajib
Departement of Computer Science and Engineering
Patuakhali Science and Technology University
Patuakhali, Bangladesh
rajib3hasan@gmail.com

3rd Sumaiya Kabir
Departement of Computer Science and Engineering
Green University of Bangladesh
Dhaka, Bangladesh
sumaiya@cse.green.edu.bd

Abstract—Internet of Things (IoT) is a very fast growing technology and the field of IoT is extending its wings in every one of the areas today. With the progression in computers like Arduino, Raspberry pi, the innovation is achieving the ground level with its application in farming and aquaculture. In this work, we have outlined and actualized monitoring of water quality of aquaculture utilizing Raspberry Pi, Arduino, various Sensors, Smartphone Camera and Android application. Water quality parameters used in this work are Temperature, pH, Electrical Conductivity and Colour. Sensor acquisition is conducted by Arduino and Raspberry Pi is used as data processing device as well as server. Photo acquisition is also performed by Raspberry Pi with the help of the smartphone camera to detect the colour of the water. Android phone is used as the terminal device. A user can monitor the water condition using an android app through Wi-Fi within Wi-Fi range and through Internet from anywhere in the world. Some analysis is performed with the four parameters value to determine the overall approximate condition of the water and required action. Every feature in this checking gadget can work legitimately and easily.

Keywords—*Internet of Things (IoT), Aquaculture, Water Quality Monitoring, Raspberry Pi, pH, Temperature, Conductivity, Water Colour, Sensors, Wi-Fi, Internet, Smartphone.*

I. INTRODUCTION

Aquaculture is one of the thriving areas in many countries in the world since demand for fish and the fish prepared food is expanding day by day. According to The United Nations Food and Agriculture Organization (UNFAO) "2012 State of World Fisheries and Aquaculture ", Worldwide yearly production of fishery items add up to around 128 million tons. The animal protein intake per individual is about 15% and increase the human reliance on fishery resources. The average consumption of fish products is 19 to 20 kg per person per year today and will be 16.7 kg per year in 2030 according to UNFAO. Production of fisheries, advancement and future food needs are firmly related [1].

Aquaculture comprises of the set of exercises, information and techniques for the rearing of aquatic plants and a few animal groups. This activity has an awesome significance in financial improvement and food production. Commercial aquaculture is confronting numerous issues because of sudden climatic vacillation leading to changes in water quality parameters. Aqua farmers are relying upon manual testing for knowing the condition of the various parameters of the water. But this manual testing is time consuming and also give inappropriate results as parameters for measuring water quality changes continuously. It will be better if automatic monitoring can be done somehow. So modern technology should be brought to aquaculture to overcome this problem. For rural development, technologies have to support several key application areas, for example, living quality, wellbeing, environmental change etc. [20]. So we have to be more selective in choosing the appropriate technologies for this kind of advancement.

An integrated on chip computer Raspberry Pi is used in our system as data processing and storing device which has an inbuilt Wi-Fi module. Using the Dataplicity service we can also access the Raspberry Pi through internet [18]. So, no additional Wi-Fi or Internet module is required. Smartphones are very obtainable and most of the smartphones have Media Transfer Protocol(MTP) today. Using these and performing some analysis on the water quality parameters make our work unique.

II. LITERATURE REVIEW & REALIZATION

A few papers in literature overview centers around how the aquatic life will impact because of progress in water quality parameters [2] and how IoT is utilized to overcome the issue. A great deal of research work is done with IoT to take care of this kind of issues as recently IoT is achieving the ground level with its application to agriculturists [3], [4].

A lot of numbers of the papers focuses on few kind sensors like pH, DO, Turbidity [5], [6], [7] and so forth and a solution for those issues. Be that as it may, the optimum fish production is absolutely subject to numerous chemical, physical and biological characteristics of water to the vast majority of the degree Thus, effective pond management requires a realization of water quality. Water quality is determined by factors like Dissolved Oxygen (DO), temperature, turbidity, transparency, water colour, pH, carbon dioxide, alkalinity, hardness, conductivity, salinity, TDS, unionized ammonia, nitrate, nitrite, primary productivity, plankton population, BOD, etc. [8].

K.Raghu Sita Rama Raju and G.Harish kumar Varma (2017) performed a work entitled as "Knowledge Based Real Time Monitoring System for Aquaculture Using IoT" which uses several sensors such as Dissolved Oxygen, Temperature, Ammonia, Salt, pH, Nitrate and Carbonates [9]. But maintaining lots of sensors is costly and tedious. So a system is needed which is not much costly and can

Determination of Characteristics and Performance Appraisal of GaN MESFET

Asif Hassan
Computer Science and Engineering
Jagannath University
Dhaka, Bangladesh
asif08ece@yahoo.com

Abu Shakil Ahmed
Electrical and Electronic Engineering
Leading University
Sylhet, Bangladesh
shakil.ahmed.bd71@gmail.com

Tasnim Sultana
Mathematics
Mawlana Bhashani Science and
Technology University
Tangail, Bangladesh
tasnimmuna94@live.com

Abstract—Several decades in the past have seen the rapid development of modern electronics and recent trends have led to the proliferation of studies that incorporate gallium nitride as a key aspect of fabricating different types of field effect transistors. Moreover, it is fast becoming an essential instrument in other aspects of electronics as well because of its phenomenal inherent properties such as high power, high temperature, and high frequency. A considerable amount of literature has been published on the mathematical formulation of gallium nitride based field effect transistors. However, there has been little quantitative analysis of various electronic properties like intrinsic delay faced by the carrier. This research article examines several properties such as intrinsic delay, gate to source capacitance, gate to drain capacitance, transconductance, cutoff frequency, and channel current for gallium nitride metal–semiconductor field-effect transistor as well as investigates the impact of variation in gate to source voltage on the channel current with proper evaluation of respective characteristics curves.

Keywords—Gallium nitride metal–semiconductor field-effect transistor, parasitic capacitance, intrinsic gate delay, cutoff frequency, channel current, transconductance.

I. INTRODUCTION

Recent developments in electronics have heightened the need for semiconductor material which is suitable for applications concerning high power [1], high temperature [2], terahertz frequency [3], and wide band gap material. The primary concern of research on gallium nitride throughout the past several decades is to investigate its prospect in these specific areas [4] [5]. Previous studies have reported that gallium nitride together with its alloys has higher carrier mobility, electron velocity, and thermal conductivity chiefly because of the presence of spontaneous or piezoelectric polarization which assists to the formation of two-dimensional electron gas [6]. In essence, these characteristics facilitate the fabrication of high-speed devices and design of next-generation radio frequency power amplifiers [7]. Moreover, this simple structure of gallium nitride draws considerable critical attention towards its incorporation with the realization of compact electronic devices [8]. Selection of a proper schematic structure, for instance, as shown in Fig. 1 is the basic prerequisite for evaluating the electronic properties of a gallium nitride based metal–semiconductor field-effect transistor (MESFET) by means of observing its carrier electronic behavior. Virtual experimentation like simulation provides not only the naive students but also the experienced researchers with the opportunity to conduct scholarly works

apart from the real world implementation by utilizing the analytical modeling in various fields such as communication systems, networking, biomedical engineering, control systems and many more which is at present available for gallium nitride-based MESFETs as well [9] [10].
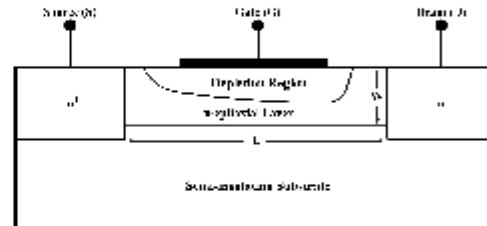

Fig. 1. Schematic diagram of GaN-based MESFET where S, D, G denotes source, drain, gate respectively [6].

The main issues addressed in this article are a) observation of the channel current through the GaN MESFET, b) determination of parasitic capacitance such as gate to source capacitance and gate to drain capacitance, c) assessment of transconductance, d) calculation of intrinsic gate delay, and e) finding the cutoff frequency with the variation of gate to source voltage in each case for a GaN-based MESFET.

The paper has been divided into four parts. Besides the introduction, the second part deals with the methodology of this analysis with a special focus on the analytical modeling of GaN MESFET. The outcomes of the analysis has been presented in the third part after conducting the simulation. all in all, the contribution of this research has been stated in brief in the final part.

II. METHODOLOGY

In comparison with the metal oxide field effect transistor (MOSFET), MESFET offers higher carrier mobility. Moreover, Schottky contact is preferred to other types of metal-semiconductor contacts such as Ohmic contact, annealed contact, and alloyed contact; markedly because it is fabricated based on GaN FET, and the barrier height for this contact is higher as well. In this case, it is important to realize that the drain to source voltage and gate to source voltage must be kept positive and negative respectively. Prior to commencing the analysis, several significant device parameters as mentioned in TABLE I are needed to be addressed.

Performance Analysis of a Compact Dual-Mode Antenna Operating at UWB and ISM Band for Wireless Medical Applications

Md Mehedi Farhad[1], Akib Jayed Islam[2], Swarup Chakraborty[3], Md. Siddat Bin Nesar[4], Md Asif Siddique[5] & Nishako Chakma[6]

[1]Department of EEE, Ahsanullah University of Science and Technology, Dhaka-1208, Bangladesh
[2]Department of EEE, American International University- Bangladesh (AIUB), Dhaka-1229, Bangladesh
Department of EEE[3,5] and ETE[4,6] Chittagong University of Engineering & Technology (CUET), Chittagong-4349, Bangladesh
Email: mehedifarhad.eee@gmail.com, akibjayedislam@gmail.com, swarupchakraborty.eee@outlook.com, mdsiddat12@gmail.com,
asifsiddiquebzs@gmail.com, nishakochakma.23@gmail.com

Abstract— In this article, a new design of a flexible dual mode off/in-body antenna is proposed. The main objectives of this proposed antenna refer to its dual mode operating at 5.7808 GHz & 4.1968 GHz, miniaturized dimension, impressive return loss, higher bandwidth that makes it suitable for WBAN applications. The size of the antenna is 12 mm x 10 mm x 0.52 mm which is appropriate for implantable as well as off-body applications. The performance parameters were scrutinized for functioning the proposed antenna in Industrial, Scientific and Medical (ISM) (5.725 GHz – 5.875 GHz) for Off-body communications and Ultra-Wideband (3.1 GHz-10.6 GHz) for implantable applications. A three layers of human phantom model is developed as simulation environment where the antenna is inserted inside the muscle for In-body operation. Biocompatibility test, flexibility and related performance measurements have been utilized using CST Microwave Studio software in both curved and planar states by following different types of dielectric property matching with human tissue model. Finally, Specific Absorption Rate (SAR) is assessed to check its feasibility and workability in wireless medical applications.

Keywords—Biocompatibility, Dual Mode, Human Phantom Model, ISM band, UWB, SAR, WBAN.

I. INTRODUCTION

Technological advancement stirred the development of miniature wearable electronic devices connected wirelessly with the network. In the course of the past several decades, Wireless Body Area Network (WBAN) has engrossed substantial attention. WBAN applications required wearable antenna [1] that, can be distributed in to three category: in-body [2], on-body and off-body mode [3-4]. In the aforementioned wireless communication, all terminals positioned on or in body will be mutual for off-body, on-body and in-body link. The antenna imbedded in the human tissue is considered as in-body mode antenna, where the human tissue has a great impact on the performance of the antenna. Instead, the antenna placed on the surface of the body and can interconnect with other antenna positioned along the body surface is identified as on-body mode antenna, which requires higher directivity [5]. Likewise, the antenna operating in near body free space and can link up with other devices such as a base station for medical telemetry is considered as off-body mode antenna which prerequisites the radiation at its maximum in the broadside path way.

Several frequency bands such as Wireless Medical Telemetry Service (WMTS), Medical Implant Communication Service (MICS), Ultra-Wideband (UWB), and Industrial, Scientific and Medical (ISM) that are utilizing for designing biomedical antennas, can provide widespread sort of frequencies for medical applications. UWB & WBAN systems have been keeping up extraordinary significance and more effective for research purpose. In 2012, a global standard IEEE 802.15.6 [6] for a diminutive variety, low profile, and greatly consistent wireless applications was issued and UWB is established as a single physical (PHY) layer approach. The UWB antenna implemented with WBAN system and its enactment is evident in medical applications. The performance analysis of UWB antenna and their suitability for communication systems and other applications are talked over in literature [7-8]. Scholars have been considering wearable antennas [9] to be embedded in the wearable medical devices. Designing biomedical antennas for such applications created curiosity in recent years. Considering wearable applications, the antenna prerequisites light weight, compact, easy fabrication, and better compatibility with human tissue properties. The antenna should perform robust in different environment fluctuations i.e. thermal, heat and bending conditions. Recently, implantable antennas as well as on/off-body matched antennas are utilizing for dual mode operation in single band, double bands or multiple bands considering biomedical applications.

Literatures [10-11] proposed dual mode antennas for on-body as well as off-body communications at 2.45 GHz and 5.8 GHz correspondingly. Another antenna working for dual mode with dual port configuration for on-off-body applications with the similar frequency are presented in [12]. Reconfigurable antenna are taking into consideration for improving the comfort degree through wearable antenna and save the gap close to body. To design the reconfigurable antenna RF switches are broadly utilized [13]. In the article [14], a meta-material structured antenna with radiation reconfigurable is recommended. Recently researchers have been utilizing CST Microwave Studio software for designing UWB and ISM band biomedical antennas aimed at on-body matched [15-16] or implantable [17-18] applications. An on-body matched bendable UWB antenna was proposed in [15]. Considering biomedical applications, the performance of the

English to Bengali Machine Translation: An Analysis of Semantically Appropriate Verbs

Mozammel Haque
Dept. of Computer Science and Engineering
Britannia University
Comilla, Bangladesh
bappy.mozammel@gmail.com

Mahmudul Hasan
Dept. of Computer Science and Engineering
Comilla University
Comilla, Bangladesh
mhasanraju@gmail.com

Abstract— Machine translator translates a source language into a target language. Obtaining a semantically valid verbal form during the machine translation is an intricate task. The subsisting translators like "Google Translator" still facing quandaries in this issue of translation from English to Bengali. The Bengali verbal inflection is transmuted to compose verb according to the nature of subject and tense. A sentence may have multiple syntactically valid verb form, which introduces intricacy during the machine translation. This study mainly focuses on the analysis of Bengali person, tense and verbal inflections. This paper describes a procedure for finding semantically valid verb within a sentence during the machine translation from English to Bengali.

Keywords— Bengali verb-root, Bengali verbal inflections, Machine translation, Bengali sentence, English sentence

I. INTRODUCTION

Machine translation (MT) is an area of computational linguistics that investigates the use of software modules to translate text from one language to another. Verb mapping during machine translation is very important as well as a complex task especially when machine translation involves Bengali because the structure of this language is very complicated.

Bengali is one of the most popular Indo-Iranian languages. It came from the Sanskrit language. Bengali is the mother language of Bangladesh and world ranked four in terms of the number of people speaking in all over the world [1]. The people of Bangladesh use English as their second language and the medium of the most of higher level (undergraduate or above) educational institution is English. Research on Bengali still in developing step as compared to English [2]. Bengali grammar rules [3]–[5], sentence quality[6], Machine Translation [7], Text and Speech [8] are some remarkable studies in Bengali Language. Some studies on Bengali language shows only the rules for subject and verb relation [9], [10]. But those studies are not sufficient to obtain semantically valid verb in sentences during MT. "Google Translator" is one of the most popular machine translators, but still facing problem to solve this issue (Fig. 1). In 2016, Haque and Huda implemented an algorithm that finds whether a

Bengali sentences contains semantically valid verb or not [1]. This algorithm is also not suitable for the machine translation.

In this paper, we have proposed an algorithm that is suitable for obtaining semantically valid verb in a sentence during machine translation from English to Bengali. Our aim is to find out the semantically valid verb form (main verb) during the machine translation. The rest of the paper is organized as follows. Section II introduces the structure of Bengali verb. The proposed approach has been presented elaborately in Section III. In Section IV, We present the experimental results and its analysis. We conclude our proposed work in Section V.
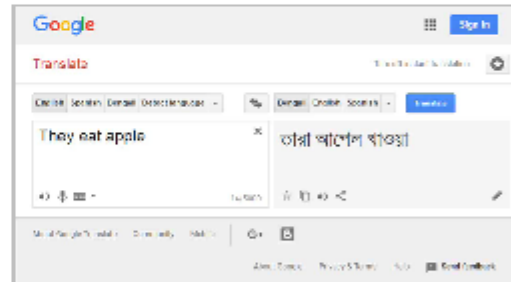
Fig. 1. Incorrect verb translation from English to Bengali using Google translator (Screenshot had taken on June 18, 2018).

II. PERSON AND VERB IN BENGALI LANGUAGE

Bengali sentence structure is very complicated. The structure of Bengali language is different from English language. Bengali has two types of writing format: Shadhu (সাধু) and Colito (চলিত). In this study, Colito language is used for processing.

English: I eat fish (Subject + **Verb** + Object)

Bengali : আমি মাছ খাই (Subject + Object + **Verb**)

Design and Performance Measurement of an On-body Capacitively Loaded Planar Inverted-F Antenna for Bio-medical Applications

Shamim Ahmad*, Rakibul Hasan, Sudipta Das and Md. Hasnat Rabbi
Department of Electrical and Electronic Engineering (EEE)
American International University-Bangladesh (AIUB)
Dhaka, Bangladesh
*ahmadshamim827@gmail.com

Abstract— In this research, an on-body capacitively loaded planer inverted-F antenna has been designed for biomedical applications, which is able to operate in MICS (Medical Implant Communication Service) band. The primary reason behind choosing MICS band (401MHz-406MHz) because of its availability, accepted propagation, safest frequency band for human body, easy fabrication etc. For making this antenna bio-medically suitable to use on human body tissue the antenna has mounted on the human body phantom model where all the properties of human body tissue has been maintained. The antenna is suitable for real time monitoring of different type body signals and also for communicating with other sensors related to on-body devices. To make this antenna bio-compatible and improve its performance an additional silicon layer has been used between the patch and human body phantom. As this antenna is designed for biomedical applications it needs to be harmless to human body tissue, for which its SAR is calculated and found at a safety region. VSWR<2, radiation pattern, bandwidth, return loss also observed through simulation and measurement by using CST microwave studio.

Keywords—PIFA, Specific Absorption Rate, MICS, Body Phantom, VSWR.

I. INTRODUCTION

In present era, the wearable devices are receiving much attention. Because of the advancement of wearable electronics, the research over body conformal antennas progressed rapidly in recent days. Nowadays multiple sensors are mounted on human body to receive several kinds of physiological signals of human body such as ph, blood glucose, blood pressure monitoring, temperature monitoring etc [1].

In wireless communication systems a low profile antenna is important to support multiband and wideband operation. Planer inverted-F antenna is met these requirements this antenna is compact, has minor inverted radiation and quarter wavelength patch. Because of high data transferable rate, miniature size, low manufacturing and fabrication cost, PIFA can be needed for several types of on-body communication. On the other hand, Federal communication commission have approved several bands such as Industrial scientific and medical (ISM) bands (5.725-5.875GHz, 2.4-2.48GHz, 902-928MHz and 433-434.8MHz) Medical Implant Communication Service (MICS) band (402-405MHz). This band was extended to 401-406MHz in 2009 and renamed medical service radio communication service (Med radio) [2]

In this paper, a capacitively loaded PIFA antenna is designed for on-body communication and bio-medical applications at MICS band. The proposed antenna characteristics like operating frequency, radiation pattern, gain, directivity, VSWR, SAR calculation were found to be in good agreement with the simulation and measurement results.

II. ON BODY ANTENNA DESIGNING

This article is about to introduce a capacitively loaded PIFA antenna with single layer structure and meandered lines. The antenna performance has been examined in the free space as well as on human phantom model. Analyzing the antenna on the human body phantom is the mainstream here. To fulfill the radiation requirements within the miniature size and mounted the proposed antenna on the three layer body phantom model is the principal goal here [3].
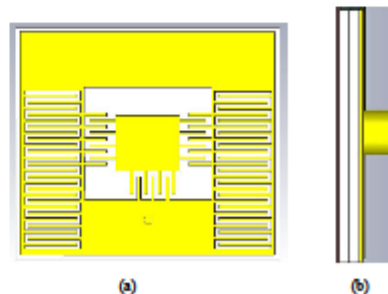

Fig. 1. (a)Top view and (b) side view of the proposed Antenna in -free space.

Numerical Analysis of Wind Flow over Various Shaped Rooftop of Buildings for Renewable Energy Application in Bangladesh

Sajid Nakvee
Aeronautical Engineering Department
(Faculty of Mechanical Engineering)
Military Institute of Science & Technology
Dhaka, Bangladesh
nakvee.339@gmail.com

Ishtier Rahman
Mechanical Engineering Department
(Faculty of Mechanical Engineering)
Military Institute of Science & Technology
Dhaka, Bangladesh
ishtier.rahman@gmail.com

Abstract—A numerical study has been conducted particularly graphical analysis to investigate wind flow above roof of the constructed structure of various shapes from side views such as the conventional structure, filleted corners, dome shaped, half wedges. The velocity contours and velocity profiles have been the points of observation to find out the shape having the efficacy to initiate the turbine rotation. In addition, the suitable location for mounting wind turbines has been illustrated and the desired roof shapes for future buildings are proposed to be constructed in Bangladesh. Computational results show that dome shaped roof delivers the maximum velocity among all the other shapes taken into consideration here. On the other hand, when corners are filleted the velocity has a relative increase than the conventional one. Case study shows that among all the cities Chittagong, Comilla and some certain places in Dhaka have the minimal wind speed to initiate the turbine to generate energy.

Keywords—*wind turbine, energy, fillet, wedge, dome, velocity profiles*

I. INTRODUCTION

Bangladesh is a developing country in South Asia. Dhaka is the capital and largest city, followed by Chittagong. Bangladesh is the world's eighth most populous country. The rate of population here is growing day by day. Also, there is lack of accommodations as well as lack of lands. Therefore, many buildings without any proper design are constructed in an unplanned manner. Despite this unavoidable condition these buildings can be utilized as the source of power generation.

The power generated in our country is not sufficient to cover all the regions. In addition, the pollution is growing sharply with the increase of industrial advancement. This requires to reduce the environmental impact as much as possible. Demand is always higher than the production. To meet up the demand, building-integrated wind turbines are suggested to install on the roof of commercial as well as residential structures to generate energy. Wind turbine power of a wind generator [1] can be expressed as follows:

$$P_{Turbine} = \tfrac{1}{2}\, \rho\; C_p A V^3 \qquad (1)$$

where, $P_{Turbine}$ is the wind turbine power, ρ is the air density (kg/m³), C_p is the co-efficient of performance, A is the swept area of the blades (m²) and V is free wind speed (m/s). From the above equation, it is showed that the power of the wind increases with the cube of the wind speed.

On the other hand, the rate of carbon emission is rising day by day. An expansion in the degree of public awareness regarding the effect of Green House Effect on the nature and the detrimental effect of our dependency on fossil fuels has acquired a developing enthusiasm on site-generated electricity from sustainable energy sources. Therefore, use of fossil fuels should be reduced to lessen environmental damage. Hence, the focus is on alternative energy solutions, which will reduce our carbon footprints.

The Global Institute of Sustainability building located in Arizona State University has mounted 6 wind turbines and under average condition, 36 computers can run with the generated electricity. The wind turbines accommodated there can produce electricity with winds down to 5 mph [2]. Numerous studies regarding utilization of urban wind energy have been done beforehand and a few has given hints of further work.

Durson (2012) has introduced the concept of Building Augmented Wind Turbines (BAWT). The advantages of roof mounted wind turbine was represented by him. The idea was to utilize the buildings as an accelerator of wind [3]. Study of Islam Abobela (2013) shows that as the building height increases, the wind velocity increases and accordingly the energy yield of a roof mounted wind turbine increases. He also found, barrel-vaulted roof is the desired roof shape for mounting wind turbines on the roof in order to accelerate wind above the roof [4].

In another study of Islam (2013), different designed roofs were compared and it was stated that mounting wind turbines on barrel vaulted roof would deliver 56% more electricity than a free standing wind turbine at the same location. Although wedge shaped roof will deliver only 9% more electricity than a free standing wind turbine, it is more feasible to take the advantages of the building's acceleration effect [5]. On the other hand, Sari (2012) found through numerical analysis and wind tunnel test that the wind speed raises at the center of rounder towers [6]. For the detail setup in wind flow simulations, S. Murakami (1993) have analyzed the distinctions of turbulence models and finished up with a decision that no model can simulate wind flow over buildings splendidly, although standard k-ε turbulence is a standout amongst the most sensible models and is broadly utilized [7].

Series Dynamic Braking Resistor Based Protection Scheme for Inverter Based Distributed Generation System

M. Shafiul Alam[1, 2*], M. A. Abido[1], Md Ismail Hossain[1], Md. Shamimul Haque Choudhury[2], and
Muhammad Athar Uddin[2]

[1]Dept. of EE, King Fahd University of Petroleum and Minerals Dhahran, Saudi Arabia
[2]Dept. of EEE, International Islamic University Chittagong, Bangladesh
*shafiul@kfupm.edu.sa

Abstract— High penetration of inverter based distributed generation (IBDG) in power system increases fault current level. However, according to new grid code fault current level must be kept within specified limit during contingencies in order to ease detrimental effect on power grid. This paper proposes series dynamic braking resistor (SDBR) based protection scheme for IBDG. SDBR is connected with the AC side of the IDBG to insert resistance during contingencies. Fault detection scheme is developed based on point of common coupling (PCC) current. DC link voltage controller of IBDG is developed with feedback mechanism such that the net active power exchange with DC link capacitor is zero. Inner current control strategy is developed for IBDG to transfer DG power to the grid. Different faults are applied in the system to show the effectiveness of the proposed SDBR based protection scheme. The proposed SDBR based control scheme have been found as an effective solution to limit the fault current for IBDG system as evident from the simulation results.

Index Terms— Inverter based distributed generator; Series dynamic braking resistor; Fault current limiter; Voltage source inverter.

I. INTRODUCTION

Nowadays, renewable energy resources are considered as promising solution to the perpetual increase in the energy demand due to environmental and economic issues as well as inefficiency of conventional power generators. Solar cells, wind turbines, fuel cells, micro turbines are widely connected to utility grid as distributed generators (DGs) to deliver power [1]. These types of DGs have DC power output which needs inverter to convert this power as AC output and deliver to grid. And, such DGs connected inverters are generally referred as inverter based distributed generator (IBDG) [2], [3].

Control issues of inverter of IBDG involve balancing of power in the network, regulating magnitude of node voltage, and system frequencies in case of islanded mode operation of DGs [4], [5].

Designing the controller and tuning the parameters of the controllers are challenging issues for IBDG system. DC link voltage of DGs must be regulated in a predefined value for the proper operation of IBDG. Inner current controller can be employed to control active power exchange with the grid.

IBDG system has several benefits as mentioned before; however, stability margin of interconnected DG systems are reduced, especially with high penetration of renewable energy resource based DGs. Fault ride through capability as well as stability must be improved for IBDG system according to grid code requirement [6]. Several techniques have been proposed to enhance stability of IBDG system in the literature.

Due to the complex nature of the power system, security and stability are important [7]–[10]. High level of fault current in power system causes oscillation [11], [12]. One of the promising solutions to the stability issues of power systems is to employ several fault current limiting devices such as series dynamic braking resistor (SDBR), superconducting and non-superconducting current limiter, and DC reactor [13]–[17]. Fault analysis and fault current contributions from distributed generator in IBDG system are discussed in [18]. This research proposes SDBR based control strategy of IBDG system in order to limit fault current as well as improve dynamic performance. To the best of the authors' knowledge, SDBR performance has not been investigated in IBDG system in order to limit fault current. Two control loops are proposed for controlling IBDG. The performance of the proposed control technique has been validated by simulation study. Reference tracking as well as current limiting performances of IBDG system have been greatly improved as evident from the simulation results.

Section II provides details on operation of SDBR and its control strategy. Modeling of IBDG and control strategy are presented in Section III. Simulation results and discussions are provided in Section IV. Finally, section V presents the conclusion of this work.

Bangla Handwritten Character Recognition Using Local Binary Pattern And Its Variants

Chandrika Saha, Rahat Hossain Faisal and Md. Mostafijur Rahman
Dept. of Computer Science and Engineering
University of Barisal
Barisal, Bangladesh
chandrika.cse1.bu@gmail.com, rhfaisal@gmail.com, mostafij.csebu@gmail.com

Abstract— Optical Character Recognition (OCR) especially for handwritten characters is an important task for its numerous applications in daily life including data digitizing, robotics vision, helping visually disabled people and many more. However, Bangla Handwritten Character Recognition (HCR) is rarely explored despite Bangla being one of the mostly spoken languages over the world. For classifying Bangla basic characters, compound characters and digits various feature descriptors and classification algorithms can be used. This paper provides a comparative study of different Local Binary Pattern (LBP) based feature descriptors on Bangla basic characters, compound characters and digits. For classification, Support Vector Machine (SVM) with linear kernel is used. The rigorous experiments on CMATERdb 3.1.2, CMATERdb 3.1.3.1 and CMATERdb 3.1.1 datasets for Bangla basic characters, Bangla compound characters and Bangla digits respectively have showed reasonable accuracies of different LBP based feature descriptors.

Keywords—Optical Character Recognition (OCR), Handwritten Character Recognition (HCR), Feature extraction, Feature descriptor, Support Vector Machine (SVM), Linear kernel.

I. INTRODUCTION

Optical Character Recognition (OCR) is the conversion of images of characters into electrical format. The electrical form of text is a better way of storing, searching, displaying, editing and translating data. OCR is used extensively in machine learning, natural language processing, robotics vision, reasoning, text to speech conversion and many other sectors. We see the use of OCR in checking business documents, number plate recognition, automatic key information extraction, pen computing and helping visually impaired people [1]. Handwritten Character Recognition (HCR) is a special type of OCR which deals with the ability of computer to recognize the letters written by human. HCR has become a vital part of robotics vision for its application in enormous sectors of life like smart education, autonomous driving, purchasing process, digitizing paper based process and many other areas [2]. Actually, we find the touch of education around us every day, everywhere.

Bangla is the fifth largest spoken language around the world being the language of 242 millions of people. It is the mother tongue of people of Bangladesh and also official languages of some Indian states [3]. Bangla has a rich set of characters including 11 vowel, 39 consonants, 171 compound characters and 10 digits. Compound characters can contain 2 or 3 basic characters combined into a single character. For classifying Bangla handwritten characters, we need to use some feature extraction and classification method. There are a variety of feature extraction techniques that have been used for Bangla HCR like shadow and quad tree based features [4], [5], [6], gabor filters, zoning [7], gradient based features[8], [9] etc. Recently, Local Binary Pattern (LBP) based feature descriptors [10], [11], [12], [13], [14], [15], [16], [17] have become popular for their robustness, simplicity and considerable accuracies. Already Hassan et al. have proposed a method for Bangla digit recognition using LBP as feature descriptor [18] which has obtained better results. However, works using LBP based feature descriptors are hardly seen in Bangla HCR. Some classification algorithms like logistic regression, neural network, Support Vector Machine (SVM) [19] etc. uses the features obtained by any feature extraction method to classify Bangla characters. The vital part of categorizing characters is feature extraction as it brings out the core part from a given data. The main concern of this paper is to apply various type of LBP based new feature descriptors on Bangla handwritten characters and find out which method works superior.

The rest of the paper is organized as follows, Section II contains the literature review, Section III provides the overall methodologies, Section IV provides the experimental evaluation and Section V concludes the paper with future directions.

II. LITERATURE REVIEW

Bangla character recognition system began to develop at around the middle of 1980s [7]. Since then, majority of the works was done for Bangla printed text recognition. Work on Bangla handwritten character recognition especially Bangla compound character recognition is very few. Some of the remarkable works on Bangla handwritten character recognition are described in this Section.

Basu et al. proposed a Bangla handwritten basic character recognition system using Multi-Layer Perceptron (MLP) based classifier [4]. As feature set they used 16 centroid features, 24 shadow features and 36 longest run based features. They formed a dataset of 10,000 characters by optically scanning handwritten character specimens for 50 characters. They find out accuracy rate of 86.46% on training data and 75.05% on test data using a single layer MLP. In another study, Das et al. proposed an improved feature descriptor for basic characters[5]. As feature set they used 16 centroid features,

Design and Implementation of an Embedded System to Observe the Atmospheric Condition using a Helium Balloon

Sadman Shahriar Alam[1*], Akib Jayed Islam[2*], Md. Mahmudul Hasan[3] and Md Mehedi Farhad[4]

[1]Department of Electronic Systems, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway
[2,3]Department of EEE, American International University- Bangladesh (AIUB), Dhaka-1229, Bangladesh
[4]Department of EEE, Ahsanullah University of Science and Technology, Dhaka-1208, Bangladesh
*Email: sadmanshahriar23@gmail.com, akibjayedislam@gmail.com

Abstract— For conducting any space-related research such as surveillance and communication, launching high power rocket, geographical imaging or even space exploration, it is necessary to know the optimal weather condition at different levels of the atmosphere. One of the most commonly used methods for measuring the atmospheric conditions is using a weather balloon. Of course, this can be done by using modern-day satellite technology. But satellite, for example, provides temperature only on the land surface. As a result, it limits the possibility of providing accurate measurements on temperature profile at different levels of atmosphere or wind speed of the jet stream. An embedded system consists of different sensors is capable of providing profiles of temperature, pressure and relative humidity at different altitude with the help of a helium balloon. In this paper, we have designed and implemented a remotely controlled embedded system. The RF transmitter is linked with the sensors on board of the balloon payload, which sends the measurements back to a ground tracking antenna on a set radio frequency. The display section receives the transmitted data for further processing and acquiring graphical results. In previous research papers on this topic, there was no graphical representation of acquired weather data from the experiment where we have discussed the outcome of the experiment with graphical representation.

Keywords— Weather balloon; high altitude balloon; stratosphere; sensors; GPS; embedded system; pressure, temperature, and humidity

I. INTRODUCTION

Perception leads the best approach to comprehend the complexities of the atmospheric conditions. The concern in regards to space weather impacts flight team, aeronautics, communications, electronics, and navigation constrain scientists in taking atmospheric radiation perception. Space weather predictions are dependent with certification to observe optimal weather conditions at various levels of the stratosphere. Researches are trying to improve the interactions as well as model the improvements and warning decisions regarding space weather. Weather balloon experiments are being utilized to observe weather or space weather for accepting and sculpting of surroundings in a better manner.

An embedded system is proposed in the literature [1] that can be used for evaluating temperature, pressure and humidity in the atmosphere using a weather balloon. The restrained data are transmitted to the ground station for monitoring. Radio frequency signal is employed for developing communication between the balloon floating station & ground station. A low-cost GSM based weather monitoring system is presented in the article [2]. The designed system is embedded with sensors that are able to gather weather information and can be transmitted to the ground station. The measured data could be utilized to establish solar or wind energy generation whenever a prototype is needed to crosscheck. Another low cost, IoT (Internet of Things) based weather monitoring device which retrieves the weather conditions of the remote area from the cloud database and displays the output is recommended in the literature [3]. Literature [4] presents a simple experimental setup of a weather station and weather balloon using Global Navigation Satellite System (GNSS) functionality. Researchers from the University of Nebraska and Peter Kiewit Institute launched project HALON (High Altitude Learning Over Nebraska) to encourage students as well as educators in STEM (Science, Technology, Engineering and Mathematics) through a discovery-driven and integrative approach concentrating on the space hardware and software that used high altitude ballooning (HAB) platforms [5]. A unique low altitude balloon experimental data can be carried out to study space explorations, weather sensing, live space video, aerial images, surveillance, and communication operations [6]. In article [6], traditional tracking method in low altitudes flight tracking was replaced to increase efficiency with an IOT based GPS tracking system for low altitude balloon in real time using LPWA (Low power Wide Area) Network. A lightweight weather balloon is recommended in the article [7] to obtain short circuit current for regulating solar cells.

In this paper, an embedded system is designed and established to observe atmospheric condition using a helium balloon. The complex circuitry model is represented as printed circuit board (PCB) layout. The upper location of the sensor box consists of a microcontroller, pressure sensor, radio antenna, GPS antenna and module, and battery. The temperature sensor and radio module are placed in the lower part of the sensor box. The main idea behind this research is to combine the proposed technologies discussed in the previous similar type of researches [1-7] and fixate on the limitations. The outcome of this work is explained with graphical representation at different altitude of the

Fabrication and Characterization of Zinc Selenide (ZnSe) Thin Film in Solar Cell Applications

Md. Abu Sayeed[1], Hasan Khaled Rouf[1]

Department of Electrical & Electronic Engineering
University of Chittagong
Chittagong-4331, Bangladesh
Email: [1]asrasel29@gmail.com, [1]hasan.rouf@cu.ac.bd

Abstract—Characterization of Zinc Selenide (ZnSe) thin film has been numerically performed using Essential Macleod Program and is found promising in applications of thin film solar cells. It is observed that at a certain wavelength and film thickness ZnSe possesses relatively high transmittance and low reflectance. Following this ZnSe thin film was fabricated by Chemical Bath Deposition (CBD) technique and then physically observed by X-ray diffractometer (XRD) and Scanning Electron Microscope (SEM). Energy bandgap of ZnSe was experimentally found at approximately 2.63 eV. We demonstrate ZnSe film can be used as a window layer in thin film solar cell to transmit maximum amount of light energy resulting in more photo generated current.

Keywords—*ZnSe thin film, chemical bath deposition, essential macleod, film thickness, reflectance, wavelength and transmittance*

I. INTRODUCTION

Natural energy is a substantial resource for the production of electricity such as tidal energy, wind energy, solar energy etc. To accelerate the wheel of modernization, necessity of electricity is beyond our description. If we are able to utilize this massive natural power efficiently, scarcity for electricity will be completely vanished. Solar electricity is a rapid growing technology that uses sunlight energy to produce electric power from a simple P-N junction. Conventionally developed solar cell is not so much power efficient for its structural limitations as well as fabrication process. Therefore, this work focuses on the design and development of efficient solar cells.

In semiconductor physics, thin film refers to a layer having thickness ranging from few nanometers to several micrometers, formed by depositing a simple or compound materials. Thin film technology has wider applications in LED, transistor, solar cell, storage and also in drug delivery.

Zinc Selenide (ZnSe) is a solid compound semiconductor possessing intrinsic and wide bandgap properties, comprised of group II element Zinc (Zn) and group VI element Selenium (Se) and is extensively used in several optoelectronic applications such as solar cells [1]. From band structure of ZnSe we have identified the maximum energy level of valence band aligns with the minimum energy level of conduction band in energy-momentum (E-k) diagram which proves ZnSe as a direct bandgap and also a polycrystalline material [1].

A lot of works has been done by researchers on thin film solar cells to improve the photocurrent generation capability, for example: thin film solar cell based on Cu_2ZnSnS_4 thin films studied the structural property such as diffraction intensity from XRD patterns and photovoltaic I-V characteristics [2], thin film solar cell using an earth-abundant Cu_2ZnSnS_4 absorber worked on power conversion efficiency [3]. Also, fabrication of CZTSSe solar cells using CZTS nanocrystals emphasized on the development of low cost and sustainable solar cells [4] and theoretical analysis of window/CIS layers on performance of CIS solar cells found the effect of conduction band energy on cells performance [5] etc. All these works had performed to improve cell's performance by mixing different types of materials, varying their percentage of concentration, using several fabrication techniques and so on.

Compound semiconductor materials such as Cadmium Sulfide (CdS) [6], Cadmium Selenide (CdSe) [7] have lower transmittance and also because of their surface roughness, these two materials are not suitable to use as a window layer in thin film solar cell. Maximum effective efficiency of thin film p-CdTe/n-CdS solar cell is 17% and for p-CuInSe₂ /n-CdS it is 17.87% due to lower transmittance of CdS as a window layer [8]. In this work we have explored the possibility of ZnSe thin film as a window layer in solar cells because of its higher transmittance and lower reflectance. ZnSe thin film has higher transmittance which allows incoming light to collide massively with p-n junction placed below the window layer. It also has lower reflectance because of its wider bandgap and polycrystalline behavior in the visible and ultraviolet region. Thus, the incident photon trapping increases resulting enhancement of photoelectric effect causing current density to increase.

Performance of ZnSe has been thoroughly studied by differing the thickness of thin film, wavelength and incident angle of incoming light. We have found maximum transmittance and minimum reflectance of ZnSe thin film at a certain wavelength and thickness.

Photoelectric effect paves the way of fabricating solar cell and other optoelectronic devices in a well-organized and productive manner. Corresponding photo generated current I_p is given by the following equation [9]:

$$I_p = Q \int \varphi \lambda \, (1 - R\lambda) \, QE_{In} \, d\lambda \qquad (1)$$

A Novel Approach of Reactive Power and Voltage Control in Grid Connected Wind Farms Using STATCOM

Mohammad Faisal[1*], M. R. Karim[1], M. J. Rahman[1], S. M. G. Mostafa[1*], Md. Shahid Ullah[1]

[1]Department of Electrical and Electronic Engineering
International Islamic University Chittagong (IIUC)
Chittagong-4203, Bangladesh
E-mail: *fsl3319@gmail.com, *mostafa.93eee.iiuc@gmail.com

Abstract —This paper presents a novel control scheme of reactive power and voltage to a grid-connected wind farms. Firstly, a simple wind farm model consisting of a squirrel-cage induction generator (SCIG) is developed in MATLAB/ Simulink environment. The Voltage controller operates by compensating the reactive power output of the wind farms and regulating the desired per unit value of output voltage across the Load. STATCOM is a flexible, dynamic and easy to implement, and used as a compensation device in this research. The test model of 575V, 60 Hz STATCOM is connected with a step down transformer, an inverter and a controller was designed to control the output voltage and reactive power. Three fixed speed parallel wind turbines constitutes the wind farm which is connected to the 25 kV grid. STATCOM is connected with the transmission line with a primary & secondary Load connected in parallel. The direct quadrature reference frame transformation and PWM generator is also implemented in this model.

Keywords— Reactive power, STATCOM, transformer, voltage controller, wind farm.

I. Introduction

The international energy market is currently experiencing an era of renewable energy revolution. Out of different renewable energy sources, wind energy is able to establish itself as a vital key player among others. The challenge in wind power generation is the optimal control of reactive power support while maintaining the sustainable grid voltages. To provide the required supports, wind farms needs to supply or absorb reactive power along with the active power supply. Reactive power plays a vital role in the up-gradation of the voltage profile in the optimum power system performance [1], [2], [3].

STATCOM is a resourceful device that provides reactive power compensation in ac networks. It is similar to a conventional synchronous compensator, which is necessarily a synchronous generator where the field current is used to compensate the regulated voltage [4], [5]. The STATCOM utilizes voltage source converter (VSC) to obtain the regulation

task. Modeling and Simulation of wind farms with STATCOM for Voltage Regulation along with Reactive power compensation imparts various control strategies such as voltage sag, swell, fluctuation, unbalance, harmonic distortion and impulses may have pernicious impact on customer devices which may cause malfunctions and loss of production [6]. Out of all the power quality problems, voltage instability is the most common disturbance that is faced by the consumer. These problems arise by various equipment's or faults. Several compensation devices may be used to mitigate these problems, out of which STATCOM gives better performance in voltage fluctuation mitigation along with harmonic distortion prevention.

II. Modelling of Wind Farms

A wind farm or wind park is a gathering of wind turbines arranged in a manner to create power which may comprise hundreds of individual wind turbines. In this research, three wind turbines have been connected in parallel to drive a 575 V, 4 MVA induction generator, and a load of 50 kW. The two inputs of wind turbine are generator speed and wind speed. Both this speeds are measured in per unit value with respect to the nominal speed of the generator and base wind speed accordingly. The base wind speed is assumed 10m/s.

The power captured by the wind turbine is converted into electrical power by asynchronous induction generator and is transmitted to the load by transformer. In order to generate power induction generators speed must be slightly greater than the synchronous speed. But the speed variation is typically so small that the WTIG is considered to be a fixed-speed wind generator. A squirrel cage induction generator always consumes reactive power for field excitation. However, reactive power consumption is partly or fully compensated by capacitors in order to achieve the unity power factor.

III. Control Strategies by STATCOM

Fig. 1 describes the block diagram of the STATCOM in Simulink model. STATCOM is basically a voltage-source converter based

Comparison of crystallite parameters of ZnO nanoparticles using various peak profile analysis

Mohammad Shahidul Alam
Dept. of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
shahid9310@gmail.com

Md Mizanul Islam
Dept. of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
mizanulislam63@gmail.com

Tetsuo Soga
Dept. of Electrical and Mechanical Engineering
Nagoya Institute of Technology
Nagoya, Japan
soga@nitech.ac.jp

M. Shafiul Alam
Dept. of Electrical and Electronic Engineering
King Fahad University of Petroleum and Minerals
Dhahran, Saudi Arabia
shafiul@kfupm.edu.sa

M. S. H. Choudhury
Dept. of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
shamimul129@gmail.com

Mohammad Rafiqul Islam
Dept. of Computer Science and Engineering
Manarat International University
Dhaka, Bangladesh
rrafique1975@yahoo.com

Abstract— In this study, the blade coating method was used to prepare ZnO film followed by X-ray diffraction (XRD) analysis of that film. The analysis indicated that ZnO particle was crystallite with a hexagonal wurtzite phase. The X-ray peak profile analysis (XPPA) was used to validate the crystallite development. Williamson-Hall (W-H) and size-strain plot (SSP) analysis were implemented to determine the crystallite sizes (D) and the lattice strain (ε) of ZnO nanoparticles. XRD peaks were further studied to determine the physical parameters including strain, stress, and energy density. A modified form of W-H models, i.e. uniform deformation model (UDM), uniform stress deformation model (USDM), and uniform deformation energy density model (UDEDM) was employed to obtain these parameters. The study reveals that the crystallite size (D) evaluated from Scherrer's formula, Williamson-Hall plots, and size-strain plot (SSP) stand in correlation.

Keywords— ZnO nanoparticles, X-ray diffraction (XRD), W-H analysis, SSP method

I. INTRODUCTION

ZnO is a promising semiconductor material which has been the subject of numerous studies in recent years for its excellent fundamental properties and technological significance [1], [2]. It shows many potential characteristics such as wide band gap (3.37 eV), a high exciton binding energy (60 meV), excellent chemical stability, non-toxic, high electric conductivity and so on [2]. It is available in nature and has a high carrier lifetime [2], [3]. Over the year researchers have developed various processes for preparing ZnO nanoparticles, for example sol-gel, precipitation, spray pyrolysis, and hydrothermal synthesis [3], [4]. Antireflection coatings, transparent electrodes in solar cells, piezoelectric devices, gas sensors, and luminescent materials are some practical application of ZnO [5], [6], [7]. In above applications, particle size and crystal morphology play a vital role which has attracted researchers for the synthesis of nanocrystalline ZnO.

Phase identification of a crystalline material can be done by XRD. The information regarding unit cell dimension can also be provide by XRD [8]. X-ray is ideally suited for the analysis of specific materials due to their non-contact, non-destructive nature [8]. Bragg's law is used to analyze the crystallite condition of the sample provided that the wavelength and diffraction angle is known. The intensity of the diffracted X-rays from the set of crystal planes can be estimated. This would allow to determine the lattice parameter and elastic strain from the position of peak, plastic strain and particle size from peak width, and phase proportions from peak intensity [8]. A well-developed crystal shows isotropic expansion to infinity. The finite size of a crystal prevents this perfect growth which results in expansion of the diffraction peaks [9]. There are two very important properties can be derived from the analysis of the peak width, which are crystallite size and lattice strain [9]. The non-uniformity of D of the particles with the particle size itself results from the presence of polycrystalline aggregates [10]. Crystal imperfections, for example lattice dislocation govern the distribution of lattice constants, this measure of the distribution is called lattice strain [10]. Two other types of lattice strains are also common in a crystal, they are, uniform and nonuniform strain [11]. Peak broadening of crystal will cause by only nonuniform strain [11]. Grain boundary triple junction, stacking faults, contact or sinter stresses, etc. are some other sources of strain [12]. Dislocation distribution can be investigated by using x-ray line broadening. Bragg peak, which is known to enhance the peak width and peak intensity. It also shifts the peak position of 2θ, is altered by D and ε [1], [2], [4]. There are other techniques for assessing crystallite size and lattice strain, but W-H is a simple method for determining the value of D and ε where the peak width is assumed as a function of 2θ [13]. Another method developed to determine of D and ε more accurately called SSP.

In this paper, different parameters of ZnO nanoparticles has been determined by XPPA technique. This technique is supported by updated W-H models such as UDM, USDM, UDEDM, and SSP method. This paper redefines the significance of W-H ad SSP models to determine the value of D for ZnO nanoparticles.

Comparison of Different Extraction Transformation and Loading Tools for Data Warehousing

Md. Badiuzzaman Biplob
Department of CSE
International Islamic University
Chittagong
mdbadiuzzamanbiplob@gmail.com

Galib Ahasan Sheraji
Department of CSE
International Islamic University
Chittagong
galibahasan@yahoo.com

Shahidul Islam Khan
Department of CSE
International Islamic University
Chittagong
nayeemkh@gmail.com

Abstract— Data Warehouses (DW) are database implementations that supports the storage and analysis of historical data. The key components of DWs are known as Extraction, Transformation and Loading (ETL). Since wrong or misleading data may deliver the wrong results. Suitable ETL Tools are necessary for a DW to enhance data quality. The choice of ETL tools is a difficult as well as important issue in data warehousing. This paper first describes the ETL procedure in brief and compare the features of the ETL tools. In this paper, we have compared the existing ETL tools to choose the best option in different situations. From a current industrial market, we collected feedback from the industry professional and documented it to establish the relevance of the data warehouse. We have implemented the available popular ETL tools to compare their strengths and weaknesses to choose the best among them for National Health Data Warehouse of Bangladesh.

Keywords— *ETL, Data warehouse, Database, Data Integration;*

I. INTRODUCTION

A data warehouse is a large records repository that consolidates diverse kinds of data converted into a single appropriate format. Relying on particular business desires it can be architecture in another way. However in general data stored in operational databases is transferred to a data warehouse the pre-processing platform also is referred to as the staging area, then after processing into the data warehouse and lastly is transformed into sets of confirmed data marts. Extract, Transform and Load (ETL), is an important element of the data warehousing structure. The method consists of the extraction of data from numerous data sources, the transformation of extracted data consistent with business necessities and loading of that data into the warehouse [1]- [6].

Any programming language may be used to make an ETL technique, but, making it from bits and portions is pretty complicated. Various ETL tools are available in the marketplace easing an organization to select one primarily based on its requirements & needs. With the passage of time, those tools have matured and now provide must more than just extraction, transformation, and loading of data. The improvements consist of capabilities together with "data profiling, data high-quality manage, tracking and cleansing, actual-time and on-demand statistics integration in a provider-orientated structure, and metadata control" [7]-[12]. Furthermore, ETL tools are now customizable according to the functional necessities of an enterprise data warehouse.

Extraction:

In this step, we extract data from different internal and external sources, dependent and/or unstructured. Simple queries are sent to the source structures, using native connections, message queuing, ODBC or OLE-DB middleware. The records could be installed a so-known as a staging area (SA), generally with the same structure as the source. In a few instances we need best the data this is new or has been modified, the queries will simplest go back the adjustments. Some ETL equipment can do this mechanically, providing a changed data capture (CDC) mechanism.

Transformation:

The transformation section guarantees the data consistency and executes data cleansing earlier than loading data into the data warehouse . With a purpose to transform the data properly, some of the guidelines and business calculations are carried out to the extracted data in order that different data formats are mapped into a single format. The transformation may be integrated with the extraction or loading section depending upon when it is performed.

Loading:

Loading the data into a data warehouse or data mart or data repository other reporting applications that house data [13] – [20].
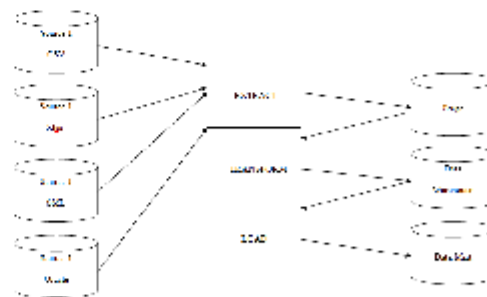

Fig. 1 ETL Workflow

To be used for various analytical purposes. It is carried out often to keep away from data stacks to get piled up. It is able to be required in one of the two conditions:

A Comparative Usability Experience Analysis of Card Sorting and Interactive Dialogue Model Design Technique

Samrat Kumar Dey
Department of CSE
Dhaka International University
Dhaka, Bangladesh
samrat.cse@diu-bd.net

Md.Sherajul Islam Bappy
Department of CSE
Dhaka International University
Dhaka, Bangladesh
bappy5may@gmail.com

Mst. Sabrina Biswas
Department of CSE
Dhaka International University
Dhaka, Bangladesh
sabrin.biswas@gmail.com

Shereen Akter
Department of CSE
Dhaka International University
Dhaka, Bangladesh
ushirin95@gmail.com

Abstract— Currently we are living in an era of technological advancement. Web Designers all over the globe are always like to experience new challenges. Web applications provide developers and designers the prospect to investigate with innovative interaction grammar. However, unfortunately those consequences for Usability testing still need to be fully understood. This research panorama will investigate how the choice of analysis method for Card Sorting and Interactive Dialogue Model (IDM) will affect the Usability Experience for a particular Web Application. An empirical study has been carried out to discover the potential usability experience of an e-government websites of Bangladesh using the two systematic usability design framework. The study was replicated with 12 test-participants. In this experiment, we have designed and developed a website for Primary and Mass Education of Bangladesh using both Card Sorting and IDM Technique. The study results indicate that card sorting technique significantly produce better results and outperform IDM in terms of usability experience.

Keywords—web usability, card sorting, IDM, information architecture, e-government

I. INTRODUCTION

Usability is considered as one of the quality attributes that assess how comfortably user interfaces are needed to be used. It also indicates a method for improving ease-of-use during the design process. Usability can be defined in a specified context where a specified product is used by specified users in order to achieve specified goals with Effectiveness, Efficiency, and Satisfaction [1]. Web usability is an approach to make websites easy to use for end users. Users should be capable to intuitively relate the action that needs to perform on the web pages. Therefore, Usability is the key concern for designing any specific website. It ensures the optimum services for its end user by employing quality attribute during website design. Poor usability affects the utility of the designed system as well as discourages users to use that system [2]. Numerous Web application is being used for a very long time in the field of e-governance, e-health, e-commerce, e-learning, etc. Usability issues are explicitly considered and evaluated to design and develop of these applications [3]. Again, the key element which encompasses the User Interface design like navigation links,

icons, buttons, images icon, thumbnail, and the like button in the social network is also being reflected as a decisive element of any website design [4]. Users always like to interact with the web interface with UI elements. Therefore, Web designers always need to keep usability issues in their minds to design specific websites. The reason behind choosing Card Sorting for our study because of its influence on Information architecture. Card Sorting is used to understand users thinking about websites content. Also, it helps to organize content so that it suits users' mental model rather than a point of view of product design. Interactive Dialogue Model (IDM) is another approach that we are using in our experiment which focuses on Multichannel Application Design. It is the first design model which directly acknowledge the importance of the concept in Multichannel Application Design. One of the prime motives for choosing IDM in our study is about the usability of a design model, where the amount of time required for developing the model and to sketch the design is surprisingly reduced. Previously very few approaches were used for constructing website by using IDM and Card sorting but no comparative analysis were made between these. H. Petrie, et al. [5] made a comparison based on onsite card sorting data collection with the offsite data collection has been approached. To assess the similarity of webpage design by card sorting using co-occurrence matrix are mentioned in [6] by Martine and Rugg. Nawaz et al. [7] conducted a qualitative analysis of card sorting in order to identify if specific users grouped items according to a thematic classification. Another suitable use of this technique in The University of Illinois at Chicago library where they redesigned their library website by conducting open card sorting studies [8]. In terms of IDM, only a few approaches were presented to develop multichannel applications. Authors in [9] developed a Military Application using IDM but no comparative usability evaluation was made. A combination of IDM and Rich-IDM based design framework has demonstrated in [10] where the author proposed a new framework for Mobile Application Design. The prime contributors of IDM methodologies D. Bolchini and P. Paolini [11] developed a method by emerging Munch and Berlin Exhibition Website using IDM framework. That was the very first comprehensive approach for developing a website using that method. In a brief, no research work has not yet been carried in order to compare

Graphene Based Surface Plasmon Resonance (SPR) Sensors : An Approach to Enhance the Performance

Tauhidul Haque* and Hasan Khaled Rouf†

Department of Electrical & Electronic Engineering
University of Chittagong
Chittagong-4331, Bangladesh
E-mail : * tauhidtuhin670@gmail.com, † hasan.rouf@cu.ac.bd

Abstract—In surface plasmon resonance (SPR) sensors, compared to most metals silver (Ag) produces narrow reflectance curve resulting in high sensitivity. However, silver is highly susceptible to oxidation. Graphene on silver substrate provides high sensitivity and also protects undesired oxidation of silver. In this work graphene on silver configuration is further enhanced by integrating a titanium (Ti) layer for better adherence of silver on prism glass. Its performance has been measured in terms of sensitivity factor (SF), sensor merit (SM), full-width at half-maximum (FWHM) values and combined sensitivity factor (CSF). SF and CSF of the proposed sensor are 66.19°/RIU and 258.59 RIU⁻¹, respectively. These performances are far better than graphene on silver configuration without any adherence layer.

Keywords—*surface plasmon; SPR sensor; optical sensing; biosensor; graphene.*

I. INTRODUCTION

The demand for low-cost, light-weight, simple and quick sensing devices for environment, food and biological applications has increased recently, not only for scientific research but also for normal works in daily life. Interaction of light with metals under required conditions gives rise to plasmonic phenomena which can be used in sensing applications. Light illumination of ultra-small metallic particles gives rise to surface plasmon (SP) which are electromagnetic surface waves propagating along the interface of two materials with real dielectric constants of opposite signs [1]. The excited SPs are strongly localized across the interface and decay exponentially. The change of refractive index (RI) of the material located within the field of surface plasmon is a critical factor in determining the surface wave. The smallest change of RI will produce a large change in the propagation of surface plasmon wave. This change alters the coupling condition between SP and light wave. As a result, resonant wavelength of the incident light is shifted or resonant angle of the incident light is changed or intensity of the reflected light is changed. These changes are related to the change of refractive index of the substance adjacent to the metal surface [2]. A surface plasmon resonance (SPR) sensor works based on this principle.

Due to low losses and strong resonance responses gold (Au) and silver (Ag) are widely used in plasmonic applications than other metals. Ag produces narrower SPR curve and sharp

SPR resonance dip providing higher sensitivity. But it is highly susceptible to oxidation. On the other hand, Au is more resistant to oxidation and is chemically stable. But sensitivity of the sensor that uses gold is decreased due to poor adsorption of biomolecules on gold which makes the response curve comparatively wider. Thus, Ag is a better candidate in terms of sensitivity if it is possible to insert a chemically inert layer on Ag surface. Graphene can be used to protect the silver film from oxidation [3, 4]. The large real part of its dielectric constant helps to absorb light energy in the metal. In the presence of graphene layer on the metal, the electric field intensity at graphene-metal interface is increased. This results in strong coupling between graphene and metal making it suitable as dielectric top layer for the SPR sensor [5]. Also since graphene has a large surface to volume ratio better biomolecule adsorption is supported and this leads to sensitivity enhancement. Several researchers have worked toward the performance improvement of SPR sensors and many of which were by using graphene [3], [6-8]. Performance improvement of SPR sensor by using monolayer graphene was demonstrated in [3] which used silver as the metallic layer. Reference [6] used gold as the metallic layer and showed that the sensitivity can be enhanced by using graphene. Through experimental works [7] demonstrated that in the SPR sensor copper (Cu) and silver (Ag) can be protected from oxidation by graphene. Xin Hong et al. demonstrated the gold nanoparticles contribute to signal amplification in SPR and sensitivity improves remarkably [8].

In this work the graphene-on-silver configuration [3] is further enhanced by a titanium (Ti) layer which is used for better adherence on prism glass. Graphene-on-silver configuration provides high sensitivity and impermeability of graphene protects from undesired oxidation of silver. However, silver has poor adherence with glass. Therefore to enhance the adherence of metal layer on prism glass the Ti layer is used. SPR sensor performances have been measured for the proposed configuration in terms of different performance parameters including SF, SM, FWHM values and CSF. Finite-difference time-domain (FDTD) method has been used for numerical simulation and optimization of metallic layer thickness has been performed. SF of the proposed sensor structure is better than that of [3] (66.19°/RIU against 55.57°/RIU) and CSF of

Influence of compression and hot-compression in electron transport in dye-sensitized solar cells studied by electrochemical impedance spectroscopy analysis

An Nazmus Sakib
Electrical and Electronic Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
ansgalib@gmail.com

M. Shafiul Alam
Electrical Engineering
King Fahd University of Petroleum and Minerals
Dhahran, Saudi Arabia
shafiul@kfupm.edu.sa

Mobinul Islam
Electrical and Electronic Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
mobin_islam@yahoo.com

T. Soga
Electrical and Mechanical Engineering
Nagoya Institute of Technology
Nagoya, Japan
soga.tetsuo@gmail.com

A. A. Abuelwafa
Department of Physics
South Valley University
Qena, Egypt
amr.abuelwafa@sci.svu.edu.eg

M. S. H. Choudhury
Electrical and Electronic Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
shamimull29@gmail.com

Abstract— This article provides an overview of the electrical impedance spectroscopy (EIS) analysis that has utilized to characterize photo-electrochemical prominence of dye-sensitized solar cells (DSSCs) prepared by various postdeposition treatments. Hot-compression technique has been found as an effective postdeposition treatment compared to compression and without compression for ZnO-based DSSC. In detail analysis of the electron transport data has been presented and analyzed in a different way to support the photocurrent-voltage, structural and scanning electron microscopy image data for the cells prepared by various postdeposition treatments. EIS analysis has been described using Nyquist plot, bode plot, impedance vs frequency plot, dielectric effect and electric modulus effect for the cells prepared by those three postdeposition treatments.

Keywords—Dye-sensitized solar cell; hot-compression; impedance spectroscopy; charge transfer resistance

I. INTRODUCTION

Energy demand growth and the ongoing worldwide push towards decarbonization to mitigate the unfavorable effects of climate change have driven to an intensification of renewable energy to stabilize emissions growth in the energy sector [1, 2]. Solar energy is an unlimited, clean and sustainable generation of energy which is abundant for all. Most of the commercial solar cells are from inorganic materials such as GaAs, CdTe, CuInGaSe$_2$, and Si based which exhibits conversion efficiency in the range of 10 to 25% [3]. However, these solar cells are very costly. The hybrid organic/inorganic material such as metal oxide based dye-sensitized solar cells (DSSCs) are considered as a lower cost alternative to those inorganic cell invented by M. Grätzel and their group [4]. Though TiO$_2$-based DSSC offers high conversion efficiency, considerable interest on ZnO-based DSSC has also taken interest by the researchers due to having many interesting and promising properties of ZnO. ZnO has few distinct advantages over TiO$_2$ such as high electron mobility of 115−155 $cm^2\ V^{-1}\ s^{-1}$ which is more than

one order of magnitude larger than anatase type TiO$_2$, simple preparation of various nanostructured particle and easy alternation of the surface structure[5, 6], along with similarity electron injection process and band gap (3.37 eV) to TiO$_2$[7]. These exciting features opens wide range of possibilities in the field of DSSC design and fabrication. It demonstrated the proof of irreversible electron infusion wonder from the natural particles into the conduction band of a wide bandgap semiconductor [8]. Also, it is frequently using in various reversed polymer solar cells and quantum dab solar cells which is similar to DSSC[9, 10]. Various types of synthesis mechanism has been studied to prepare a large variety of ZnO nanostructure by the researchers such as nanoparticles, nanowires, tetrapeds, nano flakes, nanoflowers, etc[11]-[14]. Up to now the maximum reported power conversion efficiency (PCE) is about 7.5% which is still very far from the record efficiency from TiO$_2$-based DSSC[12]. Many attempts has taken to enhance the efficiency of the cells. Although glass substrate cells show relatively better conversion efficiency, plastic substrate based flexible DSSC getting more interest nowadays due their light weight and flexible nature. The main reason for lower efficiency of flexible cells is the high annealing temperature (450-550 °C) is not applicable here. However, for flexible substrate DSSC some other attempts are usually taken to overcome this deficiency such as mechanical compression, binder free coating, low temperature heating with ultraviolet light, cathodic electrophoretic deposition, hydrothermal crystallization, and so on[15]-[19]. Mechanical compression for TiO$_2$-based DSSC has been investigated much compared to ZnO-based cells. One of the reason might be the difficulties related to peeling off of the materials during the application of compression. To solve this issue mechanical compression with annealing the compression plate has been investigated by a group for TiO$_2$-based cells[20]. Later on compression and hot-compression has been applied for glass substrate and flexible substrate by our group both for ZnO and TiO$_2$ based cells[21]-[23]. Performance improvement due to compression and hot-compression has been discussed

An Adaptive Routing Protocol for the Performance of Real-Time Applications

Saad Mazhurul Huque
Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
saadmheleven@gmail.com

Imam Muhammad Amirul Maula
Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
amirulbrinto90@gmail.com

Razu Ahmed
Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
razu17@yahoo.com

Syed Zahidur Rashid
Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
szrashidcce@yahoo.com

Abdul Gafur
Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
agafur_cox@yahoo.com

Abstract—Real-time applications such as Voice, Video Conferencing, VOIP, HTTP etc. need to fulfill some criteria of standards for the computer network. In order to fulfill those criteria, over the years, different single dynamic routing protocols, such as RIP, EIGRP, OSPF have been used. Every routing protocol has their advantages and disadvantages. In this paper, different routing protocols, such as RIP, EIGRP, and OSPF have been combined to utilize their advantages. OPNET modeler has been used as the simulation software. Different parameters, such as Convergence, Throughput, Jitter, Packet Delay Variation, End-to-End Delay, Traffic Dropped, Bandwidth Utilization etc. are selected as a simulation scenario. The experimental results demonstrate that integrating various routing protocol is showing the better performance than single routing protocol. Among all integrating routing protocols, the combination of EIGRP and OSPF, that is EIGRP/OSPF outperforms the most satisfactory performance for the applications like video and voice communication.

Keywords—RIP; EIGRP; OSPF; Convergence; Throughput; OPNET

I. INTRODUCTION

Routing is a fundamental factor in the modern communication system. Routing protocol determines how data will reach from the source to the destination throughout the network. Every routing protocol is configured differently than others according to their respective parameters as they implement different algorithms to provide the best outcome. Static algorithms and Dynamic algorithms are the algorithms used in modern communication network [1]. Static routing algorithm can't reroute traffic in case of link failure and increases network overhead [2]. For a complex network such as the internet, modern technologies execute dynamic routing protocols. Dynamic routing algorithm has many types but there are two mostly used protocols, namely Distance Vector Routing protocol and Link State Routing protocol. Link State Routing protocol keeps better information about network connectivity than Distance Vector Routing protocol. OSPF (Open Shortest Path First) is a Link State Routing protocol whereas RIP (Routing Information Protocol) and EIGRP

(Enhanced Interior Gateway Routing Protocol) are Distance Vector Routing protocols. Performance evaluation of different routing protocols has been completed using various network parameters, such as convergence, throughput, jitter, packet delay variation, end-to-end delay etc. for real-time applications. To enhance the performance, a combination of two or more routing protocols has been used for the applications, such as video and voice. In this paper, the performance of different routing protocols has been demonstrated in case of real-time applications. A mesh topology has been designed to analyze performance using simulation software, OPNET Modeler. Based on the parameters, single routing protocols (RIP, EIGRP, OSPF) and mixed routing protocols (RIP/EIGRP, RIP/OSPF, EIGRP/OSPF, EIGRP/RIP/OSPF) have been implemented in the proposed network topology and their performance has been compared with each other. EIGRP/OSPF gives the satisfactory results for most of the scenarios.

II. NETWORK TOPOLOGY DESIGN AND IMPLEMENATTION

A. Topology

Designing the topology is the first step of this study. For design and simulation, OPNET modeler has been used which is now Riverbed Modeler [3].
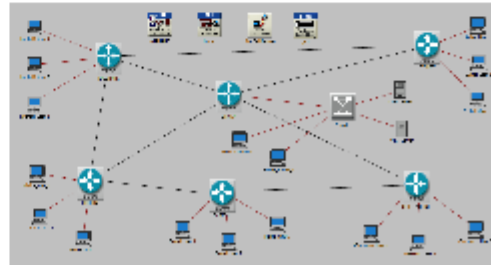

Fig. 1. Topology

In vitro antimicrobial and antiarthritis effects of methanolic extract of *Zanthoxylum rhetsa* leaves

Mohammed Abu Sayeed*, Md. Sekendar Ali, U Swe Sing Chowdhury, Ameerul Islam, Naiyaruz zaman, and Afrina Azad
Department of Pharmacy, Faculty of Science and Engineering, International Islamic University Chittagong, Bangladesh

Abstract: The antimicrobial study of Zanthoxylum rhetsa leaves methanol extract was evaluated by the disc diffusion method against some pathogenic microorganisms using Kanamycin and Fluconazole as standards for antibacterial and antifungal tests respectively. It exhibits the activity against almost all the test bacterial species with the zone of inhibition from mild to moderate in different concentrations- 100, 300 and 500 µg/disc where microbial species exhibits from minimum 11 to maximum 25 mm zone of inhibition. The extract exhibits activity against all the fungal species from mild to moderate, Candida albicans, Cryptococcus neoformans, Blastomyces dermatitidis, and Trichoderma spp with the zone of inhibition from 10 to 27mm zone of inhibition.

The Anti-arthritis test have also done by using six concentrations for absorbance of test solution, product control solution, test control solution and percentage of inhibition of methanolic extract of Zanthoxylum rhetsa with comparison of standard Diclofenac sodium in different concentrations like 31.75 µg/mL, 62.5 µg/mL, 125 µg/mL, 250 µg/mL, 500 µg/mL and 1000 µg/mL where different concentrations showed an increase in all the parameters that was statistically significant from test, control and standard groups.

The present study indicates that, Zanthoxylum rhetsa leaves methanol extract has both antibacterial and antifungal activity from mild to moderately and in different concentrations has significantly has anti-arthritic activities.

Keyword: *Anti-arthritic, antimicrobial, Zanthoxylum rhetsa, pathogenic microorganisms.*

*Author of Correspondence,
email:pmasayeed@yahoo.com, Mobile:
+8801670419435*

INTRODUCTION

As per report of World Health Organization (WHO), medicinal plants are an accessible, affordable and traditionally suitable source of primary health care for more than 80% of Asia's population [1]. An antimicrobial substance is an agent that inhibits bacterial as well as fungal growth or kills them by maximizing the spectrum. The term is often used synonymously with the term antibiotic. However, now a days, with increased knowledge of the causative agents of various infectious diseases, antibiotic(s) has come to denote a broader range of antimicrobial compounds, including antimicrobial, antifungal and other compounds.

Generally the elderly people of our society face a common problem of Arthritis. Approximately one fifth of the world's population suffers from this debilitating disease [2]. The management of arthritis and other related conditions involves the use of different classes of drugs such as non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids and disease modifying anti-rheumatic drugs (DMARDs) etc. Gastrointestinal side effects are the common problem of using NSAIDs, which includes irritation of the gastric mucosa, belching, gastric ulceration and bleeding. Long term use of NSAIDs may damage renal and hepatic functions, predisposing the patient to cardiovascular disorders [3]. Thus, continuous search for alternative drugs is to be done from plants and other natural sources. There are several types of medicinal substances that are used for the treatment of arthritis. Treatment typically starts with medications that have the least side effects with further medications being added, if inadequately effective.

Based on above information, the leaves of *Zanthoxylum rhetsa* was selected for evaluating its antibacterial and antiarthritic activity in the management of infectious as well as some non-infectious diseases like arthritis etc.

Design and Simulation of a Single Element High Gain Microstrip Patch Antenna for 5G Wireless Communication

Muhammad Mostafa Amir Faisal
*Dept. of Electronic and
Telecommunications Engineering
International Islamic University
Chittagong*
Chittagong, Bangladesh
oranta68@yahoo.com

Mohammad Nabil
*Dept. of Electronic and
Telecommunications Engineering
International Islamic University
Chittagong*
Chittagong, Bangladesh
mohammadnabil638@gmail.com

Md. Kamruzzaman
*Dept. of Electronic and
Telecommunications Engineering
International Islamic University
Chittagong*
Chittagong, Bangladesh
kamruzzamanshohag789@gmail.com

Abstract—The use of micro-strip antennas in wireless communication is very popular due to their low cost, low profile and ease of fabrication. But poor performances like narrow bandwidth, low gain etc. confines their application. As the upcoming 5th generation (5G) requires high gain antenna, the main concern of this research is to design a high gain micro-strip patch antenna using air substrate. The antenna is designed and simulated using Zeland's IE3D and operates at 28 GHz band. The gain, bandwidth, return loss and efficiency of the single element antenna is 9.82 dBi, 1.29 GHz, 42 dB and almost 100% respectively.

Keywords—5G, gain enhancement, 5G antenna, mmwave, air substrate.

I. INTRODUCTION

From the beginning of the emergence of wireless communication, it has become very popular because of its cost efficiency, flexibility, mobility and many other features. So, rapid growth in the demand of mobile connection, data rate, and mobile data traffic has been seen during the last three decades. Again, Internet of Things (IoT) has added a new extent to these demands. To meet these growing demands, telecommunication industry has been evolving different generations of standards in almost every decade. 5th generation (5G) is the consequence of them, which is to meet the demands of connectivity of more than 100 billion wireless devices, low latency of millisecond level, data rate of 10 Gbps, internet of things etc. that is expected to be deployed in the early 2020s [1].

The current 4G network is using sub-6-GHz bands for communication. But the available spectrum resources of these bands can't support the requirements of 5G [1]. So, telecommunication community has to move to the higher frequency bands ranging from 6-300 GHz. As a consequence, the following bands are expected for 5G wireless communication including the 3.4-3.6 GHz, 5-6 GHz, 24.25-27.5 GHz, 37-40.5 GHz and 66-76 GHz bands [2]. The Federal Communication Commission (FCC) has declared 27.5-28.35 GHz for 5G [1]. Among the proposed bands, 28 GHz is selected for this research.

But the problem to use these high frequency bands or mmwave bands is that the path loss or free space loss is intense in these bands, which results in the degradation of signal to interference plus noise ratio (SINR) [3]. To mitigate this problem, high gain antennas are required [1], which is the main concern of this research. Replacing the substrate of patch antenna with very low dielectric constant material is one of the methods to increase the gain [4]. In this design, air is used as the substrate whose dielectric constant is 1.

In section II, the related literatures are reviewed. The design procedure of the antenna is depicted in section III. In section IV, the optimization of the antenna parameters using genetic algorithm is introduced. The simulation results and analysis of the results are in section V. Finally, in section VI, the research is concluded.

II. LITERATURE REVIEW

The present 4G network can provide 100 megabits per second as the peak data speed. Whereas the requirements of ever-growing telecommunication data rates include peak data rate of more than 10 Gbps, 1 million per km^2 connection density, 10 Tbps per km^2 traffic volume density, improved cost, spectral and energy efficiency and more [1]. In order to support these demands, network providers are aiming to step to the next generation system namely 5G, which is going to facilitate these needs by employing the key technologies like novel multiple access, ultra-dense networking, all-spectrum access, beamforming antenna arrays, full/flexible duplex and others [1]. The installation of these upgraded technologies has brought about new challenges for the antenna engineers. To deal with the challenges of 5G, several antennas have been proposed in different literatures.

The proposed antenna in [5] obtained gain of 27 dBi, but consists of 48 elements which is bulky in size and doesn't cover the whole 28 GHz band as proposed by FCC. In [6], a dual band antenna is proposed for 28 GHz and 38 GHz bands, obtaining 5.42dBi and 6.25 dBi of gain respectively. The antenna proposed in [7] obtained gain of 13.3 dBi but the size of the antenna is large. The antenna proposed in [8] obtained gain of 10.7 dBi using 2*1 element array. The antenna proposed in [10] obtained 18.5 dBi gain, which is a MIMO antenna having 112 radiation element, whose size is 196mm × 232mm, is very bulky and not suitable for mobile devices. Also the resonant frequency is not as declared by FCC. In [11], the proposed antenna obtained 8.05dBi gain at 28GHz but the antenna is less efficient. The antenna proposed in [12] obtained gain of 8.2 dBi at 28GHz, but the design is more complex. The antenna proposed in [13] obtained 2.28 dBi of directivity, which is not suitable for 5G communication due to low directivity. So it is needed to design a single element antenna with high gain, high efficiency that covers the whole 28 GHz band.

Optimization of electrophoretic deposition parameters for uniform titanium oxide deposition on conductive glass substrate

Shah Ridwan Ahmed
Dept. of EEE
International Islamic University
Chittagong
Chittagong, Bangladesh
akib432@gmail.com

Md. Munirul Islam Tusher
Dept. of EEE
International Islamic University
Chittagong
Chittagong, Bangladesh
mdmunir012@gmail.com

Muhammad Athar Uddin
Dept. of EEE
International Islamic University
Chittagong
Chittagong, Bangladesh
mau_iiuc@yahoo.com

M. Shafiul Alam
Dept. of EE
King Fahd University of Petroleum and Minerals
Dhahran, Saudi Arabia
shafiul@kfupm.edu.sa

T. Soga
Dept. of Electrical and Mechanical Engineering
Nagoya Institute of Technology
Nagoya, Japan
soga.tetsuo@gmail.com

M. S. H. Choudhury
Dept. of EEE
International Islamic University
Chittagong
Chittagong, Bangladesh
shamimul129@gmail.com

Abstract — In this investigation, electrophoretic deposition of Titanium Oxide (P25) nanoparticles on Fluorine doped Tin Oxide (FTO) substrate has been studied. Three deposition parameters such as deposition time, deposition distance, and deposition voltage have been varied to get a uniform metal-oxide layer. The rate of deposition has been observed by varying those three parameters. Rate of deposition clearly increases as an effect of increasing deposition time and voltage. On the other hand, rate of deposition decreases by increasing the distance between the substrates. Surface morphology image shows that huge amount of cracks are formed while the amount of deposition increases beyond a certain level. By observing the surface morphology, optimized deposition parameters have been proposed for the deposition of TiO_2 for thick microfilm application.

Keywords— Electrophoretic Deposition; Titanium Oxide; Deposition Parameter

I. INTRODUCTION

Electrophoretic deposition (EPD) is one of the salient colloidal deposition process in which colloidal particles suspended in a liquid medium are migrated and deposited onto an electrode with an applied electric field [1-4]. Generally, it can be considered as a two-step process which includes charging the particles of a suspension and migration of these charged particles towards an oppositely charged electrode. When an electric field is applied, all of the charged particles migrate by the process of electrophoresis towards the electrode with opposite charges. In electrophoretic deposition any colloidal particles can be used which are capable of forming stable suspensions and can carry a charge. There are two types of EPD processes depending on the nature of surface charge of the suspended particles in the solution. These are the anodic and cathodic EPD. In the anodic process, negatively charged material is deposited on the positively charged electrode or anode. In the cathodic process, positively charged material is deposited on the negatively charged electrode or cathode.

Cathodic processes are often able to be operated at significantly higher voltages than the corresponding anodic processes [5]. In this investigation, cathodic EPD process was followed. The characteristics of EPD are maintained by two groups of parameter. Those are parameters related to suspension and parameters related to the process [1]. The parameters related to the suspension include particle size, dielectric constant of liquid, conductivity of suspension, viscosity of suspension, zeta potential, and stability of suspension. The Parameters related to the process include deposition time, applied voltage or deposition voltage, concentration of solid in suspension, conductivity of substrate and distance between the substrates or deposition distance. This investigation was concerned with the parameters related to the process, not the parameters related to the suspension. EPD is a low cost popular deposition technique as it offers controlled and precise deposition with very simple arrangement [6-7]. By this method, thick binder-free films can be deposited at a shorter time compared to the other deposition techniques [8]. TiO_2 is a promising material that deposits on various conductive substrate for many applications in the field of material science [9-13]. Electrophoretic deposition of TiO_2 has been investigated by several researchers [14-20]. Uniform and precise deposition is one of the major challenges for any deposition technique. Non-uniform deposition with having huge amount of cracks for thick TiO_2 layer is one of the major concerns for the researchers. Thus, to get a uniform crack-free TiO_2 layer many attempts such as - use of binder material, heating, compressing, multilayer deposition, and some other optimizations has been proposed by the researchers [21-22]. In this investigation, various EPD parameters were optimized to achieve uniform crack free TiO_2 layer for DSSC application [23-24].

II. EXPERIMENTAL METHODS

Suspension for cathodic electrophoretic deposition was prepared using P25 type TiO_2 as a precursor and ethanol

Low-Frequency Inter-Area Mode Detection in Power System using Continuous Wavelet Transform

Md Ismail Hossain
Electrical Engineering,
King Fahd University of
Petroleum & Minerals
Dhahran, Saudi Arabia
ismailhossain@kfupm.edu.sa

Mohammad Abido
Electrical Engineering,
King Fahd University of
Petroleum & Minerals
Dhahran, Saudi Arabia
mabido@kfupm.edu.sa

Md Shafiul Alam
Electrical Engineering,
King Fahd University of
Petroleum & Minerals
Dhahran, Saudi Arabia
shafiul@kfupm.edu.sa

Md Shafiullah
Electrical Engineering,
King Fahd University of Petroleum & Minerals
Dhahran, Saudi Arabia
shafiullah@kfupm.edu.sa

Md. Al Emran
Electrical and Electronic Engineering,
International Islamic University Chittagong,
Chittagong , Bangladesh
alemraneee@gmail.com

Fakir Sharif Hossain
Electrical and Electronic Engineering,
International Islamic University
Chittagong, Chittagong , Bangladesh
sharifo16@yahoo.com

Abstract— Low-frequency oscillation can lead to the instability of an interconnected power system. Some power systems around the world have already seen blackout incidents because of low-frequency oscillation. Hence, identification of the low-frequency oscillation is critical to the interconnected power system. Low-frequency oscillation mode can be identified from its eigenvalue. However, it requires a true model of the large complex power system and works on the linear model under certain operating condition. The recorded signal from Phasor measurement unit (PMU) is used to apply Continuous Wavelet Transform (CWT) to identify low-frequency oscillation without prior knowledge of the complex mathematical model of the large interconnected power system. Among wavelet families, Complex Morlet mother-wavelet function is used in this work to formulate the mathematical relationship between system ringdowns low-frequency oscillation modal information and the CWT. The magnitude and phase plot of the complex-valued wavelet coefficients yield mode of the recorded signal. In this paper oscillation signal from a two-area four-machine power system is measured and then analyzed using continuous wavelet transform (CWT) technique to obtain its modal information corresponding to inter-area mode of oscillation. Finally, the linear system analysis method is used to compare the result from the proposed technique.

Keywords—Continuous Wavelet Transform, Morlet Complex CWT, Eigenvalue, Linear Regression, Inter-area oscillation .

I. INTRODUCTION

Electricity is the backbone of modern civilization and its ongoing progress which can be hampered due to shortage and unreliable supply of Electricity. Because of continuous demand from the consumer side, liberalized electricity market framework, greater competition between agents, reduced generation reserve margins and large power transactions over long electrical distances, the power system is likely to operate its technical limit[1]. Power systems are subject to small and large disturbances which can create small signal stability problem [2]. This must be able to adjust to the changing conditions while ensuring stability. Usually, these problems increase or sustained themselves as small frequency electromechanical oscillation due to poorly damped low-frequency mode [3]. Typically, a lot of protection and monitoring system are there to maintain the system stability. However, if the instability in the range of oscillating frequency 0.1 to 2 Hz remains, this will progressively increase the angular separation between two interconnecting generator rotor, which can cause grid breakup, and large-scale power system blackout reported in literature[4], [5]. Therefore, identification of low-frequency oscillation is of great importance for controlling and maintaining the overall security of the power system. Typically, Low-frequency electromechanical oscillations are two types. Local area mode of oscillations and inter-area mode of oscillations. when Machines on the same area of power generation oscillate against each other then this oscillation is called local mode of oscillation. The frequency range lies in between 0.8Hz to 3Hz. On the other hand, when the coherent machines on two different area of power generation oscillate against each other, then this type oscillation is called inter-area mode of oscillation which can be observed over a large part of the network. Typically, the frequency of interarea mode is in the range of 0.2 Hz to 1Hz, which is among the major concern of system collapse if corrective measures are not made early [5]. Hence, detection and extraction of oscillations properties are of great importance to avoid system instability by providing proper damping torque on these oscillation frequencies. There are lots of online and offline based techniques have been reported in the literature to detect the interarea mode of oscillation. Eigen value-based mode detection is one of the offline based techniques that can identify different oscillation mode in the power system[2]. The major drawback of this technique is obtaining the true mathematical model of the large complex power system. As we know, the linearization is performed around an operating point, which is not in the case of the actual power system as it continuously varies. Therefore, accurate mode identification using this technique is prone to

Which Programming Language and Platform Developers Prefer for the Development? A Study Using Stack Overflow.

Sajal Saha
Department of Computer Science and Engineering
Patuakhali Science and Technology University
Dumki, Bangladesh
sajal.saha@pstu.ac.bd

Golam Md. Muradul Bashir
Department of Computer Science and Engineering
Patuakhali Science and Technology University
Dumki, Bangladesh
murad98csekuet@yahoo.com

Md. Raihan Talukder
Department of Computer Science and Engineering
Patuakhali Science and Technology University
Dumki, Bangladesh
raihantalukder96@gmail.com

Joy Karmaker
Department of Computer Science and Engineering
Patuakhali Science and Technology University
Dumki, Bangladesh
joykarmaker2065@gmail.com

Md. Saiful Islam
Department of Computer Science and Engineering
Patuakhali Science and Technology University
Dumki, Bangladesh
mohammadsaifulcsepstu@gmail.com

Abstract— Stack Overflow is the most popular Q&A website which is used by developers and programmers for many developments and programming purposes. Stack Overflow commits occur based on various types of programming languages. But among all the languages which are more reliable and helpful for programmers is a burning question. We researched over Stack Overflow commits and reached in a conclusion. Our main target was to analyze over Stack Overflow commits and to give a result which can raise the confidence level of a programmer. In this research, we will show which language and platform are better for developers and programmers. We used 1139 Stack Overflow related commits, analyzed them and came to an end that in "JavaScript" language programmers involve most and in "Java", response time is less than other languages. We also found that in "Python", programmers have a large probability to get an answer. We also analyzed different platforms in Stack Overflow and found that "Web Design" is the most helpful platform among all the platforms. From our research developers and programmers can now understand which platform and language they should choose.

Keywords—Stack Overflow, commit, platform, language, crowd.

I. INTRODUCTION

We all heard the name of Stack Overflow. A well-known term for the programmers and developers. It is an online Q&A site. People crowd there when they faced any problem related to programming, development, API usage and for other purposes. They asked a question and get answers from well and experienced programmers, developers and people related to technical subjects. At an early stage of career, computer professionals face few common problems such as which technology are trending, which programming language or development platform would be the best for his upcoming career as well as has a larger community to assist. We are trying to figure out how to solve these burning questions by analyzing the Stack Overflow dataset. We used a Stack Overflow dataset to find out which platforms are preferable for a developer as a beginner and which programming languages are mostly used and among them which one is popular. In our work, we found out some important knowledge about Stack Overflow. We have summarized the Stack Overflow dataset collected from GHTorrent in terms of numbers of commit, time to response questions, numbers of votes for an accepted answer and so on. Which then used to predict the probable answer to the question mentioned earlier.

II. BACKGROUND

We have done a survey on some well-experienced developers and programmers and found out the helpfulness of Stack Overflow. 90% of them said that when they faced any problem in programming, developing and problems related to API usage, they were trying to solve it using Stack Overflow. They consider Stack Overflow as a responsive Q&A website. Another 5% of them don't use any specific Q&A website. When they faced any problem, they just googled it, got the solution from any Q&A sites and apply it. Sometimes they took help from Stack Overflow, but we didn't consider them as a regular Stack Overflow user. The remaining 5% developers solved their problems by own or with the assistance of someone else.

We were motivated by some other studies. For example, Abdalkareem, Shihab, Rilling [1] qualitatively analyzed over Stack Overflow related commits and their research purposes were to find out what reasons developers resort to Stack Overflow, what areas crowds are most helpful for developers and what areas have the longest response time. But we investigated Stack Overflow commits to helping developers in choosing a programming language and development platforms for their career, which is the primary difference of our research goal with them. Before starting our research, we needed a clear knowledge about Stack Overflow and that's why we didn't exclude any details. We tried to understand how Stack Overflow really works and how crowd takes part in Stack Overflow. This research helps us to process and

Application of Deep Neural Network for Predicting River Tide Level

Risul Islam Rasel
Faculty of Computer Science and Engineering
Chittagong Independent University
Chittagong, Bangladesh
rasel.kmutnb@gmail.com

Md. Nizam Uddin, Fokhrul Islam
Computer Science and Engineering
International Islamic University
Chittagong, Bangladesh
{nizamcse2012; shahidcse12}
@gmail.com

Amran Haroon
School of Science and Engineering
Chittagong Independent University
Chittagong, Bangladesh
amran@ciu.ac.bd

Abstract— In riverine countries like Bangladesh, residents have to depend on rivers for many things for their daily life. If the river has river port or intercostals waterways or estuaries than it becomes more significant to country. So, knowing the upcoming water height or tide level at the river becomes an important fact to people for planning their daily activities, like: fishing, water way communication, port activities controlling etc. Moreover, people living at the bank of the river can anticipate sudden flooding by having updated information about tide height at the river. The aim of this study is to propose a machine learning model which will be able to percept short term future tide level at a river. For undertaking the experiments, we have collect 10 years (2007-2017) of historical dataset of the Karnaphuli river from Chittagong Port Authority's (CPA) hydrographic department. It is the mainstream river of Bangladesh having four tide gauge stations named Kalurghat, Canal-10, Canal-18 and Sadarghat. We have designed our study using Support Vector Machine (SVM), Artificial Neural Network with back propagation (BP-ANN) and Deep Neural Network (DNN). After careful and meticulous analysis we have found DNN model outperformed the others with almost 99% accuracy in future water level prediction.

Keywords—Tide level prediction, Support Vector Machine, Artificial Neural Network, Deep Neural Network

I. INTRODUCTION

Water level forecasting due to tidal phenomenon is very significant while planning for river fishing, water way communications, managing smooth marine vehicle operation in seaports or harbor engineering construction. And it becomes more significant if the river is a mainstream river with the direct estuaries with the sea and country's economy largely depends on it as well. Moreover, it is also necessary for the peoples living low lying lands by the river side in anticipating sudden flash flood. Since the natures of tide are random and uncertain and also change with the seasons, it is a challenging task to predict exact tide level. Traditionally the tide forecasting is done by the harmonic analysis (HA) and wavelet analysis (WA). Mohammad El-Diasty and Spiros Pagiatakis [1] did these types on analysis by calculating a huge sum of sinusoidal constrains of tide length or the height of wave length. However, these types of analysis have some limitations, such as these cannot deal the non-periodic meteorological and oceanographic phenomenon such as global warming affect, storm, winding effect or other influential natural phenomenon. To deal with these types of complexity and work with large volume of data machine learning field shows significant performance. Milos Dakovic, Tijana Ruzie and Budimir Lutovac applied ANN methods to improve Nevata Basin hydro-meteoroidal data for short time prediction [2]. Prahlada R, Paresh Chandra Deka experimented with WNN and ANN model tor time series forecasting [3]. Gang Li, Yu-Xin Zhao proposed long term prediction for ANN mode [4], B.L Meena and Dr. J.D Agrawal used ANN techniques for predicting tide as base stations [5], E.A Mlybari, M.S Elbisy, A.H Alshahri, O.M Albarakati used SVM with BPNN in their study for short term daily prediction [6] Akhil Muhammad Salima, Dr. G.S Dwarakish, Liju K.V, Justin Thomas, Gayathri Devi, Rajesh R [7] used ANN for weekly prediction. Qiu, Xueheng applied deep learning for regression [8], Kuremoto, Takashi used deep learning for time series forecasting [9], Busseti, Enzo for used deep learning for time series modeling [10]. This paper presents three different machine learning techniques, like Support Vector Regression (SVR), Artificial Neural Network (ANN) and Deep Neural Network (DNN) to forecast tide level with higher accuracy. After scrupulous experiments and analysis we have found that DNN model can predict short term future tide level more accurate then the others by dealing with complex hydrodynamics and irregular meteorological effects that makes prediction difficult.

II. METHODOLOGY

A. Deep Neural Network (DNN)

DNN allows computational models to learn the illustration of data with several levels of abstractions. It works as neural network but with more hidden layers. Each hidden layers serves different operations.

$$v_k = \sum_{i=0}^{m} [\omega_k(i)\,x(i) + b_k] \qquad (1)$$

$$y_k = \varphi(v_k) \qquad (2)$$

Where $x(1), x(2), \ldots, x(m)$ are the input signals; $w_k(1), w_k(2), \ldots, w_k(m)$ are the respective synaptic weights of kth neuron; b_k is the bias; v_k is the induced local field or activation potential; $\varphi(v_k)$ is the activation function; y_k is

A Sawtooth Shaped CPW Fed UWB Microstrip Patch Antenna for Biotelemetry Applications

Md. Abdul Muktadir[1], Md. Siddat Bin Nesar[2], Nishako Chakma[3], Akash Biswas[4], Piyas Chowdhury[5], Md. Azad Hossain[6]
[1,2,3,5,6]Department of ETE, Chittagong University of Engineering & Technology, Chittagong, Bangladesh
[4]Department of EEE, American International University–Bangladesh (AIUB), Dhaka, Bangladesh
E-mail: abdulmuktadir28@gmail.com[1], mdsiddat12@gmail.com[2], nishakochakma.23@gmail.com[3], akshbiswas101@gmail.com[4],
piyas_063@yahoo.com[5], azad98@gmail.com[6]

Abstract—A novel and simple sawtooth shaped Ultra-Wide band (UWB) antenna design with coplanar waveguide feeding for biotelemetry applications have been suggested in this research. A unique model & noteworthy enactment of the proposed antenna validates its robustness among the other antenna of similar types. This antenna covers almost 83.7% of the UWB in between 3.1 to 10.6 GHz, having an impressive return loss below 13 dB throughout the whole range. There are four resonating frequencies within the range with a maximum return loss of 26.769 dB. Obtained maximum directivity and gain for the projected antenna are 7.635 dBi and 7.641 dBi respectively. The optimized dimension of the antenna with a simple structure of sawtooth shape is 49 mm x 42.5 mm x 1.64 mm which can be easily integrated with handheld devices for UWB applications. Several calculations and performance analysis have been done using Advanced Design System (ADS) to make the antenna more invigorated for practical use.

Keywords— *Ultra-wideband (UWB) antenna, Sawtooth shape, Slot antenna, ADS, Biotelemetry applications.*

I. INTRODUCTION

In the territory of wireless communication, Ultra-wideband (UWB) system has achieved great remark because of its various advantages, like less expensive, high data processing rate (about 100 Mbps), very low power (typically -41.3 dBm/MHz), impervious to jamming and multipath, high accuracy ranging etc. [1-2]. Furthermore, Federal Communication Commission (FCC) proclaimed 3.1–10.6 GHz UWB frequency band as an unlicensed band for academic and industrial communication purposes. UWB technology prefers for widespread information transmission mostly for health care, multimedia, sport, military and security-related purposes [3]. Comparatively UWB technologies are well-suited than usual narrow-band as well as wideband communication technologies, for the limit emission masking of a large widespread bandwidth produced by regulating body operation. An antenna which is compatible to operate at frequency having bandwidth wider than 500 MHz bandwidth is considered as UWB antenna according to the regulation of FCC [4].

One of the major proviso for UWB antenna designing is to keep reasonable efficiency over the whole operating ultra-wideband frequency range with adequate radiation properties as well as having good impulse response with minimum deformation [5]. Designing an effective, compact UWB antenna is quite provocative because miniaturization of antenna structure may create short path current flow, and miss matching at lower frequencies. Keeping the key features in mind, lot of researchers expressed their views of UWB antennas with different structural variety, including implementation of different shaped slots on radiating patch to develop the current flow, modification of ground plane such as L-shaped slots, splits beneath feed line, enhanced ground plane configurations, ground plane edge modification, shorting pins structures, uniplanar monopole structures with coplanar waveguide feed. [6-8] Modification methodologies those mentioned above introduce some structural complexity. Synchronization between the antenna's dimensional parameters and its specific responses are habitually very challenging.

In general an antenna with thin slot capable to produce narrow bandwidth, while wider slotted antennas display wider bandwidth. Newly, various types of wide-slot antennas with a coplanar waveguide (CPW) or microstrip line [9-11] have been demonstrated. In literature [9], a slotted square-shaped antenna fed by a CPW tuning stub was described. By picking a suitable size and location of the tuning stub, it accomplished a reasonable bandwidth (about 60%). In [10], a slotted antenna with arc shape and a square-patch feed was proposed. Although the antenna succeeded to gain a good bandwidth oscillating from 1.82 to 7.23 GHz it was not able to contain the entire UWB and also its appearance is very large (110 mm x 110 mm). A wide-slotted antenna consisting of an E-shaped slot on an E-shaped patch projected in [11], achieved larger bandwidth starting from 2.8 to 11.4 GHz. Though the antenna has covered a bandwidth of 120%, it has outsized aspect of 85 x 85 mm². A novel UWB antenna has been proposed in the literature [12] with smaller dimensions. The design includes the use of T shaped and U shaped stubs which notched some specific frequency throughout the UWB frequency range. A square shaped UWB antenna with a dimension of 44 x 44 mm² is proposed [13] using Duroid 5880 substrate with a partial ground plane which has a ring-shaped patch. This antenna has a good overall performance except covering the whole frequency range of UWB as directed by FCC. Literature [14] presents a UWB antenna insensitive to the ground plane with a tapered shape within ground plane and radiator. Shorting pins are joined in the mentioned antenna which enhanced the performance but created the layout quite complex.

In this study, a novel sawtooth-shaped antenna with a standard dimension of 49 mm x 42.5 mm x 1.64 mm is proposed. It overcomes the limitations of the other antenna of similar types via smaller dimension, better bandwidth and satisfactory radiation characteristics that ensure patients' safety considering biomedical applications [15-17]. By introducing a sawtooth shaped slot as a radiating patch with a rectangular ground surface, the projected design attained a broad frequency coverage in between 3.9 GHz to 10.2 GHz. Dielectric FR4 is employed as a substrate because of its

Hybrid State Estimation for Diverse Combination of PMU Measurements

Pronob K. Ghosh[1], Anik Tahabilder[2], Soumesh Chatterjee[3], Milon Kumer[4]

[1, 4]Dept. of Electrical and Electronic Engineering, Pabna University of Science and Technology, Pabna- 6600 Bangladesh.
[2] Department of Electrical and Computer Engineering, Western Carolina University, USA.
[3]National Institute of Technology Agartala, Tripura-799046, India

[1] ghosh.k.pronob@gmail.com, corresponding author

Abstract— **Continuous estimation of system states is mandatory for proper operation, control and protection of power system. This paper presents an observation of state estimation improvements for IEEE 14 bus system incorporating the Phasor Measurement Unit (PMU) measurements with traditional SCADA measurements. Initially, the optimal number of PMU requirement for complete observability of this test case is identified using the Integer Linear Programming (ILP) optimization technique. Then, the diverse combinations of the PMU requirement are checked. Incorporation of PMU measurements with traditional measurements for finally selected 4 cases are done. Eventually, the improvement of state estimation is observed for those cases by a graphical representation.**

Keywords—Power system observability, PMU, state estimation, IEEE 14 bus system.

I. INTRODUCTION

Power system state estimation is a process to estimate the system states. State Estimator is a commonly used tool to filter out the errors from estimated system state values which are estimated from the existing ample amount of measurements [1]. Considering the revised values of system states, these existing traditional Supervisory Control and Data Acquisition (SCADA) measurements are not sufficient contemporarily. Hence, Hybrid State Estimator (HSE) is used by incorporating the Phasor Measurement Unit (PMU) measurements with those conventional measurements [2].

The revolutionary measuring and monitoring device, PMU is commonly being used for power system observability analysis. Aminifar et al. [3] addressed the optimal placement of PMU formulating orthodox observability analysis for complete observability of a system. Optimization technique Integer Linear Programming (ILP) is used to minimize the required number of PMU. To optimize the required number of PMU a combination approach of graph theory and Analytical Hierarchy Approach (AHP) is used by Ghosh et al. [4].

PMU based hybrid state estimation has been addressed in an ample amount of previous literature. Some of them are discussed below. PMU was used to wipe out the state estimator errors placing this device at strategic locations by Chen et al. [5]. Authors suggested employing more than the traditional optimal number of required PMU to achieve the strong improvement of state estimation of test cases. The inclusion of synchrophasor measurements in the conventional measurements for WLS state estimation was shown by Chakraborty et al. [6]. The validity of this approach was checked on IEEE 14 bus system.

The complete observability of a system was checked by placing as well as merging PMU data with conventional data for state estimation employment and judgment by Kumar et al. [7]. Our proposed work will be accomplished after being motivated by the previous literature in this field. This section provides the overview and literature review. The rest of the paper is organized as follows.

Section II describes the PMU based complete observability of the selected test case. Then, the hybrid state estimation is represented superficially in section III. Section IV elaborates the proposed work in the short description and some graphical representation. Finally, Section V concludes the paper with an essence.

II. PMU BASED COMPLETE OBSERVABILITY

PMU provides the synchrophasor measurements of the voltage of a bus and currents of the lines connected to that bus. To accomplish the proposed work, the IEEE 14 bus system has been selected which is shown in fig. 1. This test system consists of 14 buses and 20 transmission lines.

Minimum PMU installation problem is formulated by the following way.

Min $\sum_{i=1}^{n} Pi\, Qi$

$$\text{sub. to.} \quad P(x) \geq r, \quad \text{for } i = 1, 2, \ldots\ldots, n.$$

where, Q is the binary decision vector for PMU placement, whose entries are defined as,

In vitro Antimicrobial, Cytotoxicity, Antioxidant and *in vivo* Analgesic Activities of Methanol extract of *Dipterocarpus turbinatus* leaves.

Muzammil Ahmad, Mohammad Abu Sayeed*, Shalah Uddin Kader and Mehedi Hasan

Department of Pharmacy, Faculty of Science and Engineering, International Islamic University Chittagong, Bangladesh

Abstract-The MEDT (methanol extract of Dipterocarpus turbinatus) shows a significant antimicrobial effect against the tested organisms at a concentration of 100 µg/disc, 300 µg/disc and 500 µg/disc. The percentage of mortality was observed to increase as the dose decrease. The median lethal concentration is 300 µg/mL. The LC_{50} was found to be 408.50 which proves the plant to be a good source of novel drugs with less toxicity. The IC_{50} value were 78.83 µg/mL and 116.64 µg/mL as obtained from Y and R^2 values. The MEDT shows an antioxidant activity in both tests (Standard and sample), an increment of the percentage of scavenging assay were observed with an increment in concentration. The plant extract shows the presence of reductants which was caused by the reduction of ferricyanide complex to the ferrous form which was dignified at 700 nm. Using an in vivo analgesic model, the number of writhing which is a dose dependent shows highest number at a dose of 200 mg/kg body weight i.e., 32.83±1.25 and 28.16±1.89, 15.5±2 for 400 mg/kg of MEDT and 10 mg/kg of Diclofenac Na respectively. The percentage of inhibition is clearly illustrated in Fig. 3. At a dose 0f 200 mg/kg of MEDT, 28.51±0.560 seconds were spent licking the paw while at a dose of 400 mg/kg of MEDT, 23.60±0.545 seconds was spent licking the paw. On the other hand, the administration of Diclofenac Na 10 mg/kg shows lowest time spent licking the paw by the mice, see Fig. 4. The gross results in this study portrays the possibility of Dipterocarpus turbinatus to be a good source of Antibacterial, Antioxidant and Analgesic agents. Further investigation of the plant might be beneficial for the search of other pharmacological effects.

Keywords-Antimicrobial, Cytotoxicity, Antioxidant and Analgesic.

Author of Correspondence, email:pmasayeed@yahoo.com, Mobile: +8801670419435

INTRODUCTION

For a long period of time, plants have been a valuable source of natural products for maintaining health, especially in the last decade, with more intensive studies for natural therapies. According to world health organization, medicinal plants would be the best source to obtain a variety of drugs.

Anti-microbials are utilized to treat or counteract bacterial infections, and occasionally protozoan contaminations. (Metronidazole is compelling against various parasitic infections). This includes the organization of a wide range anti-toxin in view of the signs and indications displayed and is started pending lab comes about that can take a few days.

Cytotoxicity is the nature of being dangerous to cells. Cases of dangerous operators are an insusceptible cell or a few sorts of venom, e.g. from the puff snake (*Bitis arietans*) or dark colored hermit arachnid (*Loxosceles reclusa*). Treating cells with the cytotoxic compound can bring about an assortment of cell destinies. The cells can stop currently developing and separating (a decline in cell feasibility), or the cells can initiate a hereditary program of controlled cell demise (apoptosis).

An analgesic or painkiller is any member of the group of drugs used to achieve analgesia, relief from pain. Analgesic drugs act in various ways on the peripheral and central nervous systems. They are distinct from anesthetics, which temporarily affect, and in some instances eliminate, sensation. Analgesics include paracetamol (known in North America as acetaminophen or simply APAP), the nonsteroidal anti-inflammatory drugs (NSAIDs) such as the salicylates, and opioid drugs such as morphine and oxycodone.

In present day medication, around a quarter of the medications recommended to patients are gotten from restorative plants, and they are thoroughly tested[1].However, improvement of plants or concentrates having potential restorative uses is blunted by feeble logical proof, poor practices during the time spent medication advancement, and deficient financing [2]. The oleo-resin of the trunk is stimulant to the mucous surfaces and diuretic; used as an external application for ulcers, ringworms and other cutaneous affections. It has been used in gonorrhea, gleet and rheumatism [3]. On the bases of the above ethnobotanical uses, the plant was screened for the above subject title.

MATERIALS AND METHODS

Chemicals and Reagents

The analytical grade chemicals and reagents available at Department of Pharmacy, Faculty of Science and Engineering, IIUC were used for the study as per requirement of the study.

Collection and Identification of plant material

The fresh leaves of *Dipterocarpus turbinatus* were collected from Dulahazaria Chakaria cox's Bazar, Chittagong of the Republic of Bangladesh and identified by Prof. Dr. Shaikh Bokhtear Uddin, Taxonomist and Professor of Botany at University of Chittagong, Bangladesh.

Performance Studies of UWB Microstrip Antenna for Multipurpose Biotelemetry Applications

Swarup Chakraborty[1], Akib Jayed Islam[2], Md Mehedi Farhad[3], Md. Mahmudul Hasan[4], Md. Siddat Bin Nesar[5]
and Mohammad Anisur Rahaman[6]

Department of EEE[1] and ETE[3,6], Chittagong University of Engineering & Technology (CUET), Chittagong-4349, Bangladesh
[2,4]Department of EEE, American International University- Bangladesh (AIUB), Dhaka-1229, Bangladesh
[5]Department of EEE, Ahsanullah University of Science and Technology, Dhaka-1208, Bangladesh
Email: swarupchakraborty.eee@outlook.com, akibjayedislam@gmail.com, mehedifarhad.eee@gmail.com, mahmudul2211@gmail.com,
mdsiddat12@gmail.com, anisur.rahaman@cuet.ac.bd

Abstract— A unique small and flexible antenna operating in Ultra Wide Band (UWB) for Wireless Body Area Network (WBAN) applications is proposed in this article. The overall size of the antenna is 17.0 x 14.0 x 1.07 mm³ which is compatible to use with off-body, on-body as well as in-body wearable medical devices. The antenna, designed to use for biotelemetry application, has been experienced various performance studies like radiation pattern, bandwidth, directivity, gain, efficiency, Specific Absorption Rate(SAR). Simulation in different medium which is needed for future implementation, is performed. Both planer and bending conditions are analyzed on and inside the human phantom model designed in CST MW Studio Suite. The designed antenna is aimed to use in the frequency range from 3.1 to 10.6 GHz with remarkable return loss of -64.625dB for off-body and noteworthy results for on/in-body applications.

Keywords—UWB, Tiny Antenna, Human Phantom Model, Biotelemetry, Reflection Co-efficient, Bandwidth, SAR, WBAN.

I. INTRODUCTION

With the advancements in RF and microwave technology, unified design of complex circuitry, miniaturization and better performance have become famous in recent years. Antennas and filters have been often integrated into simple module circuit design because of their significant accessibility in wireless system. Biomedical telemetry applications require wearable antenna [1] that can be distributed into three categories: in-body [2], On-body and off-body mode [3-4]. In the aforementioned wireless communication, all terminals positioned on or in body will be mutual for off-body, on-body and in-body link. The antenna implanted in the human tissue is considered as in-body mode antenna, where the human tissue influence momentously on the antenna performance. Instead, the antenna placed on the surface of the body and can communicate with other antenna positioned along the body surface is identified as on-body mode antenna, which requires higher directivity [5]. The antenna operating in near body free space and can communicate with other device such as a base station for medical over a long distance is considered as off-body mode antenna which prerequisites the radiation at its maximum in the broadside path way.

There are various bands which can be considered for designing the biomedical antennas. These bands are arranged in a numerous frequency range for the medical application. Industrial, Scientific, and Medical (ISM) is allocating frequency of 902-928 MHz, 2.4 GHz, and 5.7-5.8 GHz [6-9]; Medical Implant Communication Service (MICS) has a frequency range from 401 to 406 MHz [10-11]; Wireless Medical Telemetry Service (WMTS) has three defined frequency of 608-614 MHz, 1395-1400 MHz, and 1427-1432 MHz that consists of 14 MHz of spectrum to be utilized by wireless medical telemetry users [12-13] and Ultra Wide Band (UWB) [14-15] has a frequency spectrum from 3.1 to 10.6 GHz are allocated for the biomedical antenna. UWB are utilizing to design biomedical antennas because it offers higher bandwidth, high data rate, and enhancement of the channel capacity and less power spectral density. A global standard IEEE 802.15.6 [16] for a diminutive range, low profile, and greatly reliable wireless applications was issued and UWB was established as a single physical (PHY) layer approach in the year of 2012.

A double band implantable antenna operating at MICS and ISM band is proposed in [17] which can be embedded with bio-telemetric devices because of its tiny dimension (22 mm × 23 mm × 1.27 mm) and dual band availability. Literature [18] presented an antenna for on-body and off-body wireless communications for healthcare applications. A low profile antenna operating in UWB is presented in literature [19] for TVWSDs (TV White Space Devices). The fabricated UWB antenna using CMA (Characteristic Mode Analysis) could be applied to implement with various antenna design necessities by tuning the modal resonances to frequencies, multi band antennas could be achieved. In literature [20], an UWB antenna is presented for medical applications. The proposed antenna, which has T-shaped slots with a tiny size of 18×30×0.8 mm³ illustrated better performances for medical imaging applications. A novel flamenco fractal antenna is suggested in [21] for off-body communications in UWB and ISM bands.

In this research, a novel UWB antenna is presented for UWB (3.1-10.6 GHz). The final dimension of the antenna is 17.00 x 14.00 x 1.07 mm³. The antenna is designed in such a way that it can perform off-body, on-body and in-body communications in UWB for medical telemetry applications. Off-body communication is achieved with a bandwidth of 6.4 GHz and low return loss of -64.625 dB for wireless medical applications. The resonance frequency is 9.06 GHz with a directivity of 3.46 dBi. A human tissue model is established

Assessment of *in vitro* antioxidant capacity and *in vivo* anti-stress potential of methanol extract of *Combretum indicum* leaves and its different fractions

Md. Masudur Rahman, Tasnim Forhad, Fahmida Yesmin

Department of Pharmacy, Faculty of Science and Engineering, International Islamic University Chittagong,

Chittagong-4203, Bangladesh.

Abstract

Background: Plant is a blessing of nature which cures; treat many diseases over a long period. *Combretum indicum* (Combretaceae) is well-known for its ethnopharmacological activity such as anthelmintic, nephritis, fever, headache among different tribes. The study was framed to reveal the potentiality of this plant in different pharmacological viewpoint.

Method: Liquid-liquid portioning was referred to obtain chloroform (CIC), n-hexane (CIH), and aqueous fractions (CIA) from methanol (CIM) extract. Phytochemical screening also performed for detecting the plant compound. For assessment it's activity, *in vitro* antioxidant and *in vivo* anti-stress test was carried out. DPPH scavenging, reducing power, total phenolics and flavonoids content test were designed for *in vitro* antioxidant analysis. Anti-stress potential was evaluated through tail suspension, forced swimming and anoxic stress tolerance test study.

Result: Aqueous fraction of *C. indicum* showed remarkable scavenging activity (IC_{50} = 28.92 µg/mL) as well as having potential reducing power. Chloroform showed the highest number of phenolic content (255.1 ± 0.18 mg/g QE) while n-hexane showed the highest flavonoid content (93.53 ± 0.22 mg/g QE). Furthermore, anti-stress outcome was observed in a dose-dependent manner on treated mice. CIH, CIC and CIM at 400 mg/kg dose showed notable significant (P < 0.01), such as 52 ± 16.04 sec, 90.67 ± 13.68 sec immobility, and 65.00 ± 2.88 min latency of convulsion accordingly in tail suspension, forced swimming and anoxic stress tolerance test.

Conclusion: Different fraction of this plant showed more or less activity in different assay or models compared to standard. All these results represent that the plant has potential antioxidant activity along with anti-stress potential.

Keywords- Combretum indicum, antioxidant, anti-stress, DPPH, free radicals, phytochemicals.

I. INTRODUCTION

Medicinal plant plays a pivotal role in the well-being of rustic people throughout the world. Medicinal plants have traditionally and culturally used among tribal people from the prehistoric era [1]. Traditional medicines are still used for primary healthcare purposes. People use those plants because of religious verses, cultural practices and physical manipulations due to lack of proper knowledge and also the scientific evaluation of those plants will remain to unfold.

Combretum indicum (L.) DeFilipps belongs to Combretaceae family is a valuable medicinal plant. Different parts of the plant are used as an anthelmintic (extract of leaves and roots); to relieve flatulence (juice of leaves); applied topically to treat boils and ulcers (infusion of leaves). Seeds are also ingested to children to banish the worms [2].

Free radicals are highly active chemical substances which produced within the cells can instigate numerous chemical reactions in cellular organelles in particular membrane lipids, DNA and proteins, which can ultimately lead to cell death [3]. Free radicals may also be involved in a large number of diseases including cancer [4], cardiovascular disorder [5], mild cognitive impairment [6], Alzheimer's disease [7], Parkinson's disease [8], ulcerative colitis [9] and, aging [10]. Natural antioxidants have the potentiality to prevent or cure the free radical-induced disorders. So, antioxidants play a crucial beneficial role in the risk management and treatment of diseases.

Stress or depression is a complex disease with distinctive pathology, and many of the significant symptoms such as feelings of hopelessness and low self-esteem are not easily replicated in animals [11]. Usually, depression or stress-induced changes are self-limiting and versatile until and unless events that overthrow the 'threshold' limits become irrevocable and pathological. A plethora of diseases including hypertension, reproductive dysfunction, immunosuppression, peptic ulcer, and behavioral dysfunctions can be raise due to the consequences of stress [12]. Current therapies for depression either fail to total recuperation or induce undesirable side effects [13, 14], so newer medicine is needed to meet the clinical need.

There is no scientific report was found in antioxidant and anti-stress potentialities of this plant. The present investigation was undertaken to elucidate the *in vitro* antioxidant capacity and *in vivo* anti-stress potential of *C. indicum* leaves methanol extract and its different fractions.

II. MATERIALS AND METHODS

A. Materials

A.1 Chemicals and Reagents

All the chemicals and reagents were used throughout the investigation of reagent grade expect methanol. For *in vivo* study, normal saline (OPSO SALINE LTD, Bangladesh), 3 mL disposable syringe (JMI SYRINGES & MEDICAL DEVICES LTD, Cumilla) and 29 gauge 100 unit capacity (length 12.7 mm) single-use syringes (ReliOn®, USA) used for the experiment. For reference, Fluoxetine (SUN

A Differentiate Analysis for Credit Card Fraud Detection

Md. Akter Hossain
Department of Computer Science & Engineering
East Delta University
Chattogram, Bangladesh
E-mail: myselfakterhossain@gmail.com

Mohammed Nazim Uddin
School of Science, Engineering & Technology
East Delta University
Chattogram, Bangladesh
E-mail: nazim@eastdelta.edu.bd

Abstract—With the swift progress of internet and electronic commerce, online money transaction has increased over time. People mostly eager to use online money transference and because of the internet is now available almost everywhere. Therefore, any attackers could be plan attacks from anywhere to forage any victim. There was various way from the previous attacks that victims became hunts by duplicate copy of the website, cards, ID numbers, rearranging provisional codes, fake documentations or signatures and so on. The genuine transaction and fraudulent transactions are almost similar, that's why it's very hard to figure out a real or fake transaction. One way could be effective if we know the behavioral pattern of card's owner. In this manner, we have introduced a Fraud Detection Engine (FDE) along with a Feature Selection Tool (FST). After gets a transaction request, FDE engine have searched for any sorts of intruder based on its key selective features. FST is one of those feature, which have used to match the cluster patterns with the requester behavioral pattern. Cluster pattern are cardholder's behavioral patterns which have trained by using of feedforward neural network. Therefore, examine all of the key features with vector analytical method or simply vector method. Proposed technique has applied from collected and previously driven on many studies datasets.

Keywords—fraud detector, deep learning network, support vector machine.

I. INTRODUCTION

The banking industry has implemented internet technologies for their commercial operations and in their plans, policies and strategies to be more reachable, convenient, competitive and economical as an industry. The purpose of these strategies was to provide online banking customers the facilities to access and manage their bank accounts without difficulty and internationally. Online banking has been installed more frequently over the past few decades to support and progress the operational and managerial performance within the banking industry. So, the security concerns become a serious issue for both bank and individuals who get services from it. The lack of face-to-face or voice interaction on the Internet makes fraudsters more daring by providing them with anonymity, which makes the detection and prevention of online frauds more difficult. Lists of stolen credit card numbers are also being posted on the Internet or sold in news groups and can be used by a variety of individuals to purchase goods online without the authorization of the credit card's proprietor [1].

Both transactions and the customer behavioral pattern considered as highly variance data design, which is a serious matter if it's selected by such vigorous method. Hence, there were many methods and their implementations had been suggested. One applicable suggestion was, examine for the customer behaviors for the next activities. When a loan requests comes forward, it's extremely required to determine the risk threshold. Deep learning technique has been very helpful to the current decade that uses in recent popular method. There are other methods that applied deep learning concept, and extract extreme features form raw datasets. After applying auto-encoders, they found it as simple as flexible, which they used in class label very effectively that went with their purpose [2]. In another study, they applied same auto-encoders process to extract features and append SoftMax network to determine the class labels [3]. Also, there have many studies on neural networks, those were the most common factors for apply in study like fraud detection. In this paper [4], an NN (Neural Network)-based fraud detection structure had trained on large amount of an account that were prelabelled by information of credit card transactions. These datasets tested by basis on accounts activity a sub-sequent two-month period of time. The training process of NNs conducted on following events, fraud due to lost cards, stolen cards, application fraud, counterfeit fraud, mail-order fraud and NRI (non-received issue) fraud. Sometime, NNs applied with a classifier such as Bayesian model [5], where they applied two types of machine learning techniques suited under uncertainty. both methods believed networks to the problem and shows their significant outcome on real world financial data. At end, future directions were indicated to improve both techniques.

In our research, we have performed an independent and cognitive analysis as security assessment by applying NNs and Support Vector Machine (SVM) from different states. First of all, a design has created to extracts card-holder's behavioral patterns from the main datasets and applying a feedforward neural network (backpropagation), then make some cluster pattern storage on basis of similar sampling pattern. For this, we applied an FST mechanism, which have implemented as one of the inputs with another mechanism named FDE. Then, applied engine (FDE) works on based vector analysis, where six different inputs have designed to seize any intruders related with banking card stealing. One of the previous study uses this kind of analysis by SVM, where classification models had designed based on decision trees and SVM. Also, it developed and applied on the problematic aspects of credit card fraud detection [6]. This study is one of the firsts, which applied real dataset to compare the performance by using SVM and decision tree techniques.

Our contributions are explaining in follows:

Effect of Sensitization Temperature on the Performance of Amaranth Dye-Sensitized Solar Cell

Al Amin [a], Md. Al Emran [b]
Department of Electrical & Electronic Engineering [a,b]
Rajshahi University of Engineering & Technology [a,b]
Rajshahi-6204, Bangladesh
alamin.3eee@gmail.com [a]
alemraneee@gmail.com [b]

M. F. Hossain (M, IEEE)
Department of Electrical & Electronic Engineering
Rajshahi University of Engineering & Technology
Rajshahi-6204, Bangladesh
dr.faruk_eee@ruet.ac.bd

Abstract— In this work, the amaranth dye sensitized-solar cell was fabricated and characterized. Mainly the effect of sensitization temperature on the performance parameters of solar cell was observed. It was investigated that the performance of DSSC varies with sensitization temperature. Here, nanocrystalline TiO_2 films deposited on the fluorine doped tin-oxide (FTO) were sensitized using amaranth dye extracted from *Amaranthus Gangeticus* leaves at three different temperatures: 4°C, 25 °C, and 50 °C. Carbon counter electrode and KI/I_2 electrolyte were used to fabricate the DSSC. The performance of DSSC was tested under solar simulator AM 1.5 illumination. The maximum efficiency of 0.413% was obtained at 25 °C.

Keywords—Solar Cell; Amaranth Dye; Nanocrystalline TiO_2; Counter Electrode; Electrolyte; Performance Parameters

I. INTRODUCTION

There are two basic needs, one is Energy and second is the healthy environment. According to the international energy agency's electricity database reports [1] nearly 25% of the population of all developing countries don't have electricity, about 1.3 billion people are living in the dark. Even 40% people don't have electricity in Bangladesh. Otherwise, the maximum amount of electrical energy comes from the burning of fossil fuels [2]. As a result, our environment gets polluted through the emission of greenhouse-gas (GHG). So, there are two big challenges in front of all researchers: one is energy crisis problem and another is environment. Now, we need such types of energy so that there is no possibility of the emission of GHG. So, solar energy conversion into electrical energy through the solar cell can be regarded as green energy [3] for the solution of the above problems. All types of energy come from the solar energy in the world. The sun radiates solar energy approximately 3×10^{24} J per year which is more enough to fulfil the current energy demand [4]. The solar energy can be converted easily into the electrical energy through the solar cell.

Dye-sensitized solar cell is the third generation organic solar cell. It has lower cost than the Si solar cell [5], and it is not sensitive to the angle of light incidence [6]. In DSSCs, dye is used to absorb more photons corresponding to the wavelength of color. The dye can be extracted from natural sources [7] such as flowers, fruits, leaves, seeds, barks etc. Natural dyes contain plant pigments such as anthocyanin, carotenoid, flavonoid, and chlorophyll that are responsible for the photon's energy absorption and the injection of charges to the conduction band of TiO_2 by the dye sensitizer. In 2015, in a renewable and sustainable energy reviews journal paper, 90 natural sources were shown used in DSSCs [8]. DSSC was first developed by B. O'Regan and M. Grätzel in 1991 [9]. After that, DSSC has drawn the attention of many researchers for its low cost, easy fabrication, non-toxic and environment friendly operation. The DSSCs show the efficiency of 11.20% at 1 sun using ruthenium(II) sensitizer ((C4H9)4N)2[Ru(4-carboxy-4' carboxylate-2,2' bipyridine)2(NCS)2] (N719) [10]. The main limitation of ruthenium dye is its high cost [11, 12]. Besides, it is so tough to get the ruthenium complexes from its chemical compositions. The ruthenium complexes (N719) can be replaced by natural dye to remove this complexities in the fabrication of DSSCs.

In this work, the highly expensive ruthenium dye (N719) was replaced by amaranth dye extracted from *Amaranthus Gangeticus* leaves. The chemical bonding among the different chemical compounds in amaranth dye has been shown in Fig. 1(b) [13]. Amaranth dye is a mixture of 5-O-glucuroindogluco-sides of two aglycons: betanidin and isobetanidin. They are also called as amaranthine and isoamaranthine respectively which show good dyeing properties. That is why, the amaranth dye was used to observe how it performs as a light absorber. It was also tried to investigate the effect of temperature on the performance of the amaranth DSSC.

II. EXPERIMENTAL DETAILS

A. Preparation of TiO_2 Photo-electrode

Fluorine doped tin oxide (FTO, 8 Ω/sq., Solaronix) coated on glass was used as substrate. At first, the FTO substrate was cleaned with absolute ethanol for 5 minutes and then with distilled water for another 5 minutes taking into the ultrasonic cleaner. The cleaned FTO substrate was then dried using air pump. Then TiO_2 nanostructured films were deposited on FTO substrate by using spin coater as follows: 0.5 g of TiO_2 was taken in a mortar, 0.1 ml of acetylacetone, 0.4 g of Triton X-114 and 4 ml mixture of water and ethanol (1:1 in %vol.) were added. This mixture was stirred strenuously for 10 minutes. Then the prepared diluted paste was deposited on the cleaned FTO substrate placed on a spin coater by spin coating technique. The spin time and speed were fixed at 5 minutes and 3000 rpm

Supporting the Treatment of Mental Diseases using Data Mining

Shahidul Islam Khan[1,3]; Ariful Islam[1]; Akther Hossen[1]; Taiyeb Ibna Zahangir[2]; Abu Sayed Md.Latiful Hoque[3]

[1]Department of CSE, International Islamic University Chittagong

[2]Department of Psychiatry, National Institute of Mental Health

[3]Department of CSE, Bangladesh University of Engineering & Technology

nayeemkh@gmail.com; akashctg90@gmail.com; akther532@gmail.com; taiyeb.dmch@gmail.com;
asmlatifulhoque@cse.buet.ac.bd

Abstract—Mental disorders are a growing phenomenon in Bangladesh. This phenomenon has contributed to intensive mental health-related data. It may change into helpful information via data mining application. In Bangladesh, healthcare data is underutilized. There are fifteen million individuals enduring from mental diseases of the many sorts in our country. Particularly, almost 10 percent of the people are badly in need of mental health services. Early treatment of mental state issues helps the psychiatrist to treat it as a primary stage. For various mental problem symptoms are similar which makes diagnoses very complex task to recognize and sometimes doctors misjudged the disease. The objective of this research is to examine a classification algorithm to predict mental disorder. In this study, we analyze 466 mental health patients dataset to find the relation between diagnosis and attributes. We applied three machine-learning techniques: Random forest, SVM, K-nearest neighbor and compared their performances on different measures of accuracy in diagnosing mental health problems. Experimental results show that Random forest has a better performance than the other algorithms we applied.

Keywords— Data mining; Mental disease; Bangladesh; Health Data; Classification algorithm.

I. INTRODUCTION

According to The World Health Organization (WHO), mental health is a state of well-being in which a person understand his or her own proficiency to cope with the natural stress of life and work effectively, and be ready to make a participation in their own community[1]. Irregularities in thinking, attitudes or actions called a mental disorder. 14% of the global burden disease is connected to mental illnesses from them, 75% found in developing countries, from well-known mental illnesses like anxiety and substance abuse, to critical illnesses such as psychosis [2]. In the new era, everyone is trying to stay ambitious. These lifestyles make people be excited to make success, causing them to manage many difficulties, frustrations, and demands. Anxiety disorders have slowly attacked their mental health in this pressurized environment. Developing countries have a larger burden of mental disorders than economically advanced countries [3]. Around the world, the number of psychiatric disorders patient is increasing day by day. In Bangladesh, the area of public health needs more concentration than it is currently getting. In Bangladesh, many groups and NGO work on chronic non-communicable diseases. Unfortunately, they ignore mental health. According to the World Health Organization (WHO), more than 450 million people in the world are suffering from neuropsychiatric disorders. In Bangladesh, there are fifteen million individuals enduring from mental illnesses of many kinds [4]. Particularly, almost 10 percent of the people are in need of mental health services. The objective of this research is to examine, a classification algorithm to predict mental disorder. This study refers to higher perceive of the health system readiness to deal with mental state problems in Bangladesh. Machine learning algorithms give means of obtaining objective, unseen patterns from evidence-based information.

A. Data Mining

Nowadays data mining is within the thought. Data mining involves the identification of unseen patterns in information stored in the database using Machine Learning algorithms. The progress of computational technology and huge data storage has heightened the attention of researchers to research into the domain of data mining. Many kinds of data mining techniques added to solve problems. For example: devising an advanced marketing strategy, formulating cost-saving business plans, spam mail, and fraud detection. Data mining application classified into two part, these are the automated prediction of trends and behaviors, and the automated discovery of previously unknown patterns [5]. Usama Fayyad et al. [6] stated that the purposes of description and prediction could be gain using different data-mining methods. This study focuses on classification.

B. Data Mining In Healthcare

Data mining is used in many areas. In the healthcare field, it is becoming popular because there is a need for an efficient analytical methodology for identifying unknown and important

A Low Cost and Ionizing Radiation-free Method based on Pulse-Echo Ultrasonic for the Diagnosis of Osteoporosis

Sadia Mahmud[1], Mohammad Anisur Rahaman[2]
Department of Electronics & Telecommunication Engineering
Chittagong University of Engineering & Technology, Chittagong-4349, Bangladesh
sadiaria07@gmail.com[1], anisur.rahaman@cuet.ac.bd[2]

Abstract—*The risk of suffering from osteoporosis is increasing day by day, specially the people with increasing age are at high risk. Nowadays, different cure and preventives have been taken to minimize the risk and sufferings of osteoporosis along with lifestyle interference. Till now, the Dual energy X-ray Absorptiometry (DXA) is known as the ultimate "gold standard" because of having certified management qualification to prevent it. But, it comes with some particular restrictions like high cost, vast size of equipment and most significantly the use of ionizing radiation which makes it unsuitable for an elementary stage of healthcare. Other methodologies like QCT, Radiographs could not show proper skill in this site. This study describes a low cost, ionizing radiation free ultrasound method which is based on pulse-echo measurements using ultrasound simulation software wave2000 plus for the determination of bone thickness. Thickness has been calculated from three different model of bone sample using the time delays obtained from the transmitted and echo signals through the bone models. Presently, ultrasound methods are able to diagnose osteoporosis more effectively by characterizing between subjects with fractures. Therefore, this study will help to form a basis for the diagnosis of osteoporosis at an elementary stage.*

Index Terms—**Osteoporosis, Quantitative Ultrasound, Pulse-Echo method, Soft tissue and Bone Thickness.**

I. INTRODUCTION

Osteoporosis, an emaciated disease is distinguished by less bone quantity with narrow masonic decay of bone tissue conducting to bone frailty and fracture. It can be defined as a "state of porous bone"[1,2].According to different surveys, all over the world one in 3 women over 50 will endure a fracture because of osteoporosis; which increases to one in 2 in women over 60. One in 5 men over 50 will endure a fracture due to osteoporosis; which increases to one in 3 over 60[3]. Osteoclasts and osteoblasts are the two kinds of cells in bone, both of which are formed in bone marrow. Osteoclasts demolish bone and the osteoblasts build the new bone. With the increasing age, because of operating characteristics of these cells, few bones are constructed and more bones are withdrawn. Postmenopausal women suffer from this skeletal disease more than men [4].Yet the most exact fracture determination can be done by conducting the assessment where there is a risk of fracture in future. Unluckily, due to having some particular limitations, DXA can't be claimed as ultimate 'gold standard' for the management of osteoporosis anymore[5].Also, the usage of ionizing radiation imminently increments the cancer risk.

In order to provide a low cost, ionizing radiation free ultrasound method, this study proposes Quantitative ultrasound (QUS) method [6].QUS shows the ability to determine osteoporosis related fractures and the measurements is identical to that of DXA, the standard method for assessing bone mineral density (BMD). It is possible to improve the assessment of bone capacity by using the propagation of ultrasonic wave that is impacted by both bone mass and structural properties like elasticity of bone. Along with ultrasonic reflection and backscatter parameters, pulse-echo methods have been used to identify the mechanical capacity of bone tissue [5,7]. In practice, the whole skeleton of human could be availed using the measurements of pulse- echo (PE) ultrasound. Thus, Introducing a novel methodology of pulse-echo ultrasonic for feasible measurement of cortical and trabecular bone properties is the aim of this study. Here, ceprtrum method has been introduced to determine the thickness of long cortical bones. Moreover, it is difficult for envelope detection techniques to identify the cortical layer thickness at proximal femur as it is too thin. So, the cepstrum method has been demonstrated here to calculate the thickness of these kinds of thin layer using numerical simulations. The Receiver Operating Curve (ROC) has also been provided to ensure the perfect analysis and result so that it can be of great use in primary healthcare level.

Towards Blockchain-Based E-voting System

Asraful Alam[1], S. M. Zia Ur Rashid[2]
Department of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
[1]asrafulalam.iiuc@gmail.com, [2]smziaurrashid@gmail.com

Md. Abdus Salam[3], Ariful Islam[4]
Department of Electrical and Electronic Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
[3]salam.et_cuet@yahoo.com, [4]smarifulislam.me@gmail.com

Abstract—This paper proposed an Electric voting (E-voting) model that ensures security, privacy and transparency. Our approach uses blockchain method, a distributed ledger technology where data are shared and distributed into a network. Blockchain system offers transparency, decentralization, irreversibility and reduces the involvement of intermediaries which is crucial for an election process. An optimized algorithm is proposed for blockchain based e-voting system. An internet of things (IOT) based system is designed to exchange data from e-voting devices to the nodes. Moreover, we proposed several possible techniques and improvements for voting scenarios.

Keywords—blockchain, electronic voting, internet of things

I. INTRODUCTION

The purpose of election is to elect legitimate leaders for a country or organization to ensure democracy in administrative systems. It is essential to make the voting process secure, fair and transparent to ensure a healthy democratic system.

The traditional voting process is centralized and crowded with intermediaries. The voters submit their identification documents to a third party i.e., the supervisors or representative deployed by the administration. After authentication by the representatives, the voters are allowed to perform their vote. This process left many holes to rig an election, e.g. the representatives may authorize illegal voters, there's a chance of ballot stuffing, ballot boxes may get damaged etc. The involvement of more intermediaries dramatically increases the risk in the whole voting process. Traditional e-voting machine has an encrypted access card to extract the voting information, which may get damaged or lost. Thus the traditional voting system lacks security, transparency, data retention and has a significant risk of data tampering.

However, the blockchain technology is a reliable method to overcome the aforementioned problems.

Block-chain is data structures where data are arranged into a chain of blocks and distributed into a network. Every node-server in the network are synchronized i.e., stores the same data throughout the network. So, the data cannot be altered by one administrator without acknowledgement and permission of all other administrators of the network. Moreover, all the changes in the data are auditable. Thus block-chain provides a secure, auditable and third-party free data managing system that is crucial for an election process.

In recent years, blockchain has been used for several purposes. For example, blockchain has been used in Bitcoin transaction by S. Nakamoto [1]. Yong Yuan and Fei-Yue Wang proposed a block-chain based smart transportation system [2]. Several researchers approached blockchain to develop e-health system [3-5]. Blockchain-based energy distribution, transaction and trading methods are proposed by K. Mannaro group, E. R. Sanseverino group and G. Kim group [6-8]. Blockchain has been used to manage agricultural products [9]. A smart electric vehicle charging system has been developed based on blockchain [10]. A. Dorri, M. Steger, S. S. Kanhere, and R. Jurdak proposed a distributed solution to automotive security and privacy [11]. There have been several works on blockchain based smart city [12], [13].

Due to its security, transparency and flexibility, we approach the blockchain method to develop a model of IOT based e-voting system.

The rest of the paper is organized as follows: Section II briefly describes the blockchain. In Section III, we described the implementation of blockchain with IOT. Features and analysis of the proposed model described in Section IV. We conclude the paper in Section V.

II. BLOCKCHAIN: AN OVERVIEW

Blockchain is a decentralize data managing system, where the data are sequentially stored in an encrypted chain of blocks and distributed into a peer-to-peer (P2P) network. The idea of blockchain is generated from electronic Bitcoin system proposed by Satoshi Nakamoto [1].

The key properties of blockchain are as follows:

1. Maintain consensus mechanism i.e., require proof of work (PoW) throughout the chain.
2. Store data as a ledger into the blocks.
3. Synchronize the whole ledger throughout the network.
4. Offers decentralization of data.

Fig. 1. Blockchain peer-to-peer (P2P) network

Predicting Default Payment of Credit Card Users: Applying Data Mining Techniques

Mohammad Aman Ullah, Mohammad Manjur Alam
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong-4203, Bangladesh
ullah047@yahoo.com, manjuralam44@yahoo.com

Shamima Sultana, Rehana Sultana Toma
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong-4203, Bangladesh
Shamima.bithi71@gmail.com, toma.rehana@gmail.com

Abstract- Over the years, credit card debt crisis is the main issue in share market and card-issuing banks. Most card users, regardless of their payment capability, overused credit cards and cash-card debts. This catastrophe is the biggest challenge for both card holders and banks. The study aimed at predicting the accuracy of default payment of credit card users using data mining techniques. In this study total of six data mining techniques were applied to the data set of 30,000 individual records collected from the UCI data repository. Then we have compared our regression results with target value of the dataset. According to our test results, linear regression shows the best performance with 80% accuracy and Random Forest regression shows the lowest performance with 63% accuracy. Finally, we have evaluated the performance of each algorithm on overall dataset which was randomly sampled and found the Adaboost showing highest performance with 88% accuracy and Random Forest shows lowest performance with 70% accuracy. The study was implemented using data mining tools such as SPSS and Orange.

Keywords- credit, card, default, payment, data mining.

I. INTRODUCTION

Over the years, credit card debt crisis is the main issue in share market and card-issuing banks. Most card users, regardless of their payment capability, over used credit card and cash-card debts. This catastrophe is the biggest challenge for both card holders and banks. Currently, the card providers in Taiwan are in cash as well as credit debt crisis [2]. For reducing this risk, predicting the default payment of credit card holders became necessary. A lot of statistical methods, such as discriminant analysis, Bayes classifiers, logistic regression, and Nearest Neighbor have been applied to create models of risk prediction [3]. Artificial neural networks and classification techniques were also applied to forecast the credit risk [4] [5]. Credit risk means the chance of a delay in the payment of the credit granted [6].

All the above analysis could be used to directly find the final result by exploiting various data mining techniques. Data mining is the process of computation that discover useful patterns from large data sets using the methods coming from statistics, machine learning, and database systems [1]. In this study, we have tried to find the probability of default payment by using different data mining algorithms.

The remainder of the paper is organized as follows: in the next section we have provided the Literature Review. In section III, we have discussed Research problems and objectives, section IV include the discussion about the methodology. Our experimental results and analysis are shown in section V. Section VI describes the performance along with the comparison. Finally, we have provided the conclusion and future work of this research in section VII.

II. LITERATURE REVIEW

Data mining has been utilized in different part of financial analysis such as predicting money laundering, stock analysis, detection of bankruptcy, predicting credit card fraud, decision of loan approval, etc. [7]. Moreover, there has been inadequate use of data mining algorithms for detecting default payment of credit card users. Many researches are ongoing to improve the accuracy of machine learning algorithms in predicting default payment of credit card users, as small portion of improvement plays a vital role in the economic developments to the related organizations [8-9]. Initially, some statistical methods such as Linear Discriminant Analysis(LDA), and Logistic Regression(LR) [10] were used and later on, many machine learning methods such as K-nearest neighbor (KNN)[11], Neural Network(NN) [12], genetic algorithm [13], and support vector machine (SVM)[14-15] were used to improve the accuracy of predicting default payment of credit card users.

The study shows that, though the accuracy seems good for the above mentioned models, but sometimes they are misleading and can't easily be interpreted [16-18]. Even then, there are few researches done. As per sohn [19], marital status, loan period, basic condition, education, capital turnover, borrower and the guarantor relationship are the main attributes that determine the loan payment quality is good or bad. The analysis was done using Logistic Regression model. In [20], the Bayes discriminant principle was applied to generate a simple default discriminant model. The experiment shows, when the organizations are in lack of quantitative data, then they or they don't utilize the important quantitative financial features to discriminant. The authors have recommended that, due to the imbalanced data sets, one may not get standard accuracy value of the discriminant model. As per Hand and Henley [21], credit scoring is the classification of credit risk as 'good' or 'bad' using statistical methods. This method is becoming famous due to the growth of consumer credit in today's world. Pasha et al. [22] evaluate the predictive accuracy of default payments of customer's using neural network (multilayer perceptron), LDA, J48, Logistic Regression, Naïve Bayes,

Comparative Evaluation of Segmentation Algorithms for Tumor Cells Detection from Bone MR Scan Imagery

Eftekhar Hossain
Dept. of Electronics & Telecommunication Engineering
Chittagong University of Engineering & Technology
Chittagong, Bangladesh
u1308006@student.cuet.ac.bd

Mohammad Anisur Rahaman
Dept. of Electronics & Telecommunication Engineering
Chittagong University of Engineering & Technology
Chittagong, Bangladesh
anisur.rahaman@cuet.ac.bd

Abstract—Bone cancer is considered to be the most dangerous and often the cause of early death around the globe. Therefore, early detection of the bone cancer has become needed to cure the patient. A number of segmentation methods have been used for bone tumor detection. This study gives a comparative assessment of the existing bone cancer segmentation methods and also proposed an object labeling algorithm for the segmentation of bone tumor from magnetic resonance images (MRI). The comparison of the existing bone tumor segmentation algorithms with the proposed one has been done on the basis of quantitative methods like the dice similarity coefficient (DSC) and the structural similarity index measurement (SSIM). The comparative evaluation found that the object labeling algorithm provides the highest mean of DSC 96.04% and mean of SSIM 98.33% over the other segmentation methods.

Index Terms—Bone tumor; MRI; Object labeling algorithm; DSC; SSIM.

I. INTRODUCTION

Image segmentation always plays a monumental role in cancer diagnosis. Magnetic resonance imaging (MRI) or computed tomography (CT) are the main schemes of highlighting the bone cancer segment from a bone anatomy [1]. The actual meaning of segmentation is the splitting of an image into several regions and then extract the meaningful information from this regions [2]. The objective of the image segmentation is to facilitate the representation of an image in such a way that it becomes simpler to explore. In medical image analysis, segmentation is widely used to find out the tumor portion from a type of medical imaging technique whether it is MRI or CT scan. This study only focuses on the bone tumor detection from MR images. Based on two elementary properties of image intensity values the image segmentation algorithms are distinguishable and the properties are discontinuity and similarity. In the former category, the segmentation is done by finding the changes of intensity over the image. It comprises techniques such as edge detection that tries to find the sharp variation in intensity between the dissimilar regions and thus segments an image. The latter one is based on splitting an image into regions those are uniform due to

a number of similarity criteria [3]. It comprises thresholding-based segmentation, region-based segmentation and clustering techniques as all of these has some predefined criteria. In medical image segmentation bone cancer detection is a challenging task because bone images contain granny portions of tissues and low volume tumor which make problems of over or under segmentation. Bone cancer is a multifarious genetic disorder which occurs due to various physiological factors and it directly affects the bone. It produces the uncontrolled growth of the cell making demonic bone tumors and invade to the adjacent parts of the body. Bone cancers are also called sarcomas [4]. Basically, the bone cancer is classified as either primary or secondary cancer where the actual cause of bone cancer is not known. When the malignant bone tumors start rising in normal bone tissues then it is called primary bone cancer stage. Primary bone cancer rarely arises and it counts for much less than 1 percent of all cancers. About 2300 new cases of primary bone cancer affected patient are diagnosed in the united states each year [5]. Osteosarcoma, chondrosarcoma, and Ewing sarcoma are the most common types of bone cancer. In the year 2014, an estimation of bone cancer affected patient is provided by the American cancer society (www.cancer.org) in which shows that about 3020 new cases have been diagnosed and 1460 deaths are expected from this patient due to bone cancers. Many different segmentation algorithms have been approached throughout the years for bone cancer detection. The region growing algorithm, k-means clustering and fuzzy C-means clustering integrated with k-means are the already used algorithms [6] [7] [8]. Every algorithm has its own advantages and drawbacks and this paper presents a comparative study of the bone cancer segmentation algorithms with the proposed algorithm. In this paper, an object labeling algorithm has been approached for the segmentation of bone cancer and presents a comparison with the other existing segmentation algorithms.

The remaining portion of the paper is structured in the following way: Section II provides a summarization of the various bone cancer segmentation algorithm that has been completed in the fields of bone cancer detection. Section

Design and Implementation of a Secured Enterprise Network using Dynamic Multipoint VPN with HSRP Protocol

Towhidul Alam
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
Towhiduleteiiuc23@gmail.com

Chowdhury Mohammad Masum Refat
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
masumrefat3@gmail.com

Abu Zafar Md Imran
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
azmimran28@gmail.com

Syed Zahidur Rashid
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
szrashidcce@yahoo.com

Md Humayun Kabir
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
mdhkrrabby@gmail.com

Rabiul Hasan Tarek
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
hrobiul91@gmail.com

Abdul Gafur
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
agafur_cox@yahoo.com

Abstract: **The Purpose of this work is to improve the availability and remote access for secure enterprise network infrastructure by using dual hub dual DMVPN (Dynamic Multipoint VPN).Using multipoint GRE (mgre) over IPsec data transmission in the enterprise network is highly reliable secured. DMVPN is a technology that can be associated with different protocols concept such as IPsec encryption, next hop resolution protocol (NHRP), generic routing encapsulation (GRE) and it provides dynamic and static IPsec tunnel between spoke to the hub, spoke to spoke communication. In this paper, we implement the DMVPN technique to constructs a secure enterprise network for an organization and employing hot standby routing protocol (HSRP) to overcome the unavailability and failure of a certain network. The simulation was done by GNS3 and packets were captured by Wireshark software. It was revealed by the test that, DMVPN technology with HSRP protocols completely fulfills the demand of availability that is vital for any enterprises. It offers a faster mode, highly efficient and practically valued venture and also provides accessibility by keeping the network always in upstate thereby facilities for building a safer and highly dependable network infrastructure.**

Keywords:-DMVPN, mGRE, NHRP, IPsec, EIGRP, HSRP

I. INTRODUCTION

In present days computer networks are playing pivotal role in operation of the majority of companies and institutions, which allows systems to provide different services, and required accesses to shares resources among connected computers and related devices across various workgroup networks which are called Enterprises networks. Enterprises are using the different technique to construct the safe network between headquarter and many branches and in various corporations to carry out information, shares resources data and applications. For safe and secure communication, most of the companies use a traditional leased line method to connect remote users and branches. But in this method, leased line is expensive to plan and take a large amount of time and cost for installation and activation. The enterprise management has a bigger network infrastructure to maintain. In Enterprise Network design the branches are scattered all over the country. Enterprises, customers, employees are always enhance requested for security transmission data and availability network. Many enterprise networks are using the VPN (virtual private network) technique to build a safe enterprise network across the different field. But IPsec VPN does not support route dynamically. A problem of the traditional VPN that networking and expansion are underhand maintenance and operation cost is hugely expensive. [1] While designing an enterprise network it is ensured that data transmission is secure, maintenance and operation cost has minimized and the connection between Headquarter and branches are always available. In this purpose, we design an enterprise network using DMPVN technique over IPsec to establish a secure system and using hub standby routing protocols (HSRP) to ensure that operations are not interrupted by connection loss, and network services are always available for connected nodes. The Dynamic Multipoint VPN (DMVPN) technology has based on the combination of different techniques which provides the capability to build IPsec tunnel between Hubs dynamically to spoke, spoke to spoke tunneling. The Following technologies are Multipoint Generic Routing Encapsulation (GRE), Next Hop resolution protocol (NHRP), Dynamic routing protocols (EIGRP), Dynamic IPsec Encryption. [2] The author considered an Enterprise's network of Dynamic Tunnel (DMVPV-Dynamic Multipoint Virtual Private Network) as a cloud server which when called by Headquarter (Hub) provides service and the client is considered as the Spoke (branch office). A cloud server is connected to the two different Hubs where the tunnel

IoT Based Power Efficient Agro Field Monitoring and Irrigation Control System : An Empirical Implementation in Precision Agriculture

Ariful Islam[1], Kohinur Akter[2], Noor Jahan Nipu[3], Amlan Das[4], Md. Mahbubur Rahman[5], Mohimanur Rahman[6]
Department of Electrical and Electronic Engineering
University of Chittagong
Chittagong, Bangladesh
Ariful@cu.ac.bd[1], kohinur.apece09@gmail.com[2], nipu2016cu@gmail[3], amlandas65@gmail.com[4], mahbubcu14@gmail.com[5], mohimanur@gmail.com[6]

Abstract—Internet of Things (IoT) has been flourishing the communication and networking system in recent years, while experiencing a growing phase in agricultural field. Precision agriculture requires sensor integration, automatic control, and networking and data processing capabilities. With the implementation of rapidly growing IoT, challenges of scalability and data management can be overcome. In this research, we have developed an IoT based smart monitoring system for agricultural practice including client application- web application and android application; and designed a controlling system for power efficient irrigation. We have used LoRa, wireless RF transceiver to overcome the limitations of area coverage and have enabled to established real time data communication. While our android application makes this system feasible for users. Real time data were collected deploying the system and empirical data has been included in the result section.

Keywords— WSN; precision agriculture; smart agriculture; IoT; LoRa;

I. INTRODUCTION

Precision agriculture is an information and technology based site specific farming practice with the aim of maximizing the crop production along with the efficient usage of resources involved in farming process. It provides real time assessment of various crop and environment parameters by precising the observed farming land as well as the amount of required water, fertilizer and other input needs [1]. This method enables our farmers to achieve efficient water consumption by irrigating with proper amount in the required time and therefore ensures growth of non-toxic, safe and healthy crop [2]. But to fulfill its purpose there needs a continuous, organized and precise observation with the help of information technologies like Global Positioning System (GPS), sensors, satellites or aerial images, etc. [3]. However, scientific approaches should be more convenient, comprehensive, and cost efficient. In recent years our current technological discipline has intensely impacted by Internet of Things (IoT). It has been taking part in enriching almost all sectors of modern life and precision agronomy is a potential area which can be mostly advantaged by IoT [4]. Our goal is to use IoT technology to overcome the difficulties of adaptation in real field of existing platform and developing a cost effective system as well.

So, on the basis of IoT and by merging variant useful technologies and mechanisms we have designed and implemented a smart farm monitoring and irrigation management system for PA. In which, sensing and measuring the variations of some meteorological factors (Temperature, humidity) and some soil attributes (soil temperature, moisture, pH), which are essential parameters for proper growth monitoring of crop and irrigation management are obtained by corresponding sensors. One of the unique features of the system is to use IoT protocol based LoRa transceiver for wireless and rapid communication, and long distance coverage between the gateway and the sensor nodes. A cloud based database with web application for data management and monitoring has been added to the system. Addition to the uniqueness of our cloud based system; we have also developed an android application, which provides the users their corresponding field condition in daily and weekly basis as well as irrigation controlling feature. In brief, features of the system are real time field condition monitoring, managing and analyzing data using cloud server, user understandable presentation using numerical and graphical plots of data on web application and android application, controlling the irrigation system as well as expandability of the platform.

Consequently, by implementing our system, farmers can remotely obtain their field status instantly and thereby take the necessary decision. The remaining part of the paper is organized as follows: literature review will be discussed in section II and the overall system architecture, in section III. Methods and materials will be presented in section IV. Irrigation control system will be included in section V. Finally, in section VI and VII, result, conclusion and future work will be discussed respectively.

II. LITERATURE REVIEW

IoT has been emerging in the numerous field of life for the purpose of monitoring, data collecting, and machine controlling, security. A survey on IoT in smart agriculture has been presented by Mekala MS, Viswanathan P. [5]. [6] J. Ye, B. Chen, Q. Liu, and Y. Fang have proposed a platform to implement IoT for PA using WebGIS. The architecture would require expertise to operate and develop the system.

Energy Sustainable Provisioning for Green Data Centers

[1]Md. Shamimul Islam, [2]Abu Jahid, [3]A.S.M Tanwir Islam, [4]Sharif,
[5]Md. Anwar Sadath and [6]Md. Kamrul Hasan Monju

[1]Department of Electrical and Electronic Engineering, University of Information Technology and Sciences
[2,3,4]Department of Electrical, Electronic and Communication Engineering, Military Institute of Science and Technology
[5]Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology
[6]Department of Electrical and Electronic Engineering, Bangladesh University of Business and Technology
*Corresponding email: shamim142is@gmail.com

Abstract—In recent years, the integration of renewable energy source with data centers has emerged as a promising optimal focusing on economic and environmental perspectives. This paper studies an efficient energy sustainable framework aiming to maximize the utilization of green energy and curbing down the operating cost associated in provisioning computing services across a group of data centers. Under the proposed framework, the green data centers (GDC) are envisioned to be jointly powered by solar photovoltaic (SPV) modules with commercial grid supply. Additionally, a sufficient energy storage system (ESS) is installed for enhancing system reliability under 20 years project duration. The validation of our approach is comprehensively investigated in terms of optimal architecture, energy yield analysis, cost assessment etc. varying different system parameters using the HOMER optimization software. Based on this architectural framework, some research challenges are discussed. Simulation results demonstrate that a green data center has an immense potential as it offers significant energy efficient operations via reducing on-grid consumption while maintaining the quality of service.

Index Terms—Green data center, Renewable energy, Energy harvesting, Power usage effectiveness, Sustainability.

I. INTRODUCTION

Over the last few decades, the booming of revolutionary advancement in the area of information and communication technology (ICT) instigate the demand for internet service and cloud computing. The skyrocketing interest in the internet of things (IoT) and computing resources has produced an enormous demand for data center results a double-digit annual growth rate [1], [2]. A data center consists of some hundreds to thousands number of computer servers which have been identified as an energy-hungry element. Besides, facility equipment e.g., cooling, lighting devices are incorporated leading to a massive amount of electricity consumption. As an indication of this trend, modern data center in ICT sector places an immense burden on the utility grid and generate pernicious greenhouse gases apart from the increasing amount of the operation and maintenance cost. Therefore, many researchers in the area of data center are highly interested to integrate the renewable energy sources with the conventional power supply and the term has been identified as 'green data center (GDC)' [3], [4]. The GDC has the potential to reduce global carbon emissions as well as net present cost (NPC) through green engineering solution.

Despite the potential advantages of renewable energy sources, the standalone green power supply is not sufficient to feed the entire data center due to their variable nature of power production and may deteriorate the system performance results the lower reliability [5], [6]. To address the sustainability and reliability issues, traditional grid supply is still required as a secondary energy source along with adequate storage devices. Meanwhile, the utilization of renewable energy with ESS scheme is a plausible solution for achieving higher energy efficiency through detrimental environmental aspects and also has the potential to purchase low grid electricity. On the other hand, conventional data centers are usually feed from the combined grid and diesel generator (DG) power supply, where the DG set is acting as a backup source during load-shedding. This option intensifies the toxic intensive greenhouse gas (GHG) emissions to the environment. Although the ESS widen the NPC, nevertheless it has been recognized as an optimistic solution instead of DG source while considering sustainability issue during the malfunctions of the input power supply unit. However, the previous works focused the data center capacity enhancement and build scheduling algorithm to minimize overall cost regardless of an optimized techno-economic analysis [4], [7], [8].

In this paper, we develop an SPV/grid hybrid power supply system to feed the GDC in consideration of service requests, utilization factor, and power usage effectiveness (PUE). The power expenditure in GDC is divided into two parts: the consumption in IT infrastructure e.g servers, which customarily depends on the server utilization factor and another part is the consumption by the facility equipment e.g., cooling and lighting devices, which hinges on the variation of PUE. The optimum system design for the proposed model is dimensioned and evaluated using hybrid optimization model for electric renewables (HOMER) software. The overall performance has been extensively analyzed in terms of energy evaluation, grid energy savings, battery bank autonomy, economic assessment, and cost of electricity varying system parameters.

The rest of the paper is organized as follows. Section II outlines the modeling of the proposed hybrid PV/grid driven power supply system for GDC. In addition, architectural framework, workload distribution model, dynamic power model, and green energy model are also described in the same section. Section III depicts the cost modeling and optimal framework problem with the consistent solution. Section IV

Design and Performance Analysis of a Multiband Microstrip Patch Array Antenna at Ku and K Band

Md Mehedi Farhad[1], Akib Jayed Islam[2], Md. Siddat Bin Nesar[3], Swarup Chakraborty[4], Md. Mahmudul Hasan[5] & Md. Azad Hossain[6]

[1]*Department of EEE, Ahsanullah University of Science and Technology, Dhaka-1208, Bangladesh*
[2,3]*Department of EEE, American International University- Bangladesh (AIUB), Dhaka-1229, Bangladesh*
Department of ETE[3, 6] and EEE[4], Chittagong University of Engineering & Technology (CUET), Chittagong-4349, Bangladesh
Email: mehedifarhad.eee@gmail.com, akibjayedislam@gmail.com, mdsiddat12@gmail.com, swarupchakraborty.eee@outlook.com,
mahmudul2211@gmail.com, azad98@gmail.com

Abstract— Utilization of microstrip patch array antenna in space borne radar and satellite application is widespread nowadays. An array antenna operating at Ku band (12 GHz to 18 GHz) and K band (18 GHz to 27 GHz) for radar and cube-sat applications is presented in this paper. The designed antenna consists of 64 dual feed radiating elements arranged in a 2X2 sub-array configuration. A block of 16 elements constitute of four 2X2 sub-array are excited with single feed line connected with central feed. All 2X2, 4X4 and 8X8 arrays are analyzed, where 8X8 array illustrates higher bandwidth, high gain and significant return loss with multiple output. To implement the antenna for radar and/or cube-sat application, high gain, high bandwidth and multiple output are the prerequisites, which are achieved here. The performance parameters of the antenna are represented as the tabular form in the appendix section for better understanding.

Keywords—Array antenna, radar, CubeSat, multiband, multiple output, Ku band, K band.

I. INTRODUCTION

Military applications and telecommunication have consistently extended the range of frequencies in the course of last several decades, which lies in the upper part of the radar frequency spectrum. Notable improvement has brought in the field of deployable and origami antenna and amplification of RF power at sub-cm wavelengths, throughout this process. This technological advancement along with tiny high power computing system to process data and signals and the innovation of cube satellites has a remarkable impact on the application of high tech planetary radar to model the small-scale weather model and forecast of cloud and precipitation and other space applications.

Due to the improvement of rocket technology, it is now possible to launch multiple miniature radar and cube-sat in origami formation in a single launch. Space technologies dedicated to the improvement of small satellites are receiving attentions of the researchers now-a-days. Antennas are designed for several applications such as biomedical applications [1-4], satellite communications [5-6], GPS [7-8], and navigation antennas [9-10]. Two major obstacle to communicate with the satellite are electromagnetic interferences and coupling, which affectedly limits its full functionalities. Additionally, high power, high bandwidth as well as miniature deployable antenna is the foremost perquisite for the space communication due to its high space constrains inside the space shuttle while launching from the

ground station at earth. With the development of nano-satellites as cube-sats are permitting the access to the space. The CubeSat [11-12] criterions has allowed the researchers to carry out the studies in space technology and explorations.

A both sides linked patch antennas' array is recommended in literature [13] operating on Ultra High-Frequency band (UHF) to be executed for communication via small-scale satellite with Pico sat in Leo. A multiband micro antenna [14] is designed to work in 30-150 GHz with high bandwidth point-to-point satellites communication designated for remote sensing and radio astronomy. The antenna described in [15-17] is based on a cube-sat nano satellite framework for ESPACENET sensor satellite. The experimental data confirmed its feasibility of implementing tiny sized antennas on silicon substrates. Literature [18] presents a design of hardware for GPS receiver operating in multiband comprised with two antennas, which is well-matched with the CubeSat standard. The simulation results are satisfactory to fabricate the prototype model. A unique design of circularly polarized, low profile MSSA (Monofilar Square Spiral Antenna) is presented in [19]. The design which is developed and fabricated to operate at Ku frequency band showed decent results both in simulation and practical environments. Furthermore, quasi-isotropic type pattern of its radiation makes the wire antenna more appropriate for the Ku-band frequency [20]. Depending on the category of utilization and due to its low power on board, cube-sat nanosats are not generally outfitted with an orientation control structure, and in a given minute, its alignment is absolutely subjective [21]. A novel mesh reflector antenna is proposed in the article [22]. This high gain antenna's dimension reported as 10x10x15 cm³ for a 10x20x30 cm³ sized cube-Sats. Considering mesh and solid prototype antennas more than fifty percent efficiency is practicable at 33.75 GHz and practical results confirmed excellent agreements with simulated data. A novel low-cost Ultra Wideband (UWB) array antenna is proposed in literature [23]. The designed antenna is validated for 3by3 and 5by5 where 3by3 showed better performances. A mathematical model is established and performances are evaluated at Ku band (18 GHz)

This paper presents a simulation based array antenna to be implemented with small satellite or radar. A dual feed microstrip patch antenna is designed and its performances are evaluated. Using this patch antenna array of 2 by 2, 4 by 4

Design & Implementation of an Automated Reminder Medicine Box for Old People and Hospital

Mohammed Abdul Kader
Dept. of EEE
International Islamic University
Chittagong(IIUC)
Chittagong, Bangladesh
kader05cuet@gmail.com

Mohammad Nayim Uddin
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
nayimuddin61@gmail.com

Asif Mohammad Arfi,
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
arfieee@hotmail.com

Naeemul Islam
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
naymnaeem08@yahoo.com

Md. Anisuzzaman
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
anis.iiuc.eee@gmail.com

Abstract— The main objective of this research is to develop a smart medicine box to remind the old people or patient in the hospital to take the appropriate dose of medicine in the time suggested by the doctor. The device has twenty-one airtight compartments to keep the medicine. The attendant of a patient or nurse can make a weekly plan of medicine remainder by keeping medicine in twenty-one compartments for taking medicine three times per day. The attendant can manually set the time of taking medicine or load a text file in an SD card mentioning the time for taking medicine of every compartment. The device has a real-time clock to read the time. When time is matched with the set time, the device plays a sound in the speaker to share the information of medicine quantity and blinks the LED of the specific compartment where medicine is kept for that time. The device also informs the patient whether the medicine should take before a meal or after a meal. The device can ensure the medication safety, appropriate medicine dose, and prevention of drug abusement of elderly people.

Keywords—pill box, real time clock, microcontroller, SD card, audio amplifier, medicine remainder

I. INTRODUCTION

According to the World Health Organization (WHO), over 80% of the people above the age of 50-60 years are prescribed medicine, that are to be fed 2-3 times in a day. With the increasing of many vascular diseases and diabetes among the elderly person, proper medicine taking has become the first priority to live healthy. But among this people, 40-60% are having an issue of forgetting to take medicine on right time [1]. In Hospital or in home, the patients have to take the right doses in appropriate time. Even young people who are used to take care of elderly people in home forget due to different problems. So, it may cause prolong period to recover from the diseases. Sometimes old people take wrong medicine and wrong doses that may cause severe problem. Henceforth it is necessary for the patient to take proper medicines at precise quantity and time. Developing of electronic device can be efficient solution to solve the above problems in this era of technology. There has been considerable amount of research work on smart remainder medicine box. Aakash Sunil Salgia, K. Ganesan and Ashwin Raghunath proposed to design a smart pillbox using Keil Software, UART and GSM. The system can be often limited by the network problems or engaged in the line of communication [2]. S. Mukund and N.K.Srinath design a pillbox using microcontroller interface with keypad, LED display, motor controller, pill container and alarm system but it required additional 12V for providing supply to the motor. So, it is not a portable device and its cost is high [3]. Tess Antony, Meria M George, Nimmy Mary Cyriac and Sobin Mathew proposed a modern healthcare IoT platform with an intelligent pillbox along with sensors for health diagnosis and monitoring. But this method would help only young people who are having an android operating system based mobile and it is very difficult to understand and operate for elderly and illiterate people [4]. Shih-Chang Huang et. al. developed a system where special packing of medicine is required which is not suitable in places in the world [5].

To overcome these problems, a prototype of an automated medicine box for old people and patients is developed in this paper. An airtight box is used for the purpose of keeping the medicine fresh. This consists of 7x3=21 little compartments connected with different color LEDs sealed beneath the box. An LCD display and voice alert system is used in the device. The purpose of LCD display is to show the right time and informative data for the patient. The alarming system with the human voice helps to understand which medicine should take and where to take. The LED helps the patient or people to choose the medicine as the user preset time which is kept in the specified compartment. The purpose of this research is to produce a low-cost design and construction of a microcontroller-based automated medicine box that implies it for the purpose of helping assistant. In this design, we have explored the use of both hardware and software to bring about the entire research. The hardware components are solely coordinated by the ATmega328P microcontroller chip.

II. SYSTEM OVERVIEW

This system is mainly divided into six parts: SD card shield, real time clock, reset button act as the input device and LED, LCD display act as output devices. SD card shield stores the time schedule and audio file. The real time clock is used for reading time. When real time meets with pre defined time from SD card then LCD display shows the measured

An efficient model to limit the vehicle speed and horn sound in sensitive public zone with encrypted wireless communication.

Md. Eftekhar Alam
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
eftekhar78@gmail.com

Naznin Nahar Nipa
Dept. of CSE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
nazninnipa74@gmail.com

Kaniz Fatima
Dept. of CSE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
nazninnipa74@gmail.com

Mohammed Abdul Kader
Dept. of EEE
International Islamic University
Chittagong (IIUC)
Chittagong, Bangladesh
kader05cuet@gmail.com

Abstract— Road accident nowadays has become a national catastrophe for over populated developing countries like Bangladesh. Enormous innocent lives are taken way ruthlessly every day due to road accident. One of the main cause of accident in the sensitive public zones like school, college, hospitals etc. and sharp turning points is the over speed of vehicles avoiding the speed limit indicated in the traffic sign board. Motorists endanger the lives of passengers, pedestrians and fellow motorists not limiting their vehicle speed in these sensitive public zones. This paper paves a system to limit the speed of the vehicles in sensitive public zones without any interference of the drivers where controls are taken automatically by the use of a wireless local area network. Any motor vehicle entering the network zone cannot overcome the speed limit defined by the system. But driver can change the speed of vehicle within that speed limit. The system can also control the horn of the vehicles at certain important and restricted places or locations such as hospitals and school zones to prevent unnecessary noise generation. Besides, the system is capable of detecting any obstacle in front of the vehicles by using an ultrasonic sensor and stops the vehicle automatically if any obstacle is detected to avoid collision. The main objective of the proposed system is to operate the vehicles in a safe speed at critical zones minimizing the possible risk of unwitting accidents and casualties.

Keywords— road accident; vehicle speed limiter; microcontroller; RF communication; linear block code

I. Introduction

According to the report of NCPSRR (National Committee to Protect Shipping, Roads and Railways), at least 4,284 people, including 516 women and 539 children, were killed and 9,112 others were injured in 3,472 road accidents across Bangladesh in 2017. This report pronounces that the number of road accidents and casualties increased in 2017 compared to 2016. The NCPSRR mentioned some primary reasons behind the increased number of accidents and casualties where reckless driving, employing unskilled drivers are most common reasons [1]. Bangladesh Road Transport Authority (BRTA), Dhaka Metropolitan Police (DMP), and Dhaka Transport Coordination Authority (DTCA) have blamed drivers for 90% of the accidents, citing rash driving as the main reason [2]. Reckless driving and compete in speed when driving vehicles without bothering about the risk of fatalities creates a panic situation in the busiest public zones for us as well as our children. Problems like over speeding and rash driving can be solved by installing a speed limiter system.

A number of systems have been proposed for controlling the speed of vehicles to minimize the number of accidents. RF based automatic vehicle speed limiter by controlling throttle valve was proposed by Saivignesh H et al [3]. In this system there is a transmitter for certain zone which send coded signal continuously with certain time delay. Whenever a vehicle enters into this zone, a receiver circuit placed at vehicle will receive the code and then the speed of the vehicles is controlled automatically by taking control action in the throttle valve [3]. Srivas M C et al. has proposed another system which checks the speed of vehicles when in range of the network and reduces the speed of vehicle controlling the throttle valve [4]. K. Govindaraju et al developed a system named Embedded Based Vehicle Speed Control System Using Wireless Technology. Here, the authors focus on unifying the global positioning system to operate the vehicle in safe speed at critical zones [5]. Gummarekula et al proposed a system to intimate the driver about zones and to automatically maintain the speed by RF technology [6].

The system proposed in this paper has some additional features confiscating some limitations of previous works. This system sends the data of speed limit encoding it with error detection code from speed limiter device to vehicle. A receiver circuit should place in the vehicle which can encode the received data and also it has error detection and correction capability analyzing the received data. The circuit placed in the vehicle also capable of detecting the obstacle in front of the vehicle by a sonar sensor and stops the vehicle if any obstacle detected. Another important objective of the proposed system is to minimize the sound pollution of special zones ceasing the horn sound of the vehicles. It is

Design, Development and Performance Analysis of a Low-Cost Health-Care Monitoring System using an Android Application

Akib Jayed Islam[1], Md Mehedi Farhad[2], Sadman Shahriar Alam[3], Swarup Chakraborty[4], Md. Mahmudul Hasan[5] & Md. Siddat Bin Nesar[6]

1,5Department of EEE, American International University- Bangladesh (AIUB), Dhaka-1229, Bangladesh
2Department of EEE, Ahsanullah University of Science and Technology, Dhaka-1208, Bangladesh
3Department of Electronic Systems, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway
Department of EEE4 and ETE6, Chittagong University of Engineering & Technology (CUET), Chittagong-4349, Bangladesh
Email: akibjayedislam@gmail.com, mehedifarhad.eee@gmail.com, sadmanshahriar23@gmail.com, swarupchakraborty.eee@outlook.com,
mahmudul2211@gmail.com, mdsiddat12@gmail.com

Abstract— Cardiovascular disease (CVD) patients need continuous monitoring of bio-signals and regular hospital visit to improve health conditions. A portable health monitoring device can provide continuous monitoring of chronic diseases. In this paper, a low-cost health monitoring system is introduced to observe Electrocardiogram (ECG), body temperature and heart-beat. This research illustrates the use of android smartphone and Android applications to process and visualize the ECG signal, heart rate, and temperature. An android application is developed to monitor, store and share this biomedical signal data with an expert to get the fastest treatment. The system can also store the previous data to observe patient's history easily whenever necessary. The design strategy, experimental data with android apps, smartphone synchronization, real-time monitoring have been presented in this paper. The prototype can be utilized to control heart diseases for the people in the underdeveloped area.

Keywords— *Android apps, Arduino, biomedical signals, CVD, ECG, healthcare monitoring.*

I. INTRODUCTION

CVDs can be categorized into two forms; disorders of heart and blood vessels. This disease is responsible for a leading cause of death around the world. It is estimated that 7 out of 10 deaths will be caused by non-communicable diseases including CVD by the end of 2020 [1]. Statistics according to the WHO (World Health Organization) stated that more than seventeen million people die in a year from cardiovascular disease. A new scheme from WHO namely "The Global Hearts" focuses on taking measures against this global threat of heart attack and strokes to the citizen of the countries having small-scale earning groups or in a limited amount of resources [2]. The cardiovascular diseases diagnosis depends on its ECG (Electrocardiogram) pattern. Unhealthy diet, blood pressure, cholesterol levels beyond optimal value as well as smoking cigarettes are the main risk factors of Coronary Heart Disease (CHD) [3].

Willem Einthoven, who invented the ECG machine in 1901, defined letters, for instance P, Q, R, S & T for the respective deflection of the galvanometer string, which is shown in Fig. 1 [4]. To accurately diagnosis cardiac-related diseases, it is required to process the data and signals in real time. In the QRS complex, there is a high amplitude of energy

due to the cardiac ECG signal. On the other hand, T wave and U wave displays the low concentration of energy. In the most of the ECG signals, it is too (50% to 75%) vague to distinguish the aforementioned T & U wave. ECG means to keep track of the electrical activities of the human heart. ECG signal is normally a weak signal. The frequency of ECG signal lies in between 0.05 to 100Hz [5], which is weak and bipolar in nature. The average amplitude of the ECG signal is 1mV where the highest one is 5mV and the weakest one is 10µV. ECG signals are used to detect several heart-related diseases. The mismatch of the interval between waves and the amplitude as well indicated the cardiac abnormality. For heart diseases detection, the most popular way is based on the smart device that uses signal processing techniques or methods to clarify the ECG characteristics and diagnosis of a cardiomyopathy. The myocardial activities of the human heart are recorded as ECG signal shown in Fig. 1. The variations in ECG waves, interval and segmentation can be indicated as cardiac disorders.
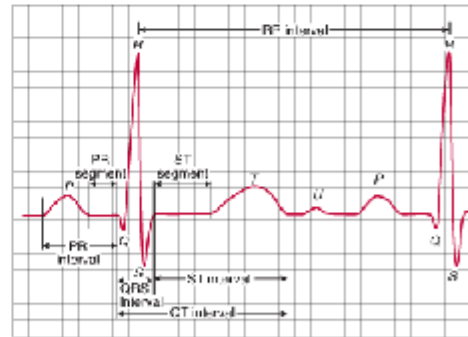

Fig. 1. Basic ECG signal with denoted waves, segmentations and interval [4]

To assess the heart condition, ECG is one of the most commonly used biomedical procedures worldwide. Various ranges of physical circumstances can be identified by observing the heartbeat. In recent years, the size of the ECG instrument is being miniaturized incredibly which allows

Performance Analysis of DTN Routing Protocols: Single-Copy and Multi-Copy in ICMN Scenario

Md. Ibrahim Talukdar, Md. Sharif Hossen

Department of Information and Communication Technology
Comilla University, Comilla, Bangladesh
ibrahim.ictcou@gmail.com, mshossen@cou.ac.bd

Abstract—Delay tolerant networks are qualified by asymmetric flow and intermittent connectivity where direct path is not found between nodes. In this research, we analyse two routing schemes' performance, single and multi-copy simultaneously in an intermittently connected mobile network. Among various routing protocols, first contact from single copy while spray-and-wait, prophet, and epidemic from multi-copy are chosen to analyse their performance. Aside from various performance metrics, routing protocols are analysed in terms of overhead, delivery, average buffer time and latency for varying number of mobile nodes, time-to-live and message generation rates respectively. Opportunistic network environment simulator coded by java programming language is taken as the tool of simulation for the investigation of these routing protocols. According to the investigated result of the specified routing techniques, we can conclude that the performance of spray-and-wait is good while bad for epidemic with all the metrics used here. On the other hand, first contact does not show good performance among all the routing protocols with delivery probability and average buffer time.

Keywords— delay tolerant networks, mobile networks, simulation, routing, simulator, prophet, snw, epidemic, first contact

I. INTRODUCTION

DTNs [1] are qualified by sporadic property and sparse network in which greater error is found for the purpose of communication. DTNs vary from traditional mobile networks that are rarely interconnected [2]. They are the extension of mobile ad hoc networks where at first a path is built from node to node for successful communication [3]. While, DTNs are not always interconnected. They follow the store-and-forward strategy during the transmission of data source. The routing protocols must specify when to forward, whom to forward and how to forward [4] [5] [6].

In this paper, the performance of the considered four existing routing techniques: first contact, spray-and-wait, epidemic, and prophet are examined using ONE in terms of overhead, delivery, buffer time and delay. At first, in section II, we shortly describe DTN routing protocols those are considered here. Then, we discuss about simulation tool and environmental setting in section III. After that, we describe routing protocols' performance metrics and their graphical analysis in section IV. Finally, section V includes the conclusion with future works.

II. BRIEF DESCRIPTIONS OF INVESTIGATED ROUTING PROTOCOLS

There are numerous protocols for DTNs that perform differently depending on the environment they reside within. Routing techniques are of single and multi copy. The first is a forwarding routing scheme which forwards a single-message copy to the entire network. Regardless of higher probability of message delivery, forwarding-based routings are resource efficient. While, multi-copy routing strategy is replication oriented scheme wherein many copies are forwarded through the networks [7]. In our investigation, the routing performance of multi-copy (i.e. epidemic, prophet, and spray-and-wait) and single-copy (i.e. first contact) are analysed. These are shortly explained here as follows:

A. First Contact

First contact is the forwarding based routing wherein it contacts and sends a copy to a node having first meeting using FIFO queuing [8].

B. Epidemic

Epidemic is the flooding based routing scheme where copies are sent to all nodes with no copy in common [9].

C. Prophet

Prophet is based on delivery predictability calculated by each node which measures the shortest path. A node carrying higher delivery, compared to other, delivers message copies to all neighbors [10].

D. SW

Spray-and-wait (SW) [11] follows FIFO strategy which is based on spray and wait strategies and limits message replications. Among the variation of it, i.e., binary and vanilla, we work on binary version since its message dissemination rate is much faster than the vanilla version. Two phases of binary spray-and-wait are:

Spray: L message copies forwarded by source to L/2 relays
Wait: Direct transfer of message to destination

III. SIMULATION TOOLS, SYSTEM REQUIREMENTS AND ENVIRONMENTAL SETTINGS

Different routing protocols are designed for different purposes. In our research, we concentrate on the performance evaluation of single and multi copy routings in an ICMN scenario using a java mapped simulator. Simulation tools imitate the activities of the real world routing strategies. Routing activities are simulated using a simulation tool, i.e., ONE to measure the performance of DTN routing protocols. Here, we discuss about ONE simulator, system requirements, as well as environment settings.

Comparative Analysis on Tropospheric Scintillation Prediction Models for Bangladeshi Climate

Md. Rabiul Hossain
Department of electronic &
Telecommunication Engineering,
International Islamic University
Chittagong,
Chittagong, Bangladesh,
rabiuliiuc@gmail.com

Nizam Uddin
Department of electronic &
Telecommunication Engineering,
International Islamic University
Chittagong,
Chittagong, Bangladesh,
nizam.rony1010@gmail.com

Abu Zafar Md Imran
Department of electronic &
Telecommunication Engineering,
International Islamic University
Chittagong,
Chittagong, Bangladesh,
azmimran28@gmail.com

Md. Jashim Uddin
Department of electronic &
Telecommunication Engineering
International Islamic University
Chittagong,
Chittagong, Bangladesh
jashimcuet@yahoo.com

Abdul Gafur
Department of electronic &
Telecommunication Engineering,
International Islamic University
Chittagong,
Chittagong, Bangladesh,
agafur_cox@gmail.com

Abstract—Satellite communication depends on a number of environmental elements such as cloud, fog, rain and atmospheric scintillation. In this paper, the tropospheric scintillation of Bangladeshi climate is predicted by four different prediction models which are ITU-R, Karasawa, Van de Kamp and Otung. Humidity and temperature are used for analysis which is collected from Bangladesh Agriculture Research Council (BARC). Comparison on predicted results show that scintillation fade depth (SFD) is highest in Rajshahi and the SFD is lowest in Dhaka for all prediction models. 9.60dB, 10.6dB, 8.88dB and 14.1dB maximum SFD is found for ITU-R model, Karasawa model, Van de Kamp model and Otung model respectively for Rajshahi city. On the other hand 8.04dB, 8.85dB, 7.20dB and 11.8 dB minimum SFD is found for ITU-R model, Karasawa model, Van de Kamp model and Otung model respectively for Dhaka city.

Keywords— Scintillation, Scintillation Fade Depth (SFD), Satellite Communication, Scintillation Prediction Model.

I. INTRODUCTION

Satellite link's performance is sensitive on various environmental factor like rain, fog, cloud and atmospheric effects. Atmospheric effects are ionospheric and tropospheric scintillation. The factors can vary because of territorial climate. Bangladesh is a sub-tropical area which is situated in south-east Asia. Her climate faces six season such as summer, rainy, autumn, late autumn, winter and spring. Bangladesh uses several ground station for telecommunication, D to H (Television broad-cast). Also newly launched BS-I satellite have two ground stations such are Sojib Wazed Joy Rangamati and Sojib Wazed Joy Gazipur. According to the aforesaid fact climatic condition of few stations are presented to calculate tropospheric scintillation. Here, scintillation can be defined as the flection of amplitude and phase of the satellite signal in propagation time as it goes through the different layers of earth's atmosphere.

Scintillation can occur both in the rainy and clear-sky condition. The paper [1] presented that the ionospheric scintillation occurs when the single is less than 3GHz but the signal higher than 3GHz faces scintillation because of the troposphere. Satellite communication prefers frequencies higher than 3 GHz. So, there is a massive effect of tropospheric scintillation on the satellite link. In paper [1], Scintillation prediction for Bangladeshi Climate is analyzed by ITU-R Model.

Rain attenuation, Cloud attenuation for satellite communication are adequately explained for Bangladeshi Climate in papers [2-4]. Comparative analysis of rain attenuation prediction is also presented in paper [5]. A comparative study on scintillation prediction for the subtropical area like Malaysia and Indonesia have been explained in papers [6-7].
The papers mentioned above did not conduct any research for Bangladeshi climate considering all other models along with the ITU model.

The prediction of scintillation is essential to calculate the budget of the satellite link, especially at frequencies above 10 GHz. In this paper, it was presented that the cumulative distribution of four different tropospheric scintillation models
This paper is formed as follows, the section I, states the introduction. Scintillation prediction models are demonstrated in section II. In section III, Res of the result. Finally, in the last section which is section IV, the conclusion is drawn.

II. SCINTILLATION PREDICTION MODELS

Scintillation prediction models such as ITU-R Model, Karasawa Prediction Model, Van de Kamp Model and OTUNG Models are used in this paper.

An Internet of Things (IoT) based Smart Traffic Management System: A Context of Bangladesh

Abdul Kadar Muhammad Masum
Department of Computer Science and
Engineering
International Islamic University Chittagong,
Bangladesh
akmmasum@yahoo.com

Md. Kalim Amzad Chy
Department of Computer Science and
Engineering
International Islamic University
Chittagong, Bangladesh
kalim.amzad.chy@gmail.com

Iaamanur Rahman
Department of Computer
Science and Engineering
International Islamic University
Chittagong, Bangladesh
rafidrahman38@gmail.com

Mohammad Nazim Uddin
Department of Computer Science and Engineering
International Islamic University Chittagong, Bangladesh
nazimuddinasifiiuc@gmail.com

Khairul Islam Azam
Department of Computer Science and Engineering
International Islamic University Chittagong, Bangladesh
khairulislam.azam@gmail.com

Abstract— With the fast growth of population, traffic congestion monitoring and control has become a great challenge. Increasing vehicles creates lots of problem like time wastage, fuel wastage, air and sound pollution, even death by getting stuck emergency vehicles. This paper proposes a real-time traffic management system (TMS) using the Internet of Things (IoT) and data analytics. Ultrasonic sensors are used to measure the traffic density. After analysing the sensor data, system controller sets traffic signal time by traffic management algorithm and also sends data to a cloud server through a Wi-Fi module. The proposed system can predict probable traffic congestion in the intersection point. If an emergency vehicle is detected, it gives priority, i.e. high signal duration to pass the intersection. In case of the signal violation, the system can identify the vehicle and charge a fine that is paid through Traffic Wallet mobile app. This proposed system is cost-effective, very simple to install and easy to maintain.

Keywords - Data Analytics; Internet of Things (IoT); smart traffic system; Sensors; Wi-Fi module

I. INTRODUCTION

A recent statistic shows that 30% of the air pollution is caused by the fuel that is used in the vehicle. It has been reported that congestion in the Dhaka – capital of Bangladesh eats up around TK 200 billion in a year [1]. Researchers also stated that this traffic jam lost 32 lakh business hours per day [2]. Centre for Economics and Business Research reported that it would rise to nearly TK 300 billion by 2030 [2]. The congestion for hours causes different severe types of pollution. Consequently, people are suffering from any kind of physical and mental discomfort [3]. To get rid of this unwanted congestion, Bangladesh needs a system that will overcome the problems of the existing system.

So, a smart traffic system can be a solution to these problems. Controlling the vehicle with the help of the traditional traffic light with the combination of the sensors and artificial intelligence is known as the smart traffic system [4]. The proposed smart TMS measures traffic density by analysing

sensor data. It sets the timing for traffic signal light by traffic management algorithm. Traffic density is visualised graphically at Thingspeak by sending data through ESP8266 Wi-Fi module. In case of emergency vehicles like ambulance, fire brigade, the system stops it's as usual task and changes the signal as green until that emergency vehicle passes to that intersection. In violation of traffic signal, it can detect the vehicle through RFID module and the system can charge fine, and a notification will send to that person through Traffic Wallet Mobile App.

The prime objective of this paper is to develop a smart traffic management system (TMS) using IoT. To the best of our knowledge, smart traffic system is not implemented in Bangladesh yet. This whole approach will cost less than other approaches. Moreover, operating the proposed system is more comfortable than other existing systems.

The rest of this paper is structured as follows. Section II deliberates the literature reviews. The architecture of the proposed system is described in Section III while Section IV describes the methodology of the system. An experimental result is presented on in Section V. Finally; the last section includes the limitations, future directions and implications of the study.

II. LITERATURE REVIEW

The urban population is incredibly increasing in this modern era, and that affects everyday life very badly, especially in transportation. Cities like Delhi, Dhaka and many more developing countries are still using the traditional way of managing the vehicles for the intensely increasing population. According to United Nations report, in 2018, about 55% population of the world resides in an urban area that is anticipated to be 68%, and increasing rate of Asia and Africa closed to be 90% by 2050 [5]. For this growing urban population, an effective smart traffic congestion avoiding system is a crying need for managing the significant number of vehicles.

Cell Tower Radiation and Effect on Human Body: Bangladesh Perspective

Muhammad Mostafa Amir Faisal
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
oranta68@yahoo.com

Mohammad Golam Mortuza
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
mortuzaete@gmail.com

Towhidul Alam
Dept. of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
towhiduleteiiuc23@gmail.com

Abstract–Recently a trend is being seen in Bangladesh that Base Transceiver Stations (BTS) are being built at highly populated areas without any analysis of their possible radiation hazards.A calculation based analysis of possible radiation hazard caused by these BTS antennas is presented in this paper. Important data are being collected from antenna specification data sheets provided by antenna manufacturing companies.Based on the collected data, Specific Absorption Rate (SAR) on human body at different distances from BTS is being calculated. Finally, different safety ranges for humans from BTS for different antenna types used in BTS are proposed.

Keywords – GSM, cell tower radiation, SAR, base Station antenna, RFR.

I. INTRODUCTION

Today, communication through mobile phone plays a major role in day to day life. It has become one of the necessities in our life although it produces harmful radiation that affect the human [1].Cellular wireless telephones have become an inseparable part of everyday life. By means of Radio Frequency (RF) signals, users are connected with each other on expanded networks of base stations. A lot of concern arise throughout the most recent decade about conceivable disturbances in human health caused by exposure to RF signals, especially the effects of radiations from base stations [2] [3] [4]. Radiation from Base Transceiver Stations (BTS) occupies the range of 800 MHz to 3000 MHz and it is a part of microwave frequency (MW) radiation (300MHz-300 GHz). Microwaves lie between radio frequency (RF) and infrared waves in electromagnetic spectrum.

There are two types of radiation that may cause negative effects on human beings. These are - ionizing and non-ionizing radiations. The atoms in the cells of living tissues can be affected by ionizing radiation. In this case, the normal neutral charge of the atoms gets changed and their normal functions get altered. The atomic structure does not get altered by non-ionizing radiation. Non-ionizing radiation is not dangerous compared to ionizing radiation. But thermal effect happens as water molecules of human body vibrates and rotates when they absorb power from radiation sources like mobile phones, BTS antenna etc. [5] [6].The measure of power produced by radiation of mobile phone also relies upon the quantity of base stations around the zone, network traffic of the cell phones, position of the mobile held by the user and the distance between cell phone and the base station.

Universally, the human body exposure to radiations is measured by Specific Absorption Rate (SAR). There are defined safety values of SAR in different standards. ICNIRP [7] proposes a 10 g-averaged SAR value of 2 W/kg at most for public exposure. Up to 3 GHz, the 2005 revision of the IEEE standard [8] has the same SAR limits as ICNIRP in the head region, except for the case of the pinna, where the SAR limit is 4W/kg.

In Bangladesh, bandwidths are sold at the bands of 900MHz and 1800MHz for 2G and 2100MHz for 3G to different operators [10]. Depressive manifestations, cerebral pain, wooziness, memory changes, tremors and sleep disturbances occur due to exposure to electromagnetic fields from base stations and mobile phones. Human cognitive functions are being affected by acute exposure to radio frequencies [8]. Exposure also caused congenital malformations and structural changes in developing kidneys [9].

Fig. 1. BTS established at the rooftops of buildings [15]

It is observed quite often that BTSs are established very near to human locality, even in the rooftops of buildings [15]. Not only that, it has been seen that BTSs are built at the middle of the high raised buildings to provide continuous network. Faster means of communication is always appreciable, but not at the expense of safety. BTSs are always connected to each

Performance Evaluation of MIMO in Urban Microcell for Dhaka City at 28 GHz Frequency

MD. Imtiaz Kamrul
Department of Electronic and
Telecommunication Engineering
International Islamic Univerity
Chittagong
Chittagong, Bangladesh
imtiazshuvo10@gmail.com

Kazi Mazharul Haque
Department of Electronic and
Telecommunication Engineering
International Islamic Univerity
Chittagong
Chittagong, Bangladesh
arshakib38@gmail.com

Muhammad Mostafa Amir Faisal
Department of Electronic and
Telecommunication Engineering
International Islamic Univerity
Chittagong
Chittagong, Bangladesh
oranta68@yahoo.com

Abstract—5th generation cellular network is the upcoming revolution in the cellular communication world. It tends to operate in millimeter wave frequency to provide the throughput requirements of the next generation. The 28 GHz frequency band is a significant candidate for mmWave communication with more than 3 GHz of potential bandwidth. Direct communication between wireless transmitter and receiver is established by line of sight (LOS) communication, and several types of wireless and radio transmissions depend on it. But in the random transmission of wireless signals, interruptions are made by different types of obstacles which are responsible for creating non-line of sight scenarios. A proper selection of a number of antenna elements in 28 GHz frequency in NLOS and LOS environment and their performance by analysing different channel parameters in urban microcell scenario for Dhaka city is presented in this work. The analysed parameters for this research work include an angle of arrival (AoA) and angle of departure (AoD) for azimuth and elevation angle, time delay profile, RMS delay spread, path loss exponent for both LOS and NLOS environment.

Keywords—5G, mmWave, path loss, 28 GHz, MIMO, urban microcell

I. INTRODUCTION

Nowadays, in the technology-dependent world, the demand of high data rate is rapidly increasing because of demanding applications and increased number of users. Revolutionary applications requiring high data rate include communication capabilities in the vehicle to vehicle (V2V), internet of things (IoT), a vehicle to everything (V2X), machine-to-machine (M2M) communication and communication between different types of smart sensors that have been used in various applications [1-3]. The data rate demand will be increased more than 1000 times in the next ten years assumed in 2010[4]. To provide this huge amount of data, researchers are going to use millimeter wave frequency after fourth generation (4G) which is termed as fifth generation (5G) wireless network. It is supposed to overcome the shortage of bandwidth. 5G tends to operate on mmWave frequency bands especially 28 GHz, 38 GHz and 73 GHz.

Along with the usage of mmWave band frequency, spatial multiplexing, beamforming, multiple input multiple output (MIMO) etc. are supposed to be the key enablers of the generation [5, 6]. A huge amount of bandwidth can be achieved in different frequency bands like 28GHz, 38GHz, 60GHz, E band frequencies from 71 GHz to 76 GHz and from 81 GHz to 86 GHz. Many channels have been modelled using these bands.

The medium between the receiving antenna and the transmitting antenna is termed as a channel. Proper modelling of the radio channel is regarded as of prime importance in mmWave communications [7]. From every angle of mmWave communications, from real-world performance prediction, antenna architectures and system performance, system and equipment design to capacity and coverage evaluation, understanding of all of these depend on appropriate consideration of the performance of radio channel in which mmWave signals propagate [8, 9, 10].

There are multiple factors which make the channel modelling challenging at millimeter wave frequency than the heritage sub-6 GHz including nonlinear device distortions, high-speed circuits and the wavelength of mmWave band frequency. Millimeter Wave band signal wavelength is so small that the attenuation resulted by dust particles, molecules of water and oxygen which is present in the air is foremost. But there are some benefits e.g. reduction in antenna size and massive bandwidth at mmWave band [11].

To maximize the capacity of a channel, MIMO technology is used in earlier long-term evolution (LTE) system. Now for 5G, massive MIMO is proposed and is expected to offer better throughput. The technology uses orthogonal frequency division multiple access (OFDMA) technique.

To bring out the maximum capacity of a channel, it's very essential to model a channel according to its operating scenario. In this aspect, the channel simulator plays a vital role. Different types of channel parameters have been developed and exercised by developers in recent years.

For example, a simulation software is developed by Smith [12] for outdoor and indoor propagation channels. For this software, two-ray Rayleigh fading channel model is used. Another channel model was developed by Clarke [13] which is a 3-D multi-cell channel model. This is promoted by Fraunhofer Heinrich Hertz Institute. The main feature of this model is that it can correctly forecast the performance for an urban macro cell setup with the help of high-gain antennas. Based on this model, a channel simulator has been developed that clinched features such as scenario transitions, time evolution and many others [14]. For indoor scenarios, a channel simulator was utilized for machine-to-machine communications [15].

Design and Analysis of IoT Based Ionizing Radiation Monitoring System

Siddique Ahmed, Abdullahil Kafi, Tanveer Rahman, Tahmid Azmain Mahatab, Mainul Hasan Muradi
Department of Computer Science and Engineering, International Islamic University Chittagong
Chittagong Bangladesh
Email: drsiddiqueahmed@gmail.com; ab_kafi@yahoo.com; shakil10vr@hotmail.com; tahmid.azmain94@gmail.com;
main_hasan@yahoo.com

Abstract— Continuous monitoring of radiation is essential for a location to protect its inhabitants from serious health hazard. It is also important to analyze the impact of radiation on the environment. We have developed a low-cost portable IoT based system which is comprised of a Geiger counter, Wemos microcontroller, temperature, humidity, and light ambient sensor and an online database. We have collected radiation data along with temperature, humidity and light intensity at different time frame in different weather in Chittagong City. These data can be stored and observed live from the web interface. We found that in sunny weather radiation is as high as 3000 microSieverts during the afternoon. The correlation between the measured radiation, temperature, humidity and light intensity are studied.

Keywords— *Geiger counter; ionizing radiation; Wemos D1; DHT11 Humidity and Temperature Sensor; Ambient Light Sensor*

I. INTRODUCTION

In our physical realm there exist air as well as different types of radiation such as ionizing radiation and non-ionizing radiation. Radiation is a form of energy whose sources are synthetic and naturally occurring. Some of those are harmful and some of are not, depends on limits of radiation dose and period of observation on a human body. A massive disaster happened in World War II (1939-45), America dropped the world's first deployed atomic bomb over the Japanese city of Hiroshima where the explosion wiped out 90 percent of the city and immediately killed 90,000–146,000 people due to the radiation exposure. Three days later, another bomb dropped on Nagasaki, killing an estimated 39,000–80,000 people due to over radiation exposures.

Ionizing radiation has always been present in the natural environment. Sources of ionizing radiation are commonly found in water, air, soil, or manmade devices. However, ionizing radiation is situated in the electromagnetic spectrum outside the region of perception of the human eye - visible region - and it has no smell. Thus, it cannot be detected by the human senses. Since the ionizing radiation is not easily detected and it also possesses high ionizing power and penetration strength, it constitutes a risk to human health when it is found outside of its acceptable limits. The adverse effects of ionizing radiation on human health need to be systematically monitored in order to prevent damage, overexposure, or even death. The ability to identify sources of radiation, specific radioisotopes and measure quantities of radiation is crucial to environmental monitoring, radiation protection, and development of security programs.

As ionizing radiation cannot be directly measured, the detection is done indirectly using an ionizing radiation sensitive material. The interaction of radiation with matter depends on the nature of the radiation: the electromagnetic radiation, lightly charged particles, neutrons, or heavy charged particles. Therefore, a detector which efficiently measures a particular kind of radiation could be completely inappropriate for others. The nature of the sensitive material's response to the ionizing radiation and its energy range to be measured will determine the type of detector. Considering the above phenomena, we are dedicated to making a system which monitors the continuous ionizing radiation around our environment. The ionizing radiation is monitored by a customized system using the Geiger counter and a micro-controller named Wemos. The system has been implemented on a Wi-Fi intergraded ESP8266 micro-controller Wemos D1 which makes it low cost and easier to implement. The sensor Geiger Counter is the main device to measure the radiation. Temperature, humidity sensor, and Ambient Light Sensor are also used to determine the temperature, humidity, and atmosphere light intensity. Using this system, it is easy for measuring and collecting radiation, humidity, and light intensity value from the environment to detect the level of radiation and the effect of it.

II. RELATED WORK

Geiger counter is an extremely beneficial device that can detect fatal radioactive radiation. There are many devices which measure radiation data but the Geiger counter is more reliable and easier to use. To measure smaller doses and show changes of dose rate with time at points of particular interest in the vicinity of nuclear facilities [1]. Another work with Geiger counter for measuring radiation within a particular time period with 20°C room temperature and 20-meter height [2]. We are performing a similar type of experiment, but in different environment. A wireless system compiled with a radiation sensor and associated peripherals been developed and implemented upon ZigBee technology using TI CC2530 chip. The radiation sensor uses a Geiger Muller tube as a reliable detector for the radioactive particulates in the gaseous effluent vented from nuclear facilities. The Wireless Sensor Network or

Improving Healthcare Services of Community Clinics using Machine Learning Techniques

Shahidul Islam Khan[1,2]; Arman Shaharia[1]; Nazmul Islam[1]; Md. Monirul Islam[1]; Abu Sayed Md.Latiful Hoque[2]

[1]Department of CSE, International Islamic University Chittagong

[2]Department of CSE, Bangladesh University of Engineering & Technology

nayeemkh@gmail.com; shaowna@gmail.com; nazmulislamrahad@gmail.com; monirliton@yahoo.com;
asmlatifulhoque@cse.buet.ac.bd

Abstract— Healthcare in Bangladesh has witnessed rapid growth in the recent past. A vast amount of data is generated in health sector of Bangladesh every day. Machine learning (ML) has a wide range of applications in healthcare. This paper highlights a brief overview of the applications of ML in healthcare. In this paper, we used ML techniques to predict different outpatient amounts of community clinics. We collected a dataset of 14889 patients within a time span of 508 days, from Community Clinics in Sandwip. In our research, we predicted the day of the week when maximum female and infant patients come into the community clinic for treatment. So the clinic authority may arrange support staffs accordingly. We used multiple linear regression and support vector regression for this purpose. Experimental results show that we could predict the amount of different types of outpatient visit with minimum error.

Keywords—Health Data Analysis; Linear Regression; Support Vector Regression; Health Informatics; Community Clinic; Bangladesh

I. INTRODUCTION

In Bangladesh, there are 64 districts and 492 sub-districts. According to Sandwip Upazilla Health Complex survey, 61.4% of patients get admitted for dysentery diarrhea whose ages are less or equal to five. Not only children are affected, 57.5% patient's ages are 30 plus. The death rate of children 42.9% for dysentery diarrhea. This is an alarming sign that people who live in sub-district, they are maintaining an unhealthy lifestyle still now. Dysentery diarrhea, Bacterial & fungal diseases (such as fungal infection, finger infection, nail infection), PUD, Asthma, fevers (Typhoid, paratyphoid) are the top five diseases, according to Sandwip Upazilla Health Complex [1]. People still leading and unhygienic lifestyle over there. The human resources, equipment are not sufficient in Sandwip sub-district, Bangladesh. People are deprived of proper treatment for the lacking of doctors, nurses, and machinery. According to the latest WHO data published in 2017, diarrhea disease deaths in Bangladesh reached 19,951 or 2.53% of total deaths. The age adjusted death rate is 16.57 per 100,000 of population ranks Bangladesh #60 in the world [2]. Alike dysentery diarrhea, some diseases Asthma, PUD, Helminthiasis, Fungal infection, chronic dysentery, etc. are common in the rural area.

People who lives in rural area are unaware of healthy lifestyle. They often faces health outbreaks because of social and ethical unawareness. If clinic management know at which day of the week they are getting which amount of outpatients considering gender or ages, they can arrange some health awareness program, vaccine program or sanitation program for them to increase awareness and motivate the people for a hygienic lifestyle. Clinic authority can arrange proper physicians and nurses at which day they needed, they can grant casual leaves of their staffs in other days. Clinic authority can arrange proper medicines backup by predicting the specific disease patient load and can arrange those disease specialist on that day.

Researchers are often faced with the need to describe quantitatively the relationships between outcomes and predictors, with the objective of explaining trends, testing hypotheses, or developing models for forecasting. Regression models are able to incorporate complex mathematical functions and operands to best describe the associations between sets of variables. Unlike many other statistical techniques, regression allows for the inclusion of variables that may control for confounding phenomena or risk factors [3]. Regression to the mean is a widespread statistical phenomenon with potentially serious implications for health care. It can result in wrongly concluding that an effect is due to treatment when it is due to chance. We discuss the importance of the issue and its effects on many common clinical, public health, and managerial decisions [4]. A vast amount of data is generated in health sector of Bangladesh every day through different medical and diagnostic equipment. These data are very important and highly sensitive resources. If we used machine learning (ML) techniques, we can have novel and useful insights from this data [5]-[10]. In this paper, we used ML techniques to predict number of outdoor patients who will visit the clinic in different days of the week. Thus the clinic management will be benefited and can manage their human resource in a better way.

II. METHODOLOGY

This methodology section is the systematic and theoretical analysis of the methods applied to our research study. It encompasses our concepts such as paradigm, theoretical model, phases and techniques. We tried to discuss underpinning for understanding which method, set of methods, or best practices can be applied to our research case in this section. Our proposed model workflow has been shown in Fig. 1:

Electromagnetic Performances Analysis of a Microwave Imaging System(MIS) for Breast Tumor Detection

Farzana Tasnim
Dept. of CSE
International Islamic University Chittagong
Kumira, Chittagong-4318, Bangladesh
farzanatasnim34@gmail.com

Farhanatul Jannat
Dept. of CSE
International Islamic University Chittagong
Kumira, Chittagong-4318, Bangladesh
jannat66@gmail.com

Salehin Kibria
Centre of Advanced Electronic and Communication Engineering (PAKET)
Universiti Kebangsaan Malaysia
Bangi, Selangor, Malaysia
sakib2005@yahoo.com

Mohammed Shamsul Alam
Dept. of CSE
International Islamic University Chittagong
Kumira, Chittagong-4318, Bangladesh
alam_cse@yahoo.com

Touhidul Alam
Dept. of CSE
International Islamic University Chittagong
Kumira, Chittagong-4318, Bangladesh
touhid13@gmail.com

Tanveer Ahsan
Dept. of CSE
International Islamic University Chittagong
Kumira, Chittagong-4318, Bangladesh
tanveer.ahsan@gmail.com

Rezaul Azim
Dept. of Physics
University of Chittagong
Chittagong, Bangladesh
rezaulazim@yahoo.com

Mohammad Tariqul Islam
Centre of Advanced Electronic and Communication Engineering (PAKET)
Universiti Kebangsaan Malaysia
Bangi, Selangor, Malaysia
tariqul@ukm.edu.my

Abstract— Breast cancer is the second most common disease throughout the world, more than 1.8 million new breast cancer cases diagnosed every year worldwide. Early detection and treatment of the breast cancer can be survived up to 97%. X-ray mammography, Ultra-sound system, and MRI techniques are widely used detection system. But X-ray mammography and Ultra-sound system has high false diagnose rate. MRI is the most effective one to detect the tumor but very expensive, sometimes unreachable to the low-income people. On the other hand, Microwave imaging technique is non-invasive and harmless alternative of mammography. It includes transmission of low levels of microwave vitality through the tissues. In this research, a MIS system is developed for breast cancer detection using six highly directive Vivaldi antennas that are uniformly placed over the whole breast phantom. The designed antenna obtained operating band at 3.04 GHz to 3.30 GHz with peak gain of 4.1 dB. The antennas are used as transponder to transmit signal and received backscattered signals. Antenna one transmits signal and other antennas receive the signal. The received backscattered signals are converted to digital data and processed using MATLAB software to visualize the image to detect the tumor.

Keywords— antenna, breast cancer, microwave Imaging, 2D image

I. INTRODUCTION

Breast cancer is most common invasive cancer and the second leading cause of death in women both in the developed and developing countries. It develops from breast tissue. Its symptoms vary from one person to person. From them the most common symptom is an area of thickening breast tissue, more than 80% women[1] can feel a lump in breast which is usually painless, but not always. There are around 1.38 million new cases and 458,000 deaths from breast cancer every year. Only 35% of the populace knew about the early signs and 46.3% aware that breast lump is the early warning sign of breast cancer, trailed by 28% said breast ulcer, 16% pain in breast, 9% painless lump and 1.4% said for nipple release. Regarding skin changes, no one knew about it. Around 54% aware of breast cancer by clinical examination. Early detection can be the key factor to expand the survival rate, which quickens the critical prerequisite for a reliable, comfortable and highly efficient technique for breast cancer discovery. Presently, X-ray mammography is the traditional method for screening and distinguishing breast tumour. Sadly, up to 205 high false negative rates[2]. In addition, it is clear that ionization caused by X-ray mammography speaks to a serious danger, and there is even a chance of women developing cancer from such an examination method. Patients are likewise unwilling to endure uncomfortable breast compression during this procedure. Ultrasound (US) is an elective discovery technique, with a 17% false-negative rate. As an option, attractive reverberation imaging (MRI) attracts regard for distinguishing breast tumour due to its extraordinary component of high affectability; in any case, the examination is exceptionally costly and has little specificity, which can prompt an incorrect diagnosis. The false negative rate is lower when the tumour is on stage 3 [3].To enhance the discovery framework, mixes of various models have additionally been investigated, even a mix of various models is not sufficient for cost decrease, wellbeing change, avoidance of inconvenience and all the more essential, an expansion inexactness [4]. Such impediments motivate specialists around the world to investigate new alternative diagnostic methods.

If the tumour can detect in the earlier stage it can be treated. but the existing screening system is highly expensive and have lots of limitations. So need something like which is low in cost, not time-consuming, no ionizing radiation and above all the false negative rate is lower in any type of breast

Computational analysis of Microwave Imaging (MWI) System for Post Stroke Screening Using Unidirectional Antenna

Tahsina Islam
Dept. of CSE
International Islamic University
Chittagong
Kumira, Chittagong-4318, Bangladesh
tahsinaislam385@gmail.com

Tanveer Ahsan
Dept. of CSE
International Islamic University
Chittagong
Kumira, Chittagong-4318, Bangladesh
tanveer.ahsan@gmail.com

Md. Samsuzzaman Sobuz
Dept. of CCE
Patuakhali Science and Technology
University
Dumki, Patuakhali, Bangladesh
sobuzcse@gmail.com

Hosna Ara Begum
Dept. of CSE
International Islamic University
Chittagong
Kumira, Chittagong-4318, Bangladesh
hosnaara94@gmail.com

Mohammed Shamsul Alam
Dept. of CSE
International Islamic University
Chittagong
Kumira, Chittagong-4318, Bangladesh
alam_cse@yahoo.com

Mohammad Tariqul Islam
Centre of Advanced Electronic and
Communication Engineering (PAKET)
Universiti Kebangsaan Malaysia
Bangi, Selangor, Malaysia
tariqul@ukm.edu.my

Md. Abdur Rahman
Dept. of CSE
Dhaka Commerce College
Dhaka-1216, Bangladesh
mardcc@gmail.com

Touhidul Alam
Dept. of CSE
International Islamic University
Chittagong
Kumira, Chittagong-4318, Bangladesh
touhid13@gmail.com

Abstract— Stroke is a leading cause of death and disability around the whole world. Currently computed axial tomography (CAT) scan, magnetic resonance imaging (MRI), positron emission tomography (PET) scan and ultrasound CAT scan, MRI, PET scan) and ultrasound are commonly used to detect brain stroke. However, CAT scan, MRI and PET scan are not available outside the hospital environment due to their large and bulky structure and beside this MRI is very expensive diagnose the system. In this research, a microwave imaging system utilizing unidirectional antenna is designed that uses the difference in contrast in the electrical properties between healthy and hemorrhaged brain tissues. Two unidirectional patch antennas are used in MWI simulation. One is used to transmit signal and another one is for receiving transmitted backscattered signal from various parts of the head. A homogeneous head phantom with brain is placed between the transmitter and receiver antenna. An elliptical shaped blood clot (having density of 1060 Kg/m3, thermal conductivity of 0.51 W/K/m) is considered in the simulation system. The received backscattered signals are post-processed to generate a 2D image.

Keywords— *Microwave Imaging, Antenna, backscattered signal, 2D image*

I. INTRODUCTION

While today's world is proceeding too fast with the help of modern technology then the life of human comes to a sudden death if any destructive failure occurs in human health which is not curable within a short time. like that one of sudden but frequent occurrence is stroke which makes the blood circulation blocked towards the brain and as a result, the affected life comes to an end within a twinkling of an eye. In today's world, one among six people lose life unexpectedly because of stroke. 6.7 million people in 2015 lost their lives. 80% stroke [1] can be prevented if necessary steps arranged immediately within 4.5 hours [1, 2]. currently using technologies are x-rays, magnetic resonance imaging (MRI), computed tomography (CT), ultrasound (US), and positron emission tomography (PET) [3]. A stroke can be happening in every 40 seconds and in every 4 minutes, the affected person die from stroke. two leading types of stroke are ischemic stroke and haemorrhagic stroke where causes blood clot in the brain and haemorrhagic results because blood vessel inside brain get burst. Defaults of Currently available techniques mainly are they are bulky in size and also not reachable at remote places. Ambulances are also not designed for this kind of emergency services.

Microwave imaging makes different effects are detecting the damaged tissue as the normal tissues and damaged tissues have different dielectric properties [4]. Statistics say within 2030 around 13.2 million deaths are expected as a result of stroke. 2D image reconstructed using non-ionizing microwave imaging system to detect breast cancer in [5, 6]. In [7], an image of the phantom generated using a post-processing confocal algorithm based on delay and sum method detecting the location of the stroke. Antenna is a major component of the microwave imaging and directional radiation is highly desirable for MIS. Several antenna researches have been investigated to design directional antenna [8, 9].

An Expert System Based on Belief Rule to Assess Bank Surveillance Security

Md Jamshed Alam[1], MD. Imtiaz Kamrul[2]
[1,2]Department of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
[1]etejamshed@gmail.com, [2]imtiazshuvo10@gmail.com

S. M. Zia Ur Rashid[3], Syed Zahidur Rashid[4]
[3]Department of Electrical and Electronic Engineering
[4]Department of Electronic and Telecommunication Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
[3]smziaurrashid@gmail.com, [4]szrashidcce@yahoo.com

Abstract— Surveillance is the monitoring of the behavior, activities or other changing information whereas security means the state of being protected from harmful activities. Nowadays proper surveillance security is considered as a challenging issue in the world and security has become a major concern from real life to virtual life. Tech-giants are implementing new solutions & techniques for better security assessment. This paper illustrates the design and implementation of a Belief Rule Based Expert System (BRBES) to overcome the uncertainty problems during bank security assessment. The proposed expert system has been developed based on generic Belief Rule Based (BRB) inference methodology using Evidential Reasoning algorithm (RIMER). Real-time security data has been taken from several banks of Bangladesh in conjunction with the expert's opinion to construct the knowledge base. This expert system provides more reliable and effective result under uncertainties which is better than any other traditional expert's prediction. Real life case studies were used for the validation of this system. Also, the outcome is compared with the real-life security system. Furthermore, the architectural design, implementation and utilization of an expert system to assess bank security under uncertainty are also discussed in this paper.

Keywords—— surveillance security; belief rule base; RIMER approach; banking security; security assessment

I. INTRODUCTION

In recent days, we have seen several bank plunders like ATM skimming, card skimming, jackpotting malware attacks, shimming etc. These are all hints of week security system. To overcome this risk, a close video monitoring system is being used to detect typical unusual behaviors in ATM booth, such as fraud and robbery [1], [2]. To handle threats on online banking an independent solution based on Keystroke Dynamics methodology has been discussed on these paper [3], [4].

In July 2018, IBM Security and Ponemon Institute jointly released the result of global data breach study that found $3.86 million global average cost for data breach which is increased 6.4 percent from 2017 report [5]. The study also measured $40 million and $350 million estimated total cost respectively for one million to fifty million compromised records. According to Sputnik news in recent SWIFT-based cyber-heist, a Russian Bank and Bangladesh Bank lost $6 million and $81 million respectively [6]. Hackers have stolen around 90,000 customer's data from two major Canadian Bank, Reuters reported [7]. Bank security is the measurement of taking security step to secure the bank. We can see that in the recent time bank robbery and ATM hacking is cause due

to weak security measurement. Security of the bank services can be assessed using some prevalent systems such as server security, vault room security, ATM security, shimmer security etc. Howbeit, these systems are not capable to provide 100% security as they are not designed to handle variant uncertainty issues. To stave off all types of fraudulent activities, we need to use some foolproof security solution which can be integrated with modern technologies. Using biometric technology, iris scanning, voice recognition, palm scanning, fingerprints, pressure detection, blockchain technology etc. can help to generate an extreme security level for the bank to reduce online & mobile banking transaction frauds and ATM skimming [8-12].

In this paper, we presented an expert system based on belief rule (BRBES) which is developed and designed by using RIMER approach to handle various types of uncertainty [13-17]. This system is capable to provide better assessment result as it can gather information under uncertainty. The leftover of this paper is formed as follows. In section II, RIMER Methodology is discussed. In section III, the BRBES for assessing bank surveillance is explained with its architecture and framework and also simulation result is given in this section. And then in section IV, the discussion is going on analyzing the result and comparison with real-life security system. And the last section which is section V, the conclusion is drawn.

II. METHODOLOGY

A. Domain knowledge representational using BRB

The value of the attribute contains a reference to the precedent of the BRB precedent. For example, the behavior of the referential value of the surveillance activity is a continuation of information, security behavior or other changes. The antecedent attribute as shown in equation (1).

IF
  (bank Surveillance is Low) and (ATM security is middle) and (online transaction is high)

THEN
  Bank Surveillance Assessment =
$$\{(High(0.5)),(Middle(0.3)),(Low\ (0.2))\} \qquad (1)$$

Hence, the entire degree of belief = (0.5+0.3+0.2) =1.

Electricity Generation from Train Wheel Axle

Mohammad azim uddin[1], S. M. G. Mostafa[2], Abdiaziz Mouse Abdi Miad[3]
[1,2,3]Department of Electrical and Electronic Engineering
International Islamic University Chittagong (IIUC)
Chittagong-4203, Bangladesh
E-mail: [1]azimctg50@gmail.com, [2]mostafa.93eee.iiuc@gmail.com

Abstract— the real threat to life on earth is pollution. According to google the top 10 reason of death is cardiovascular disease, cancer, diabetes mellitus, injury, stroke, chronic condition, accident, Alzheimer's disease, pneumonia, and respiratory diseases. Most of those are directly or partially connected with environmental pollution and the main reasons for the environmental pollution are the increase of CO_2 or other gasses. The most significant reason for the increase of different gas into the environment is burning fuel. If we are able to reduce the amount of fuel burning then gas production rate will decrees. Bangladesh railway use power core power generation system for generating electricity for train compartments internal power requirement (compartments light, fan etc.). In this system, the fuel generator is used for power generation. Enormous fuel burning makes environment pollution. To this research, we try to develop an eco-friendly electricity generation system from the train wheel axle which can able to reduce some amount of fuel burning. We use here fuel generator and also build an alternator that rotor makes by train wheel axle. When train run then axle are rotating then we get rotating magnetic field and after rotor getting the certain speed we collect electricity from that source. Here, we make an auto controlling system for control voltage fluctuation and switching between two systems.

Keywords— Train wheel axle, Eco-friendly, Electricity generation system, Renewable sources integration, voltage stability system.

I. INTRODUCTION

All of the train in our country use fuel generator for electricity generation. But all of that produce CO_2. For this reason, we tried to develop an electricity generation system which is eco-friendly and the running cost is very negligible. Bangladesh railway has 2877.10 km road. In 2014 it carried 65.00 million passengers and 2.52 million tons of freight making 8,135 million passenger-kilometers and 677 million tonne-kilometers [1]. To service, all class feature railway need huge electric power. Generally, railway use fuel generator for this purpose. Fuel electricity generation system for the train is very costly and not environment-friendly. With the increase in the demand, the cost of these fuels is also increasing.

Also, the rapid increase of gas in the atmosphere is caused by burning from these fuels. The emission from coal and petroleum fuels creates much more hampers to the environment as global warming. The emission due to fossil fuel is increasing rapidly. One model predicts that, even if CO_2 emissions were stabilized at today's levels, the global temperature and sea level would continue to rise for another 50-100 years [2]. This rapid increase of Green House Gases (GHGs) causes health problems and ecological misbalance. Also, these greenhouse gases cause's severe environmental calamities such as floods, droughts, heat waves, reduction of agricultural yields, or cause biological extinctions.

There is various technique apply to generate electricity from the train track and train wheel. All of that want to create a system of free energy source. Electricity generation by transferring rotational energy [3] is a very effective and easy system to generate electricity from the train track. Using the principle of mutual induction, we can produce the power in the form of electricity by the Train [4]. We can able to generate electricity by the process of collecting train wheel rotational force [5] from Rack and Pinion mechanism [6] and it's propagated into the chain drive and through the generator. Also, we can generate electricity from the train track through the process of rotation of wind turbine [7]. Now a day's energy harvesting from train vibrations [8] is also a very useful process for electricity generation from a train track. We can also generate electricity through air pressure from running trains [9]. Some Bangladeshi scientist proposes a system for generating electrical energy by using piezoelectric material from the train track [10]. Using the principle of conversion of mechanical energy into electrical energy with the help of motor generation of electricity is generated in the running train[11]. We can also produce electricity by using a turbine mounted on a train [12].

This paper proposes a simple method of electricity generation from train wheel axle. We design an alternator that prime mover is connected with the train wheel axle by the belt. When train run at the certain speed then alternator generate ac power. Our system doesn't work before the train gets a certain speed. So, this system we also need another supply system. With the help of microcontroller and relay, we can able to switching between our alternator and another supply system.

II. POWER DEVELOPMENT BY SYNCHRONOUS GENERATOR

Consider a simple alternator that rotor contains 24 poles and radius is 0.33 meter. We know, the per phase power output of an alternator is:

$$P_{out} = vi\cos\emptyset \qquad (1)$$

Here, v is the output voltage in each coil and i is the instantaneous peak current. For calculating v and i, we need to calculate frequency, maximum exciter voltage, no. of turn in rotor coil, rotor rpm, change of flux, the time of flux changes, no. of turn in stator coil, dc resistance of the wire in the stator coil.

A. Frequency

We know, Frequency of induced e.m.f. in hz; $f = \frac{pn}{120}$

A Reliable Electrical Power System Scheme for Rooppur Nuclear Power Plant Considering Diversity and Redundancy

Md. Injamam Ul Islam Chowdhury
Bangladesh Atomic Energy
Commission
Dhaka-1207, Bangladesh
eeeinjamam@gmail.com

Naruttam Kumar Roy
Department of Electrical and Electronic
Engineering
Khulna University of Engineering &
Technology
Khulna-9203, Bangladesh
nkroy@yahoo.com

Md. Asif Ahamed
Department of Electrical and Electronic
Engineering
North Western University
Khulna-9201, Bangladesh
asif.fx@live.com

Abstract— Lesson learned from the Fukushima Daiichi Nuclear Power Plant (NPP) accident, the significance of the electrical power system has been emphasized to an upper level for NPPs currently in operation. Safety systems of the NPP require electrical energy for their activation and operation which results in the safe operation of the NPP. For that reason, the presence of a sustainable and reliable electrical power system is very important. The objective of this paper is to analyze the significance of the NPP's safety based on a proposal of a reliable electrical power system for the Rooppur NPP which is being constructed in Bangladesh. In this paper, an on-site and off-site power system with diversity is proposed to achieve the safety aspects of this plant.

Keywords—Nuclear Power; Safety; Station Blackout; Redundancy; Diversity; Electrical System;

I. INTRODUCTION

The construction of Nuclear Power Plant (NPP) from the very first stage to the successful evacuation of power to the grid is a very complex process, afterwards the safe operation of the plant seeks highest level of primacy. Bangladesh has already taken the firm and concrete decision to build its own NPP pursuant to the Bangladesh Nuclear Power Action Plan, declared in 2000 titled 'BANPAP', which is intended to facilitate implementation of the Government's decision on introducing nuclear power programme in Bangladesh. According to the Power System Master Plan 2016, Bangladesh aims to incorporate Nuclear Power from the 1st and 2nd unit, with capacity of 1200 MWe each, to its energy mixing plan by the year of 2024 and 2025, respectively [1]. Ensuring safe operation is the main concern for NPP which results from the highest level of robust and reliable functioning of the systems, structures and components (SSCs) of the plant. It is required to power up those SSCs through an electrical system for their activation, sensing and operation. The design aims of the electrical system is to protect the NPP from the relevant hazards. Hence the electrical system design must have the diversity, redundancy, physical separation and maintainability [2]. From the recent plant operational history events like, Loss of Off-site Power (LOOP) occurs due to human error or component failures [3]. In this paper, an electrical system has been proposed, comprising of basically an on-site and an off-site electrical systems for the Rooppur NPP focusing on mainly considering the diversity and redundancy in each cases. It could be expected that if the plant's electrical power system is modeled as per the proposed design then the reliable operation of the plant would be achieved.

II. NUCLEAR POWER: PROSPECT IN BANGLADESH

The nuclear power program is a major undertaking requiring careful planning, proper preparation and investment in time, organizations, finances and human resources as well as involves a commitment for over 100 years use of nuclear materials. Moreover it requires strict attention to nuclear safety, nuclear security and safeguards.

For the last few years, Bangladesh has been emerging as a middle income country and facing a huge energy demand due to the upliftment in industrialization, enhancement of human life, civilization and modernization etc. Considering the fact with the assistance of International Atomic Energy Agency (IAEA), Bangladesh has undertaken nuclear power program as a sustainable energy option. As a result, country's first Rooppur NPP Construction Project having two units of VVER-1200 type reactors with total capacity of 2400 MWe, is being implemented by the Government of the People's Republic of Bangladesh through Bangladesh Atomic Energy Commission (BAEC) under the Ministry of Science and Technology (MoST) [4],[5].

Bangladesh has also established and strengthened the nuclear safety regulatory body [4] to ensure the respective safety aspects for reliable nuclear energy by,

- Adopting Bangladesh Atomic Energy Regulatory Act in 2012 (BAER Act 2012)

- Establishing Bangladesh Atomic Energy Regulatory Authority (BAERA) in 2013.

The regulatory body has already issued the site license and is preparing for construction license.

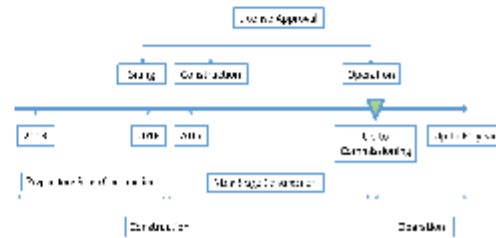This vast and complex construction work is going on to achieve its goal by following its roadmap.

Fig. 1. Rooppur NPP constructional and operational period roadmap

Prediction of Upcoming Conferences Ranking in Bangladesh based on Analytic Network Process and Machine Learning

Golam Rahman Chowdhury
Dept. of Computer Science and
Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
chy.g.rahman@gmail.com

Faisal Bin Al Abid
Dept. of Computer Science and
Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
faisaliut42@gmail.com

Md. Abdur Rahman
Dept. of Computer Science and
Engineering
Dhaka Commerce Colleage
Dhaka, Bangladesh
mardcc@gmail.com

Abdul Kadar Muhammad Masum
Dept. of Computer Science and
Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
akmmasum@yahoo.com

Mohammad Mahadi Hassan
Dept. of Computer Science and
Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
mahadi_cse@yahoo.com

Abstract— The main objective of an academic conference is the participant's scope of submitting research papers. Different types of academic institutions and organizations arrange many academic conferences annually. It is virtually impossible for academics to attend all the conferences. Consequently, selection of the best conference is of utmost importance for academics. Selection of best conference paper was dependent on significant factors such as: conference location, registration fee, conference language, subject of the conference and submission deadline. In this research paper, Analytic Network Process (ANP) was used to accurately rank ten significant academic conferences based on the specific criteria mentioned above. Machine Learning (ML) algorithm have been used to rank upcoming conferences. The upcoming conferences will be considered based on the condition that the machine learning scores should be more than 80%. Multiple linear regression machine learning algorithm was used to find out the best upcoming academic conference.

Keywords—analytic hierarchy process; analytic network process; machine learning; factor; sub-factor; multi-criteria; decision making; mean absolute error

I. INTRODUCTION

Academic conferences are the best events to present the works (papers/posters) of academics or students. It plays an important role to meet the researchers in the same field. That is why it is of utmost importance for the academics to submit their conference paper in the best possible conference. In this research paper, we not only discovered the feasible sub-factors of conferences but also ranked the 10 conferences of Bangladesh. After ranking the 10 conferences we used machine learning algorithm to predict and accurately rank the upcoming conferences in Bangladesh. This study consists of 4 sections and 2 sub-sections. In the second section we discussed literature review. We discussed overall methodology in the third section along with the subsections consisting of analytic network process (ANP) and machine learning (ML). The conclusion and future work has been discussed in the last section.

II. LITERATURE REVIEW

Academic conferences are arranged for different purposes. The subjects of the conferences can be either specific or general. Also, the classification of conferences is divided into two types: local and international. Turkish academics use a scale (developed by Yuncu and Kozak-2010) based on the criteria to select the best conference [4]. 1100 academics surveyed from numerous universities in Turkey and analyzed the surveyed data with a software package. According to this study, the location of an academic conference is very significant.

In 2011, Yuncu and Kozak also performed a study on the characteristics of conferences preferred by academics [7]. This survey included 40 factors such as cost, registration fee, submission date etc. to find the appropriate criteria. According to this analysis, the most important factors to select the best conference are location of the conference, recreation opportunities and total cost. In 2013, Unsal and Acar aimed to find the factors that influence the selection of scientific and academic conferences [9]. Their work was based on interviews with 150 academics from 4 different faculties. This research included some important factors such as prestige of the organizing institution, conference, the natural charm of the location.

Relevant works also appeared in the following studies. In 1997, Go and Zhang categorized the factors that influence the location of a conference [5]. In 2000, Chacko and Fenich performed a study to select the conference location [1]. In 2003, Kim and Kim determined the importance of quality of service (QoS) [6]. In 2004, Louviere and Crouch evaluated different alternatives and developed various approaches for selecting a conference location [3]. In 2006, Chen determined the problem of selecting a conference by Analytic Hierarchy Process (AHP) [2]. In 2016, Seyda, Mustafa and Tamer also determined the important factors for selecting an academic conference based on ANP [10].

Human Activity Recognition Using Multiple Smartphone Sensors

Abdul Kadar Muhammad Masum
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
akmmasum@yahoo.com

Arnab Barua
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
Arnab_rocky2050@yahoo.com

Erfanul Hoque Bahadur
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
ehb1729@gmail.com

Mohammad Robiul Alam
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
robi3443@gmail.com

Md. Akib Uz Zaman Chowdhury
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
ekibzaman00007@gmail.com

Mohammed Shamsul Alam
Dept. of Computer Science and Engineering
International Islamic University Chittagong
Chittagong, Bangladesh
alam_cse@yahoo.com

Abstract—Due to the availability of various sensors in the smartphones, used by millions of people for communication, a new research arena is identified for data mining and machine learning. This paper aims to recognise ten human activities, i.e., sitting, walking, jogging, lying, walking upstairs and downstairs, cycling, standing, squatting in a toilet and fallen down, through smartphone sensors. For the implementation of our models, we collected labeled Gyroscope data, Accelerometer data, Temperature data and Humidity data from three users regarding their daily activities and summarised in 1Hz frequency. Then we used our training dataset to deduct a model for the prediction of activity recognition. Our work is noble in term of our system of data collection along with recognition of new activities with higher accuracy in recognition. These works have a wide range of applications as it may predict disease related to physical activities, monitor physical activities and elderly care.

Keywords—*Accelerometer sensor; Activity recognition; Gyroscope sensor; Humidity sensor; Sensor; Temperature sensor*

I. Introduction and Related Works

Smartphones are now offering many features and provide sophisticated functionalities. Nowadays, these devices are incorporated with many different sensors such as accelerometer sensor, gyroscope sensor, GPS sensor, vision sensor, temperature sensor, light sensor, etc. Again smartphone can be considered the best and most used communication device. The distinct features offered by the phone attract the people. Because of the availability and cheap cost with distinct communicative features more than 2 billion people are using smartphone worldwide.

Android application can be developed using the various platform such as Android Studio, Eclipse and NetBeans etc. Besides, when developing these android applications, we must consider the latest version of Android OS as well as the oldest versions.

The sensors which are included in the smartphone produce a different type of data on the variation of the movement of the smartphone. And, this kind of movements produced by the smartphone sensors can be used in identifying the physical movement. After identifying the physical movements, reports related to the health issues can be generated and then those reports can be utilised for the diagnosis of human activity associated diseases in a timely basis.

Many researchers[1, 2] determined physical activities using multiple wearable sensors placed on body parts like knee, waist, arms and ankles. They developed a classification model for classifying activities which are sitting, walking and standing. Again wearable sensors like blood volume pulse sensor, galvanic skin response sensor, an electromyogram sensor and respiration sensors were used for the identification of physiological signals but these wearable sensors are quite expensive as well as maintaining those sensors needs regular efforts. Moreover, the wearable sensors should be lightweight and capable of providing high performance[3].

Other than wearable and ambient sensor, some works were done using smartphone sensors. Bayat, et al. [4] and R. Kwapisz, et al. [5] determined six activities using the accelerometer sensor of Smartphone in different works. Recently activity recognition using sensor-based data became a hot research topic for a wide range of applications. Several works have been done related to human activity recognition. In the past, most of the works were conducted using ambient sensors or sensors attached to the body. A system was created using a combination of twenty different sensors to identify activities like walking, standing, lying etc.[6]. Similarly, Maurer, et al. [7] used an e-Watch to recognise six activities: descending, running, sitting, standing, ascending and walking. Moreover, Tapia, et al. [8] conducted research on home-usable sensors only. Later in another research five accelerometers were placed on different locations of 21 gymnasts' bodyTapia, et al. [9].

In the earlier works, researchers used separate sensors attached to the body which may be costly. Recent works

Optimization of PV Energy Generation based on ANFIS

Nesar Uddin[1], Md. Saiful Islam[2,*]
[1]Institute of Energy Technology
[2]Dept. of Electronics and Telecommunication Engineering
Chittagong University of Engineering and Technology, Chittagong, Bangladesh.
[1]nesar15cuet@gmail.com, [2,*]saiful05eee@gmail.com

Abstract— The main point of this paper is to take bring out the maximum power for ever-increasing the efficiency of solar photovoltaic (PV) under unstable weather conditions. It is a method of hybrid small scale solar energy conversion system that use an adaptive neural fuzzy interface system (ANFIS). The conversion of solar energy, mostly depends on the irradiation and temperature. ANFIS is used to extract maximum feasible power under unstable solar irradiance and temperature by generating duty cycle through pulse width modulation (PWM). Duty cycle triggers the gate of DC-DC boost converter. This proposed system has been optimized by using MATLAB/Simulink software. The simulation results of the MPPT controller show that very effective and efficient than other ordinary conventional systems such as without MPPT system.

Keywords— Adaptive neural fuzzy interface system (ANFIS); Maximum power point tracking (MPPT) system; DC to DC Boost converter; Solar energy.

I. INTRODUCTION

Energy plays a vital role for our social life and economy [1]. Because of inanition of fossil fuel reserves, greenhouse effect, environmental degradation and high cost, the consumption of renewable energy sources is increasing day by day for electric power generation [1]. In order to meet up the ever rising energy demand and overcome above problem, it is necessary on the way to the renewable energy sources such as wind, solar, tidal, sea wave, geothermal and hydro energy for maximum potential [2]. Al of them, solar energy is considered more reliable for Bangladesh mainly remote area [2]. This energy source is daily available, and environmentally friendly than other renewable source.

Bangladesh lies in the sunny regions of the world. The majority of the parts of Bangladesh receive 4–7 kWh of solar radiation per square meter per day. About 250–300 sunny day occurs in a year, which can mitigate the total load demand of a family in that's country [3]. On the other hand, solar energy systems usually suffer from their low efficiency. In order to rise above these drawbacks, MPPT techniques is a way to optimize greater efficiency for maximum power of PV panel. MPPT is a real-time control system that applied to the PV power converter in order to bring out the maximum possible power from the PV panel [4]. In this paper MPPT has been designed by artificial intelligence based on ANFIS controller.

Artificial intelligence systems is a process which can take decision like a human brain by adjusting themselves. The situations and making correct decisions take automatically for future similar conditions [5]. An adaptive neural fuzzy inference system (ANFIS) is a type of artificial intelligence system that is based on Takagi–Sugeno fuzzy interface system. It is a combination both neural networks and fuzzy logic ideology [5]. Its inference system corresponds to a fuzzy set of IF-THEN rules based on training data that have learning ability to approximate nonlinear functions [6]. For using a hybrid learning procedure, ANFIS can build an input-output mapping based on both human knowledge and predetermined input-output data pairs which is more efficient and optimal way [6]. In this paper, designing and implementation of ANFIS based MPPT scheme which is interfaced with boost converter in Matlab/Simulink.

II. METHODOLOGY

A. PV model

The system consists of PV module, a DC-DC boost converter, a control unit and load. Mainly, PV module depends on the solar irradiance and temperature as well as atmospheric condition. PV power is transferred to the load through boost converter. Duty cycle to trigger the gate of the MOSFET switch is continuously adjusted to track the maximum power point. ANFIS is used as the control scheme which takes irradiance and temperature as input from change of PV power and voltage ratio. ANFIS gives duty ratio as output for maintaining the on and off time of the MOSFET switch through PWM shown in Fig. 1.
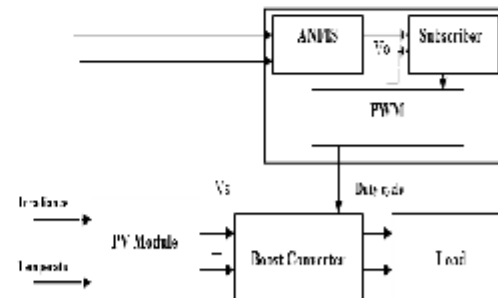

Fig.1 Block diagram of proposed system.

B. PV Model

Solar PV systems use PV modules and arrays which directly convert to electric energy from solar energy through semiconductor material [6]. When semiconductor substances

An IoT based Interactive Speech Recognizable Robot with Distance control using Raspberry Pi

[1]Saad Ahmed Rahat, [2]Ahmed Imteaj and [3]Tanveer Rahman
[1]Department of Computer Science and Engineering, International Islamic University Chittagong, Chittagong, Bangladesh
[2]School of Computing and Information Sciences, Florida International University, Miami, FL 33199, USA
Email: rahatcse37@gmail.com, aimte001@fiu.edu, shakil10vr@hotmail.com

Abstract—It is not convenient to use custom controller for operating a robot car and most easy way to control a robot is definitely with voice. In this paper, we have propounded a voice recognition based system where controlling process will be very much expedient to use. In our speech recognition based Robot car, anyone can easily control the system with his voice command and can also manage the robot to cover a guesstimate distance. For recognizing the voice, we are using Python speech recognition module and the most interesting thing is that the system can be configured with approximately 119 languages without much hazard. It can handle four different basic movement commands and the key feature of this system is that, if the user wants to run the system with a certain distance, the system can recognize that also. The system can detect human existence and the human detection part is handled by the ultrasonic sensor. The robot car will be automatically stopped by sensing obstacle if anything on its way and this obstacle detection process is handled by the ultrasonic sensor. All the system is controlled from a single board computer named Raspberry Pi 3 and the voice speech is recognized using Google speech reorganization engine.

Keywords— Bangla speech recognition; Raspberry Pi; Sensors; Human Robot interaction.

I. INTRODUCTION

Controlling devices with voice is more convenient way to control things and in this paper, we have propounded a robot car controlled by voice which can do movement in any direction along with calculative distance to cover if it is stated by the user during command. If anyone need to control this robot for a custom path, it and say "Go 1 meter back", the robot is intelligent enough to understand the distance to cover.We are using a custom equation where the main distance control is happening. At first, the system need to identify the RPM (rotation per minute) of the motor integrated within the robot car. Then we measured the wheel radius and calculated the circumference of the wheel. We have formulated an equation which is given in the system description part. We used two languages- Bangla and English to demonstrate our system. We are using a passive infrared sensor for the detection of human. The human detection process is also voice automated. Moreover, the system can also interact with the user and can reply in the specific language the user asked that robot. The author in [1] build a framework which can recognize Bangla speech but the system recognize bangle text by comparing with English text library which sometimes can generate wrong information. Another process is stated in [2], where they divide this process is two parts. The first stage is speech processing and the second stage

is pattern recognition. The speech processing stage is based on a number of signal processing stages which are speech endpoint detection, windowing of the speech signal, filtering the speech samples so that there would be no noise left in the speech signal, linear predictive coding of speech, computing the cepstral coefficients from the LPC coefficients and then perform the vector quantization of the signal to obtain the codebook, which is used in the pattern recognition stage. But the process is quite lengthy and takes more processing time to generate speech. We have used Speech Application Program Interface (SAPI), which is an STT (speech to text) library and it is easy to manipulate the text and easy to use in the program.

II. RELATED WORKS

Several research works are already done on voice recognition process as it is very effective to apply in giving command and in this paper, we have proposed a system which can recognize voice in different languages through raspberry pi which is cost efficient and fit for a robot. We have trained that robot so that it can recognize commands, interact with the user and perform actions based on keywords. Some related works which have similiar approach to our proposed system is described and a marginable distinction as well as advantages of our system are showed in this section. The author in in [3] proposed a Tigal Voice recognition where the word capacity is not enriched but in our system there is no limitation of word capacity as we used google voice recognizer which word capacity is almost unlimited.

The author in [4] presented another voice recognition based approach which can only recognize six different languages. Another voice recognition based work is proposed in [5] where the recognition process is handled by the ATmega162 microcontroller. For recognition of voice, they used an ADC (Analog to digital converter) which can only handle the basic operations, like forward, backward, left and right. In our proposed system, all the recognition process is not only occuring in cloud but also can execute wide range of different languages of commands and also can estimate the distance to cover.

A voice record software is used in [6],in which the user creates the vocabulary words. The recorded words should be compressed using quick synthesizer 4 (QS4) from sensory and built. But in our system, vocabulary is stored in cloud with large scale word capacity which can b retrieved in short processing time. Fezari *et al.* [7] proposed a system where the training process is very lengthy and the system can only recognize French Words. In our system, the system is configurable with any language and training process is simple.

Unmanned Multiple Railway Gates Controlling and Bi-directional Train Tracking with Alarming System using Principles of IoT

Afsana Ahmed[1], Kazi Rifah Noor[1], Ahmed Imteaj[2] and Tanveer Rahman[1]
[1]Department of Computer Science and Engineering, [1]International Islamic University Chittagong
[2]School of Computing and Information Sciences, [2]Florida International University, Miami, FL 33199, USA
Email: afsana.ahmed1000@gmail.com, kazi.rifah@gmail.com, aimte001@fiu.edu, shakil10vr@hotmail.com

Abstract—Train is one of the mass transportations that's famous in the whole world. But now-a-days, accidents are still major concern in terms of safety of people. There are numerous railroads crossing which are unmanned because of bolt of labor expected to satisfy the requests. Consequently, numerous mishaps happen at such intersection since there is nobody to deal with the working of the railroad entryway when a prepare approaches the intersection. Up to date, there are several propositions to minimize the quantity of mischances and to diminish the laborwork at railroad entryways. A large portion of the proposition utilized sensors as a pointer gadget to identify the landing of the prepare yet which needs upkeep price, isn't totally an automated technique. In this paper, we have proposed a method which is capable of controlling rail gate for level crossing which is totally automated. Couple of Sensors are connected with Wemos D1 for control autonomus railgate with measuring distance and ThingSpeak server has been used to centrally control. Multiple rail gate will be controlled through this process. This system is cost effective, real time, automatic and it definitely alleviates rail accidents.

Keywords— Control Railgate; Level crossing; Distance measuring; multiple railgate; Sensors; Wemos D1, ThingSpeak.

I. INTRODUCTION

Railroad line is a course of action of two parallel lines of long bits of steel. Rail transport is a strategy for trading of voyagers and items on wheeled vehicles running on rails which is the most usually utilized transportation vehicle. The majority of the general population picks this transportation basically for minimal effort and it gives comfort capacity and it is the most advantageous method of traveller transport both for long separation and rural activity. But unfortunately, still accidents are still a major concern not only in Local but also in the Global, for bringing about loss of valuable life and loss of economy. Presently, numerous railroad mishaps are occurring because of the heedlessness in manual tasks or absence of laborers. So, we encouraged to execute new innovation keeping in mind that the end goal to decrease mischance outline which is robust, efficient and stable. In the recent years, the statistics tell that, 2321 people were crushed under train in 8 years only in Dhaka due to unmanned rail crossing. This situation is not only for Bangladesh but also for all over the world. By seeing these we are motivated to do something to alleviate such kind of accidents. Here, we try to introduce Internet of Things (IoT) which controls unmanned railway gates with measuring distance and sending alert to other vehicles. It automatically closes the railway gate when train

arrives and after train departure, gate will be closed. We use GPS module to find out the location of train and distance between railgate and train. We also use GSM module for sending SMS to any kind of vehicle so that they can get an alert about the position of train. All sensors will be set on legitimate places so that these can work effortlessly. After picking the best places for putting the sensors, the sensors will be actuated. The information gathered by sensors will be sent to Wemos D1 put on different spots. The microcontroller will then process the information. All the microcontrollers will be controlled midway by ThingSpeak server. Then the gate will be control automatically through servo motor.

II. RELATED WORKS

Velayutham et al. [1] developed a system which tracks and detects the arrival of the train by using GPS. The GPS is used for tracking the train and Google Map shows the train tracks. Thusly of prepare following utilizing GPS is implanted with the versatile application [9]. Utilizing this application the motor driver controls the railroad door. In the system, engine driver controls the rail gate and the automatic controlling of railway gates is absent. However, our proposed system is totally automated.

Chandrappa *et al.* [2] developed a system of Automatic Railway Gate Controller, which operates the railway gates without a gatekeeper. Two Infrared obstacle detection sensors used to identify the arrival and departure of trains [11] and a stepper motor used to control the gate. Here, by using only IR sensor it is difficult to get exact location of train, and also IR sensors can't work well at dark. But we use ultrasonic sensor which works both in light-dark and also use GPS module for tracking location and measuring distance.

Dhande *et al.* [3] [5] proposed a faulty track and GSM modem to send geographical coordinates of a location using GPS module to collect geographical coordinates. To discover the area of the faulty track, composed IoT site utilizing Xammp server. Entry IR sensor and Departure IR sensor utilized for detecting the arrival and departure time of train. In this method, there was not a clear description about controlling the rail gate automatically. But our proposed system gives a clear description about controlling rail gate automatically and also measuring the distance between rail gate and train.

The author in [4] designed a configuration that can avoid the accidents that can be caused from the damaged tracks. With the higher recurrence of trains running on tracks, the chances

Effect of dispersion time on the removal of Escherichia coli using multiwall carbon nanotube

M. S. H. Choudhury
Electrical and Electronic Engineering
International Islamic University
Chittagong
Chittagong, Bangladesh
shaminul129@gmail.com

M. Mamnur Rashid
Aquaculture
Bangladesh Agricultural University
Mymensingh, Bangladesh
mamun_aqua@yahoo.com

T. Soga
Electrical and Mechanical Engineering
Nagoya Institute of Technolgoy
Nagoya, Japna
soga.tetsuo@gmail.com

S. M. Mominuzzaman
Electrical and Electronic Engineering
Bangladesh University of Engineering
and Technology
Dhaka, Bangladesh
mominuzzaman@yahoo.com

Abstract—*Escherichia coli* (*E. coli*) is one of the pathogenic bacterium which is gram-negative, facultative anaerobic causes several water borne diseases. In this work, Multiwall Carbon nanotube (MWCNT) of varying amount was dispersed in *E. coli* contaminated water. The rate of inactivation of *E. coli* cells was varied while the dispersion time and amount of materials were changed. Maximum percentage removal of *E. coli* was found about 37.42% using 2 g/l of MWCNT the contaminated water. While dispersing the same solution for 15 min using a vortex mixture, the percentage removal of *E. coli* was increased to 61.13% and for dispersing 30 min the percentage removal of *E. coli* was increased to 68.74%. Maximum percentage removal was found about 92.56% using 15 g/l MWCNT which was dispersed for 30 min. The result reveals that MWCNT can ensure safe water for human consumption.

Keywords—*multiwall carbon nanotube, Escherichia coli, dispersion*

I. INTRODUCTION (*HEADING 1*)

Insufficient access of clean water and sanitation is one fof the major ubiquitous problems that suffer people in many parts of the world. Problems related to getting usable water for drinking and sanitation is getting worse in many countries in the world, even in regions those are considered water-rich. Concerning these issue demands for huge investigations for identifying vigorous new methods of refining water at lower cost. At the same time, it is also required to minimize the use of harmful chemicals that might impact on human health as well as on the environment. Many investigations and advancements have been noticed on these issues using various nanoparticles and which is known as nano filtration. One of the major advantages of various nanocarbons like bucky ball (C_{60} or fullerene), Carbon nanotubes (CNTs) are the properties of the materials are tunable and thus it enables prospective technologies for resolving many problems and addressing many environmental challenges. Carbon nanotubes discovered by Iijima, S., 1991 [1] are gaining more and more interest day by day as promising components which is related to the applications of future nanoelectronic and nanomechanical systems [2]. The tubes' several exciting, exceptional, and specific properties related to electronic [3]

and mechanical [4]- [7] have been observed by the researchers and these properties are very sensitive functions of their wrapping indices (n, m). As a new and promising member of the carbon family fullerene and other CNTs have demonstrated greater potentials compared to the other nano metals in numerous applications including electronics, organic-inorganic photovoltaics, composite materials, fuel cells, sensors, optical devices, and biomedicine [8]. There uses in various environmental applications [9] however are still inadequate with few applications proposed or investigated so far. Innovations in the development of many exciting inventions and the various technologies to purify waste and contaminated water are the most pervasive and promising. The effective use of nanoparticles with proper planning is very essential for the treatment of industrial waste-water as many of the factories generate large amounts of waste-water nowadays. Most of the remediation technologies available today, while some of the systems are effective, very often those are heavy costly and time-consuming, particularly pump-and-treat method. Rapid and efficient removal of toxic compounds from sub-surface and other environments are very difficult. Moreover, to obtain such things efficiently, in a shorter time, and at a low budget often becomes very difficult.

Carbon nanotubes are a class of ominously and extensively used engineering adsorbent that can adsorb many contaminant particles. In particular, their large specific surface areas including considerable chemical and thermal stabilities are the potentials that can make them attractive adsorbent in the waste water treatment. In Bangladesh, Arsenic and fecal bacterium *Escherichia coli* (*E. coli*) having typical length of 2000 to 5000 nm and width of 400 to 600 nm are considered as very common water pollutants are responsible for many water borne diseases. There are many water purification technologies which suffer from a number of disadvantages. Those main drawbacks are high cost for water treatment, high required pressure in the treatment system, high electricity demand, and sometimes the used materials are not hygienic. The various nanometals that are used to adsorb and purify many water contaminants are also not so hygienic. However, CNTs are nontoxic and environmental friendly materials compared to the other

Automatic Accident Detection and Human Rescue System: Assistance through Communication Technologies

Frahim Wadud Taj Department of Electrical and Electronics Engineering International Islamic University Chittagong, Bangladesh frahimwadud@gmail.com	Abdul Kadar Muhammad Masum Department of Computer Science and Engineering International Islamic University Chittagong, Bangladesh akmmasum@yahoo.com	S M Taslim Reza Department of Electrical and Electronics Engineering International Islamic University Chittagong, Bangladesh smtaslimreza@gmail.com

Md. Kalim Amzad Chy Department of Computer Science and Engineering International Islamic University Chittagong, Bangladesh kalim.amzad.chy@gmail.com	Iftekhar Mahbub Department of Electrical and Electronics Engineering International Islamic University Chittagong, Bangladesh Iftekhart13373@gmail.com

Abstract—With the rapid growth of population vehicles have become an absolute necessity of our daily life. Increasing vehicles causes lots of accidents and loss of life due to late information reaching to the rescue team and arrival of an ambulance. This paper presents an Automatic Accident Detection and Human Rescue System (AADHRS) that will detect accidents and save the victims' life by informing the rescue team. Vibration sensor, Global System for Mobile (GSM) and Global Positioning System (GPS) are used in this system. After taking places of an accident, the system delivers a short message to a nearby rescue team and police station via GSM module. The message includes the longitude and latitude values of the location. A rescue team can instantly trace the location of the vehicle tapping geographical coordinates in Google earth or any other GPS viewer application to help wounded people. Most of the previous system comprised of multiple sensors for detecting accident which increased the cost of the project. But, the proposed model includes only one vibration sensor; thus it reduces the cost of multiple sensor and the complexity of interfacing. So, it will be affordable for vehicle owners of Bangladesh.

Keywords— accident detection system; human rescue system; Global Positioning System (GPS); Global System for Mobile (GSM)

I. INTRODUCTION

The advancement of the vehicles is the decisive factor for the larger amount of increasing population. Consequently it becomes a disaster through road accidents. World Health Organization (WHO) states that, more than 1,200,000 people die worldwide in road crashes and about 50,000,000 are disabled each year [1]. In 2017, 4,284 people were killed, and 9,112 were disabled in 3,472 road crashes across Bangladesh [2]. Statistics show that 15.82% accidents increased and 25.56% death in 2017 compared with the previous year [2]. Every day nearly 64 people die because of these fatal road accidents [3]. In spite of taking some necessary steps, it is increasing in alarming rate. Unfortunately, the arrival of an ambulance to the accident spot is delayed because the rescue team is not informed in time. Moreover, sometimes, they are reported but cannot trace the exact location. Consequently, it causes the loss of life as the information doesn't reach to the rescue team immediately. Virtanent et al. shows that 4.6% of the fatality of the road accidents could be avoided if the immediate steps could be taken at the place of a road accident in time [4].

As such, to track the accident automatically and inform the nearest hospital, a smart accident detection and human rescue system with an automatic notification are crying need to save the valuable lives. The main thrust of this paper is to propose an efficient Automatic Accident Detection and human Rescue System (AADHRS) that detects the accident more precisely. The AADHRS ensures the medical facilities to the accident victim as early as possible like an ambulance reaching at the accident location in time without any delay. This process will save time mainly for the areas situated in a remote place that is outer part of central city.

The prime objective of this paper is to develop an automatic accident detection and human rescue system. To the best of our knowledge, such kind of system is not available in Bangladesh yet. Moreover, the implementation cost of this system in the vehicles is very low (approximately BDT 5000-6000). So, the system would be useful and affordable for vehicle owners of developing countries such as Bangladesh.

The rest of this paper is structured as follows. Section II deliberates the related work. Part III includes methodology where circuit operation, accident identification process is described. In result and discussion section normal condition, initial condition and accident condition are observed. Finally, section IV concludes the paper.

II. RELATED WORK

Nowadays, in numerous applications, smartphones are used as moving traffic probes and sensors [5-7], investigating the road environment, accident detection and traffic congestion. These are the great features of an Intelligent Transport System (ITS) that looks for reducing traffic congestion and improving the traffic safety [8].

Whitney and Pisano [9] proposed an automatic accident detection method. But there was a chance of wrong alarming and also couldn't give any assurance of accident occurrence.

Emotion Detection from Text
Using Skip-thought Vectors

Maruf Hassan*, Md. Sakib Bin Alam, Tanveer Ahsan

Department of Computer Science and Engineering, International Islamic University Chittagong, Bangladesh

*marufxhassan@gmail.com, sakibsba@gmail.com, tanveer.ahsan@gmail.com

Abstract—Emotion detection from natural language has become a popular task because of the primary role of emotions in human-machine interaction. It has a wide variety of applications ranging from developing emotional chatbots to better understanding people and their lives. The problem of finding emotion from text has been handled by using lexical approaches and machine learning techniques. In recent years neural network models have become increasingly popular for text classification. Especially, the emergence of word embeddings within deep learning architectures has recently drawn a high level of attention amongst researchers. In this research, we apply a recently proposed deep learning model named skip-thought, an approach to learning fixed length representations of sentences, to face the problem of emotion detection from text. We propose a new framework that takes advantage of the pre-trained model and pre-trained word vectors. We found that skip-thought vectors are well suited for emotion detection task. The results of the performance evaluation are encouraging and comparable to related research.

Keywords— emotion detection; machine learning; deep learning; recurrent neural network; word embedding; sentence embedding;

I. INTRODUCTION

Emotion is an essential component of human behavior, a complex experience of consciousness that reflects the personal criticalness of a thing, an occasion, or a situation. Emotion detection is the process of recognizing a person's emotional state, e.g. as stated in Ekman's basic emotions; specifically, anger, disgust, fear, happiness, sadness, and surprise [1]. Accurately detecting emotion from natural language has application of developing emotional chatbots which extent to better understanding persons and their behavior, developing intelligent personal assistants to detecting the emotions of social media users to understand their psychological and physical health.

Computer system has not yet utilized emotion detection properly to facilitate humans in performing their assignments. Linguistic knowledge still becomes the focus on the continued efforts in emotion analysis. Language is inherently ambiguous and complex by nature. It is the most important challenges researcher encounter in emotion analysis. Also, presently there aren't any established classifications of "all human emotions" because of the complicated characteristcs of human minds.

Deep Learning architectures and algorithms have made outstanding advancements in the field of Natural Language Processing (NLP) in recent years. The idea of the usage of vector representation of words has been there around for a few times. But the interest in word embedding has been hovering in the recent years. Word embedding is a technique that produces vectors and maps them into corresponding words. Tomas Mikolov's word2vec [2] model which is trained on a large collection of corpora produce high-dimensional (50 - 300 dimensional) vector representation corresponding to words that can capture the syntactic and semantic knowledge. This representation seems to capture much linguistic information. In word2vec model, they showed fixed length representations of individual words. However, fixed length representation of sentences was an issue there.

Skip-thought vectors or simply skip-thought [3] is a name given to a simple neural networks model for learning fixed length vector representations of sentences. It was inspired by the skip-gram structure used in word2vec model, abstract the skip-gram model to the sentence level. Fixed length vector representation of sentences makes it easy to replace any sentence with equivalent vectors of numbers. This makes the process of understanding and responding to natural language mathematically straightforward.

To get good performance in these techniques, availability of large-scale data is needed to train. But, in our placing, we have only small datasets. Deep learning model is incapable of giving good result on small datasets. That's why we make the decision to take a pre-trained model. We propose a framework that utilizes the pre-trained model for finding a sentence level feature representation using the word vectors and evaluate how it performs well for emotion detection task.

The rest of this paper is structured as follows. Section II discusses related work. Section III provides a brief introduction to the skip-thought model that we used for our proposed framework. Section IV introduces our proposed approach to emotion detection. Section V carries the two data sets. We report on the experiments and results in Section VI and conclude the paper in Section VII.

II. RELATED WORK

Emotion detection is closely connected to sentiment analysis, they are often used interchangeably. By proposing the role of emotions in human-computer interaction, the concept of affective computing was introduced by Picard [4].

Human Activity Recognition using Mixture of Gaussians and Pair-wise Oriented Local Binary Pattern

Md. Shofiuddin
Dept. of Computer Science & Engineering (CSE)
International Islamic University Chittagong (IIUC)
Rajshahi, Bangladesh
shafi.2013@gmail.com

Md. Saiful Islam
Dept. of Computer Science & Engineering (CSE)
International Islamic University Chittagong (IIUC)
Chittagong, Bangladesh
saiful.iiuc36@yahoo.com

Md. Nizamuddin
Dept. of Electrical & Electronic Engineering (EEE)
Rajshahi University of Engineering & Technology (RUET)
Rajshahi, Bangladesh
nizamrobin@gmail.com

Tanveer Ahsan
Dept. of Computer Science & Engineering (CSE)
International Islamic University Chittagong (IIUC)
Chittagong, Bangladesh
tanveer.ahsan@gmail.com

Abstract—Tracking and recognizing human activities from video is a very challenging task in the field of Computer Vision. In this paper, we aim to recognize human activities by coping with the existing challenges. At first, the background and the foreground of images in videos are detected using the mixture of Gaussian distributions and the binary silhouette images are obtained. We propose a feature descriptor named Pair-wise Oriented Local Binary Pattern (POLBP) and an improved version of DLBP feature descriptor for images. POLBP is capable of encoding more information than intensity differences of LBP by incorporating orientation information with the intensity difference. This Pair-wise Oriented Local Binary Pattern (POLBP) extracts local orientation information from binary silhouette images. These feature vectors are sent to Support Vector Machine (SVM) classifier for classification. The proposed method has been used in the area of Human Activity Recognition (HAR) and the result of recognition rate is very encouraging.

Keywords—HAR; GMM; DLBP; POLBP

I. INTRODUCTION

Recognizing human activity is considered one of the key prerequisites for many computer vision applications, such as video surveillance, human-computer interaction, video indexing, recognition of gestures, and analysis of sports events. But recognizing human activities from video is still a challenging task because of background clutter, camera motion, partial occlusions, changes in scale, view-point, appearance, shadows, illumination variations, activities connected with other objects, complex activities and multi-pose activities etc. Overcoming all the challenges, we need a robust image representation approach for human activity recognition.

The image representation approaches [1] in vision-based activity recognition follow a research trajectory of global representations, local representations, and recent depth-based representations. The space-time shape approach in [2] is a global representation of human activity. Space-time shape is obtained by only stacking the silhouette regions within images. STIPs, HOG3D are some local representations of Human activity. The space-time interest points (STIPs), proposed in [3], focuses on the informative interest points. A. Klaser, M. Marszalek, and C. Schmid [4] generalized the HOG descriptor to video sequences and extended to HOG3D. With the launch of RGBD cameras, depth-based representations have been a new research topic. L. Xia and J. K. Aggarwal [5] recently presented a categorization of human activity recognition methods from 3D stereo and motion capture systems with the main focus on methods that exploit 3D depth data.

In this paper, we propose a local feature descriptor named POLBP and an improved version of DLBP [6] feature descriptor. POLBP has proved itself as a distinctive variation of Local Binary Pattern (LBP). It is an orientation dominant feature descriptor. The extracted features are used by multiclass one-vs.-one SVM classifier for training as well as for recognition. We use one-vs.-one linear SVM of LIB-SVM [7].

II. PROPOSED METHOD

Our proposed method has been demonstrated in Fig.1. At first, the foreground is detected. Using the Improved-DLBP and POLBP, features are extracted from the foreground images. Finally, feature vectors are passed to SVM for classification.

A. RGB To Grayscale Image

The frames are either in RGB or in Grayscale. If the frames are in RGB, then it is converted into Grayscale by forming the weighted sum of the Red (R), Green (G) and Blue (B) components. To do that, we use the standard NTSC (National Television System Committee) conversion formula in order to compute the effective luminance or intensity of a pixel.

B. Foreground Detection

Foreground moving object in video frames are detected using Mixture of Gaussian distributions [8] [9]. It compares a Grayscale video frame to a background model to determine whether individual pixels are part of the background or foreground. It then computes a foreground mask. We detect foreground objects in images taken from a stationary camera. Each pixel of a frame is modeled by a number of Gaussian modes. We set this value to 5 to be able

An Intelligent System for Conversion of Bangla Sign Language into Speech

Shuvashis Sarker

Department of Computer Science & Engineering
Chittagong University of Engineering & Technology
Chittagong, Bangladesh
e-mail: shuvashish108@gmail.com

Mohammed Moshiul Hoque

Department of Computer Science & Engineering,
Chittagong University of Engineering & Technology
Chittagong, Bangladesh.
email: moshiulh@yahoo.com

Abstract—Bangla sign language conversion into speech is a key to help vocally impaired people to express their feelings easily. In this wok, we develop a pair of smart gloves with sensors and microcontroller that can convert Bangla sign language into Bangla speech. Flex sensors are used to measure the bending of fingers, accelerometer and gyroscope sensor are used to measure hand position and movements. Filter these data and send it to PC over Bluetooth. The system manipulate the value string and dynamically match it with database to find out the corresponding word's sound track which is play on speakers. On-board experiments demonstrate the effectiveness of the approach. The proposed system is evaluated with 8 people with 248 samples of 72 words. Experimental results show that the system is functioning well and can detect the sign language with 99.5% accuracy. The user can change the pronunciation of words with the variations of tense and pronoun in Bangla sentences.

Keywords—Human computer interaction; sign language; vocally impaired; smart gloves; adriano

I. INTRODUCTION

Sign language is a protocol of communication using visual gestures and signs. It is varying with different geographical regions and languages. Bangladesh also has her own sign language which known as Bangla sign language (BSL). Vocally impaired cannot express their feelings as normal people does due to their vocal impairments. Instead of vocal speech they are used sign language for any expression. The number of vocally impaired or speech impaired in the world are roughly calculated to be from 70 to 90 million. In Bangladesh the number of people who is sign language is 2.4 million [12] and this number is increasing day by day. Because vocally impaired people in Bangladesh teats less important than other country. In this work, we developed a system that can convert the Bangla sign language into speech which may be useful for establishing better communication with other people. For this purpose, we make a pair of smart gloves with different kind of sensor like flex, accelerometer and gyroscope sensor, that able to sense the level of bending of fingers, hand movement and hand position. Then it sends the sense data to computer. The system will manipulate the data and play the corresponding words sound track. So we can introduce it as voice of vocally impaired people.

It is difficult to communicate with normal people using sign language because normal people don't know the meaning of sign language. There are lots of scope of utilize this work. Such as, for being vocally impaired, they can't live normal life, they can't do normal jobs. With is device they can easily communicate we others. They will able to do all those things that a normal people do. Beside that issue,

they will never think themselves less powerful than normal people. The barrier between normal people with vocally impaired people can be reducing by this device.

II. RELATED WORK

There are lots of research activities have been conducted on designing smart system that can converted sign language into speech in English or European sign languages. However, very few attempts are made for Bangla sign language to speech conversion.

A. English language based sign language detection

Chai et al. [3] proposed a system that recognizes sign language and translation with Kinect sensor. Kinect is able to provide depth and color data simultaneously, based on which the hand and body action can be tracked more accurate and easier. Therefore, 3D motion trajectory of each sign language vocabulary is aligned and matched between probe and gallery to get the recognized result. Limitation of this system they cannot detect every fingers. Patil et al. [4] proposed system to detect American Sign Language. They design a system in which sensor glove is used to capture the signs of the American Sign Language (ASL) and translate them to English displayed on a LCD. Limitation of this work is they only detect alphabet not any word or sentence and tense.

Azodi et al. [2], who are studying business administration and astronautics engineering, University of Washington, invented "SignAloud", is a pair of gloves that can recognize hand gestures that correspond to words and phrases in American Sign Language in 2016. Each glove contains sensors that record hand position and movement and send data wirelessly via Bluetooth to a central computer. The computer looks at the gesture data through various sequential statistical regressions, similar to a neural net. If the data match a gesture, then the associated word or phrase is spoken through a speaker. Limitation of this device cannot define tense. Acosta et al. [5] proposed system on American Sign Language alphabet recognition using a neuromorphic sensor and an artificial neural net. They performed with 720 samples of 24 signs; a recognition accuracy of 79.58% was obtained. Limitation of this work is they only detect alphabet not any word or sentence and tense.

B. Bangla language based sign language detection

Akhand et al. [6] proposed a system on Bangladeshi sign language recognition using fingertip position. The method considered relative tip positions of five fingers in two-dimension space and position vectors are used to train artificial neural net (ANN) for recognition purpose. They

Comparative Analysis of Stairways Detection Based on RGB and RGB-D Image

Md. Khaliluzzaman*, Mohammad Yakub and Niloy Chakraborty

Dept. of Computer Science and Engineering

International Islamic University Chittagong (IIUC)

Chittagong – 4318, Bangladesh

E-mail: *khalilcse021@gmail.com, mdyakub3028@gmail.com, niloycse36@gmail.com

Abstract— Stairways detection from RGB and RGB-D stair image is the challenging work in the computer vision research area. The detection system provides topnotch solution with greater portability in assisting visually impaired people and guiding the autonomous navigation system at the smart environments in the real world. In this paper, a framework is introduced to compare the stairways detection performance based on the RGB and RGB-D image. Here, the stairways candidate region is detected through the geometrical feature of a stair, i.e., stair steps are appeared in the concurrent sorted order. This feature is extracted from the concurrent parallel horizontal edges. The concurrent parallel horizontal edges are extracted from the canny edge image. For that, an edge linking and non-candidate edge elimination procedure is utilized in this work. Those are the key contributions of this paper. The stairway region of interest (ROI) is detected by aforementioned unique geometric feature of a stair and recognized the up, down, and negative stair by the support vector machine (SVM). For that, LBP and One-dimensional depth features are extracted from the RGB and RGB-D image respectively and sent to the SVM for classify. The stair images captured under different lighting conditions have been used to test the proposed framework to evaluate the resultant accuracy of the system.

Keywords — Computer vision; RGB-D image; RGB image; geometrical feature of stair; SVM; depth feature; uniform LBP

I. INTRODUCTION

In the current decade, accurate object detection and recognition is the key issue in the field of computer vision and human computer interaction. Object detection from image is the key part for visually impaired people to navigate safely in the indoor and outdoor unknown environments. Stairway detection is one of such demanding tasks in aiding visually impaired people in smart environments to travel independently without compromising safety. Detecting the stair region from unknown environments can be tricky due to background noise, insufficient lighting, different shapes, view angles, and so on. In addition, implementation of real time systems requires faster detection method to cope in the real world.

In the last few decades, researchers have been working extensively to ease out the process of detecting stairway in different environments. There are various methodologies that are already proposed regarding stairway detection and recognition. For examples, RGB-D image based stairway detection framework is proposed in [1] and [8] with Hough Transformation. In [1], the Hough transformation and line fitting with geometric constrains are applied to extract the concurrent parallel lines from RGB images, and then the one-dimensional depth feature is used to recognize pedestrian crosswalks and stairs followed by further detection of upstairs and downstairs. Finally, distance between the camera and

stairs is calculated for visually impaired people. Where, in [8], concurrent parallel stair step's lines are estimated by Hough Transformation and geometrical constrains. Depth features are extracted from the depth channel and fed into SVM to recognize the up and down stairs. However, the proposed algorithm is failed in dark environment as it uses RGB-D image to detect the candidate staircase.

A framework has been proposed in [3], where both RGB and depth images were taken as a input. Here, authors utilized a threshold to select the specific input image. If the threshold is satisfied, then the depth image is used otherwise RGB image is used. This procedure is used to mitigate the shortcomings of RGB-D sensor in sunlight conditions and reflective environments. This framework doesn't work efficiently as it does not recognize the lower stair steps. This method also provides less accuracy in detecting the stairs using RGB images. The proposed system in [4][5] uses depth data that are achieved by capturing images with Microsoft Kinect. The technique presented in [5] uses three consecutive frames that are extracted from depth information of the front scene. Then, the distance along with line profile graph is generated from the four predefined lines of each depth frame and this profile graph is used to detect any moving object with its direction of the movement. The accuracy is still below 90% which might prove to be fatal in a blind person's travelling. In [2] and [7], authors proposed two main ideas to detect the stair candidate region. One of the main ideas is three connected point. Another idea is horizontal edges are arranged in increasing order. Finally, stair candidate region is confirmed by vertical vanishing point. In [7], distance from camera to stair candidate region is estimated through the triangular similarity.

Geometrical cues based ascending stairs detection method is introduced in [9]. Here, depth image is used to extract the stair edge points in 3D. Then a stair modeler has been modeled to aggregate the depth feature points into a single point cloud. From this single cloud point the dimension and location of a stair is estimated. However, in this method stair step's width is not measured perfectly all the time and only upstairs is considered. In [12], an assistive system is proposed to detect the upward stairs from depth data. By utilizing the diagonal orientation of the depth image edge, the up-stair region is estimated. However, the system is not suitable for dynamic environments as the recognition scheme is not faster. Also, the system does not work for the downward stairs.

In this paper, a framework is introduced to compare the stairways detection performance based on the RGB and RGB-D image. Here, geometrical feature of a stair is used to detect