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From the Editor's Desk

We have the privilege to introduce the fourth issue of the Amity Journal of Engineering and Technology (**AJET**), a peer-reviewed multidisciplinary scientific journal that focuses on emerging trends in various domains of engineering and technology. AJET aims to provide a platform to researchers to share their ideas and emerging trends, across varied themes related to the disciplines of engineering, technology, and allied areas.

The current issue of the journal is a compilation of six papers, wherein authors have discussed ideas ranging from contemporary architectures like the early Islamic architectural tradition of Arabian world. This particular issue also includes a study that focuses on sustainable mud houses in Dinajpur (Bangladesh) which could be very useful for developing nations for cost effective housing. There are three papers with applications of information and communication technology, with one presenting a good survey of implementation techniques for systems based on Internet-of-things (IoT).

We would like to extend our sincere gratitude to the authors of the papers, from different countries, without whose dedication to research, this journal would not have been possible. We would also like to thank the reviewers for their valuable comments to the authors and the editorial committee, for extending support in bringing out this journal in its present form. All published issues of AJET bear testimony to the zeal and commitment of the founding editors of the journal in providing a common forum to researchers to share their ideas and build upon them, adding to the process of knowledge creation.

We hope that academics, researchers, and industry experts will find AJET useful, as they set out to explore the fascinating world of advanced engineering, emerging technologies, and inspiring architectures. We will continue to publish interesting articles with more focus on applications of engineering, science & technology, and architecture.

Prof. Dr. Piyush Maheshwari
Editor in Chief

Vol. 2, No. 2

- 1 Modeling the Use of Energy Harvesting in Wireless Communication Networks**
Osifeko M.O, Sanusi O.I, Abolade O.R, Oyetola O.K, Olaniyi K.A
 Department of Computer and Electrical Engineering,
 Olabisi Onabanjo University, Nigeria.....7
- 2 A Secure Students' Attendance Monitoring System**
O.K. Oyetola, A.A. Okubanjo , O.O Olaluwoye
 Computer and Electrical & Electronics Engineering Department,
 Olabisi Onabanjo University, Ago Iwoye, Nigeria14
- 3 Effect of Principal Component analysis in Block Dependency Feature based Uncalibrated Steganalysis**
Deepa D.Shankar, Vinod Kumar Shukla*
 *Research Scholar, Banasthali Vidyapeeth, Rajasthan,India
 Amity University Dubai Campus, Dubai, U.A.E.....25
- 4 Learning from the past: The early Islamic architectural tradition of Arabian world, A Case study over Qusayr Amra's construction technique and structural system**
Sayed Ahmed
 Student, Masters of Monumental Heritages (MA)
 Anhalt University of Applied Sciences, Dessau, Germany30
- 5 An Internet-of-Things (IOT) Based System Development and Implementation: A Survey**
Anu Priya George
 Research Scholar,
 Noorul Islam Centre For Higher Education, Tamil Nadu, India.....45
- 6 In search of resilience: Exploring mud houses in Dinajpur, Bangladesh**
Fatiha Polin, Shahin Sultana***
 *Research Associate, Bengal Institute, Dhaka, Bangladesh
 **Junior Architect, Inspace Atelier, Dhaka, Bangladesh.....53

Modeling the Use of Energy Harvesting in Wireless Communication Networks

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Abstract- Energy harvesting describes a technique that captures small amounts of energy from the environment with the aim of using it as an alternative to batteries, to power small, low-power electronic devices. The use of energy harvesting in communication networks has been a major area of focus for energy and communication network researchers over the last decade due to the benefits that energy harvesting brings to the domain of study. However, the scarcity of network simulators that support energy harvesting has hindered research effort in this area. In this paper, the NS3 simulator is used to model the use of energy harvesting in a wireless sensor network. The energy profile of the developed model is then compared with its equivalent analytical model. The comparison reveals that the result of the developed NS3 model agrees with the analytical model making it a valid tool for energy harvesting simulation.

Keywords: *Energy Harvesting modeling, Energy harvesting analysis, NS3 Energy Framework, WSN modelling*

1.0 Introduction

Energy harvesting describes a technique that captures small amounts of energy from the environment [1][14]. The captured energy is then used as an alternative to batteries, to power small, low-power electronic devices. At the current level of technological advancements, these devices are usually self-powered or battery-powered Micro/Nanosystems (MNS) [2] [9] [12]. The peculiarities of these systems make them an ideal candidate for utilizing the potentials and benefits of energy harvesting.

Sensor nodes are usually situated in remote locations and are very large in quantity. Thus, maintenance activities like battery replacement, software update or reconfiguration are usually not feasible [3] [10] [13]. Several techniques have been proposed and utilized to manage these seeming challenges in sensor nodes deployment. One of such techniques is the use of Energy Harvesting as a replacement for batteries. However, the scarcity of network simulators that support energy harvesting has hindered researchers from conducting a thorough investigation in this area. The authors in [4] proposed an event-driven QPN (Queuing Petri Net)-based modeling technique to simulate the energy behavior of nodes. Results from the work show that the method can be used for WSN selection and protocol, network topology deployment and system life-time evaluation.

Seyedi & Sikdar presented a Markov-based unified model that combines energy model and traffic model for energy harvesting [5]. In the work, the Loss Probability due to Energy Run-out (LPERO) and the Average Time-to-Energy Run-out (ATERO) analysis was provided. The results from the work revealed the performance of the energy harvesting nodes with their design requirement. In [8], a WSN was modeled and tested using MATLAB. For the model, a capacitor was used as a buffer. It was also used as a source for the sensor node. The authors found that only part of the stored energy is available for applications, since the voltage drop and the time constant over the internal resistance means that some of the charge stored cannot be accessed. In [6], SIVEH (Simulator I-V for EH) was used to simulate a scenario that describes a capacitive energy storage with solar energy-harvesting that was applied to WSN nodes. An algorithm to reach the energy-neutral operation (ENO) was also considered.

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A Secure Students' Attendance Monitoring System

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Abstract- Security of data is essential in authentication systems such as attendance monitoring system. A Students' attendance monitoring is an integral part of Academic Information System (AIS) in most educational institution. Research has shown that biometric systems developed for authentication application stored template in unprotected format which are vulnerable and susceptible to security treats. This paper aims to develop a secured fingerprint based biometric cryptosystem for attendance monitoring. A total of 500 fingerprints were captured, out of which 300 fingerprints were used for training while 200 fingerprints were used for testing. Minutiae based algorithm was used to extract and select biometric features. Biometric features were encrypted using Advanced Encryption Standard Algorithm (AES). The system was developed and implemented using Java programming language to operate at varying threshold value. The developed system's performance was evaluated using False Reject Rate (FRR) and False Accept Rate (FAR) as performance metrics. The results for FRR were 0, 0, 1, and 2 % at 200, 300, 400 and 500 threshold value respectively while results for FAR were 2, 2, 0, 0 % at 200, 300, 400 and 500 threshold value respectively.

Keywords: *Biometric, Attendance monitoring, Authentication, Template, Encryption*

1.0 Introduction

Technological innovation, in recent time had reshaped the process of information management globally. The importance of a reliable and efficient IT infrastructures for the success of an enterprise hardly needs any explanation. As schools, colleges, and universities increasingly rely on these infrastructure to service staffs, students, parents and the general public, computer system is no longer a peripheral to the management of a university. At the core of these systems is an Academic Information Management System (AIS), managing all academic processes and operations in educational institution. AIS is expected to be stringent in terms of security in order to eliminate unauthorized access to information, impersonation, and data theft. A generic AIS is made-up several sub-systems interoperating for effective and reliable performance .

Students' Attendance Monitoring System (SAMS), a sub-system of AIS has received tremendous attention lately, this is attributed to notable achievement recorded in the field of biometrics for the design of authentication system[1]. Unlike other methods such as bar codes, magnetic stripes, radio frequency identification (RFID), biometric uses unique psychological or behavioural traits of individuals to authenticate. Consequently, traits such as fingerprints, face image, iris, and signature had been widely accepted for information system security and authentication which had provoked hackers with interest in discovering methods of attacking biometric systems. A possible leakage of these biometric templates can lead to serious security and privacy threats[2]. Therefore, a deliberate measure has to be put in place to secure templates generated for SAMS.

In this paper we proposed an approach of securing biometric templates. A biometric cryptosystem was developed for monitoring students' attendance using fingerprint trait for verification. Students' information were encrypted using Advanced Encryption Standard (AES) using secret keys generated from templates.

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Effect of Principal Component analysis in Block Dependency Feature based Uncalibrated Steganalysis

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Abstract - Steganalysis is a method of detecting hidden information sent through a medium over the internet. The medium can be text, audio, images or video. The steganalytic method is of two types- target and blind. In this paper we utilize the blind steganalysis, and extract the statistical changes that occur when an image is embedded. The statistical values are known as features. During extraction of features, the irrelevant ones are also extracted, which may hamper the efficiency of the analysis. This paper checks the efficiency rate of steganalysis by eliminating irrelevant data. Principal component analysis is used for feature reduction. Discrete Cosine Transform is used. The features used here are a combination of first order, second order and Markovian features. The features which includes the inter block dependency features as well as the intra block features are reduced.

Keywords: *Steganalysis, Blind, Targeted, Feature reduction, Principal Component Analysis*

1.0 Introduction

Steganography is the technique of covert communication. A message is hidden in a medium [8] and sent over a public channel. No person other than the sender and receiver are aware of the presence of the hidden data. Steganalysis is the method of finding the presence of hidden message in a medium. The method is successful if the detection of the presence of the hidden image is with a probability greater than just random guessing. Steganalysis can be of two types- Target and Blind [6]. Targeted Steganalysis is designed for a particular algorithm. This steganalysis is robust because it gives a good detection accuracy when used against that particular algorithm. Blind steganalysis does not depend on any particular algorithm. Thus it removes the dependency of the targeted steganalysis, which is tagged to a specific algorithm. Thus the steganalytic method can work well with an array of steganographic algorithms [10].

Blind steganalysis can work with the statistics of an image. It is called statistical steganalysis. The statistics are called features. Certain features that change during an embedding, but do not have an effect on the image, are selected and extracted [12]. This is done in a transform domain. Discrete Cosine Transform is used in this paper. Features are extracted from a suspected image. When this is done, irrelevant features will also be present, which may decrease the efficiency of the analysis. Hence, Principal Component Analysis is used to check whether there is a substantial change in the efficiency if the dimensionality is reduced. The classification of the image as the one with embedding or not is decided with the help of support vector machine.

2.0 Implementation

The system architecture of the steganalytical scheme is given in the next page. The raw image is transformed using Discrete Cosine Transform. The features needed for the analysis are selected and extracted. The extracted features are then classified by running them through a classifier. Support vector machine can be used as a classifier here.

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Learning From the Past: Qusair Amra: A Structural Analysis of Ancient Stone Wall Construction

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Abstract - This study is a deliberation through a construction and structural analysis of a simple case study, but very persuasive world heritage monument, Qusayr Amra. For a better integrated study approach, the monument within its structural setting is necessary to enhance its preservation considerations in the future. The overhaul of Qusayr Amra could be a curious subject of vigilant investigations for the stability issues of other architectural trends of ancient Arab world. Some interpretation of the known resources conducted by previous researches in the focus; used for the literature review including future tourism planning, management and sustainable visitor usage, the economic, social and cultural growth of the Badiya region of Jordan. Such archaeology's structural documentation may allow us a better but assumed structural context. Knowing the composition of used materials and sustaining loads in such ancient stone walled structural system may endure great importance for conservation approaches. An understanding of the ancient technology is also necessary when the burning question of restoration comes into reality. This study emphasized on a possible technological revision of Qusayr Amra's built structure in a hypothetical way. Conclusions and recommendations have emerged from the mathematical analysis of common civil engineering and load bearing logic to assess the potential and current risks as generous appraisal for appropriate implementation in heritage conservation techniques.

Keywords: *World heritage, Structural analysis, Characterization, Visitor risks, Conservation.*

1.0 Introduction

Qusayr Amra, the most renowned bath complex associated with hydraulic features as well as a number of ancillary structures spread over a 2 square kilometer area in Wadi al-Butum, 85 km east of Amman along the Amman-Azraq highway, are hosting an extraordinary population of *Pistacia atlantica* trees (Holt, Holt et al., 1977) and displaying the largest extant example of early Islamic figurative paintings in the world. Because of its exceptional artistic and archaeological features and conservation conditions, the site was also inscribed in the UNESCO World Heritage List in 1985; as it was one of the three from the country. Such small ancient building is considered for some huge archaeological values

1.1 Scientific value

From the enormous potential of archaeological discoveries in the area which may sensibly impact the global understanding of Desert Castle structure and its function as well as of Umayyad territorial strategies and control. (Ababneh, 2015)

1.2 Social and symbolic values

The role held by Qusayr Amra for local communities and in the symbolic frames of reference of the Bedouin tribe, Bani Sakhr who have occupied the land for centuries. (Bisheh, 1985, 1998) A further group of values, or also opportunities, includes all such elements deriving from the many potential or effective uses of the site like hunting and pleasure. (Cresswell, 1969; Hillenbrand, 1982)

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An Internet-of-Things (IOT) Based System Development and Implementation: A Survey

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Abstract- The intention of this paper is to summarize few major applications of Internet of Things which is also called as cloud of things. Here the main sensor systems are communicated with each other using WiFi network and implementation for embedded applications. The IOT applications are supported by info communication technology (ICT) where the system datas are stored in cloud and used for further communications. Finally we conclude the paper with the study which demonstrates the potential of IOT and its system applications with improved user sustainability in different aspects.

Keywords: *Internet of Things, E-Health Monitoring, Bathroom Safety Enhancement, Smart Parking System.*

1.0 Introduction

The advances in mobile technologies and smart phones along with decrease in cost made it possible to bring up Internet of Things system for day-to-day's life applications.

In this paper we are going to review few systems that use IOT technology. Although we have various systems introduced in recent years, the chosen systems are more distinct and have more advantages applications which are usable for a common man in his daily activities and these systems are applicable for high range embedded environments as well. These systems are widely used in applications of robotics, health industries, home serve applications etc. Recent trending applications are mostly based on Internet of Things.

2.0 Internet of Things (IOT)

The idea in which valuable information around the world can be collected and detected by network devices and yield the data via Internet, where it can be processed and utilized for distinct purposes.

Few technological utilizations of IOT are:

- Sending out warnings to your phone or any other wearable device when some physical danger is detected by IOT networks
- Automatically switching on the air conditioner by detecting the time of arrival of the person staying in the property
- Tracking of daily exercise habits including goal tracking and preparing regular progress reports
- Automobiles which sense the surroundings and park on their own.

An 'ultra-vision' is being provided by the machine-to-machine (M2M) technology to almost all industries. If any device being used could predict humongous outages, organizations like hospitals, airlines, etc., will be able to maintain the optimization of their performance remotely. The possibilities for various business organizations are endless.

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In Search of Resilience: Exploring Mud Houses of Northern Bangladesh

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Abstract - Bangladesh is known as the largest deltaic plain in the world. The constant change of the land and landscape is further simulated by the change of river path for erosion and integrating levels of silt, flood, and rainwater. The change leads to having diverse microclimatic zones all around the country. Human settlement throughout this landscape is challenging as well as inquisitive. Though the traditional mud houses can be found all over the country the building typology, homestead plan and intelligent use of earth as a building material are distinctive in approach in the Northern part of Bangladesh for the specific soil type and climate, ideal for earthen house. Although the availability of oven-baked bricks, cement, Corrugated Iron (CGI) sheet and easy construction method of these elements gradually transforming the old houses; the comfort, environmental benefit, and tradition cannot be replaced. Often people just got overwhelmed by their neighbour's new brick house and the status gain by it. But by the time they realize the demerits of the five-inch-thick wall during hot summer and piercing cold in the winter, there is no way out of it. On the other hand, the thick mud walls control the interior climate, remain hygienic and have very low maintenance. When abandoned they slowly dissociate with the ground causing no environmental damage. If employed with certain modification earth dwellings can be an excellent way to solve the housing shortage and improve deprived lives.

Now the questions remain: Does this climate prefer the brick houses or the traditional homes? Do they offer the same tranquillity and cosiness like the old one? Do they have the same thermal insulation like before? Do they blend with the nature in the same way before? Do they dissolve like the mud as a part of the environment so easily? As the time goes on and the era of new technologies approaches, we also need to approach an inquisitive way to integrate traditional mud buildings and new sustainable technologies to make resilient, inclusive, safe and changed-climate effective human settlements.

This paper is a catalogue of the existing built form in the northern part of Bangladesh with an endeavour to find a way to stabilize them to act as an effective, resilient and contemporary mud building in today's world.

Keywords: *Mud house, earthen dwelling, resilient abode, sustainable design and development.*

1.0 Introduction

The deltaic landscape of Bangladesh is mainly formed by three large rivers: the Padma or Ganges, the Brahmaputra and the Meghna, and their numerous tributaries [1]. These rivers, their tributaries, and distributaries criss-cross the country along with other water bodies rejuvenates soil fertility in one hand and causes destruction like flood, riverbank erosion and additional catastrophes in another hand[2]. The age old relation of calamity and people, blessed the inhabitants with unique indigenous knowledge, earned by living in harmony with the nature.

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Delayed submission after modification, shall result in delayed publication of the article in the journal. Authors are advised to submit high resolution pictures, tables and figures in the standard format separately. Listing of references shall also follow standard IEEE format. A high resolution photograph of the author and author profile (not exceeding 100 words) should also be included. Wherever there are more than one author, authors profile and photographs should be included for each author. The corresponding authors name and email should also be indicated.

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