BATCH 14 – TELECOMMUNICATION ENGINEERING THESES ABSTRACTS

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Contents

14TL THESES ABSTRACT BOOKLET

Estimation of Walking Patterns Using Smartphone Sensors

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Supervisor: Engr.Mehran Mamonai Memon, Co-supervisor: Engr.Rizwan Ali Shah

Abstract: Recent technologies like Internet of Things (IoT) and smartphones have accelerated advancement in mobile technologies. One challenging issue to be investigated is related to technologies for locating persons in indoor environment. Global Positioning System (GPS) shows poor accuracy in indoors because of the limited availability of signal coverage. Developing a robust and accurate indoor Positioning system is an emergent task, other positioning and tracking technologies using Wireless Sensor Networks often require expensive infrastructure. This project aims to provide a low cost Inertial Measurement Unit (IMU) based solution for positioning of mobile user within an indoor environment. This project includes the development of algorithms for Motion Detection that uses Walking Patterns for foot step detection using estimated analysis at different thresholds and physical attributes. The proposed step detection algorithm exploits the acceleration patterns that vary with the leg movement during walking, it uses magnitude of acceleration and threshold with normalized values of 1.1, 1.09 and 1.08. This project aims to develop a Motion Detection approach, where smartphone is held regardless of orientation. In this Project Step Detection algorithm was performed on two users with different physical attributes and average error was found to be between 10% to 15% at 1.09 threshold, user with smaller steps have less error at 1.08 and user with longer steps have less error at 1.1, for change in direction using Gyroscope and (45® Tilt Compensated Compass), test was performed at 90® and 45® with average values of 92.1® and 42® for each test. The results can be used to enhance existing indoor positioning systems. Most important aspect was orientation free and physical characteristics should be taken into consideration, along with different suitable filters to reduce noise in any orientation.

Laboratory Equipment Inventory

Karishma Nenwani (14TL18), Nek Muhammad (14TL26), Noman Habib (1413TL57), Saeed Murad (1413TL77)

Supervisor: Dr. Faisal Karim Shaikh , Co-supervisor: Engr. Mohsin Ali Shah

Abstract: The major problem faced in a laboratory is mismanagement of the equipment. BLE is rapidly becoming one of the most common wireless standards in use today, more commonly used in applications where sensitive information is being transferred. It allows the data of an equipment to be collected by

small BLE tags. Arduino UNO and BLE module HC-05 are connected together to work as a scanner and are capable of measuring the RSSI value of different BLE tags, Drop rate, known and unknown equipment.

GPS Based Track-Up and Fleet Management System by Using Mobile Application for Locating and Tracking University Buses

Bashir Ahmed (G.L) (14TL40), Ali Gohar (14-13TL18), Lubna (14TL12), Urooj (14TL54), Manzar Hussain (14TL38)

Supervisor: Engr. Rizwan Ali Shah, Co-supervisor: Engr. Talha Kaimkhani

Abstract: In this era vehicle tracking system is a well-established technology. It is safe and reliable technology helps to locate the exact position of vehicles. Students or teachers face problem to locate university buses within the university or outside the university. Keeping this in mind we are intended for ease of students, to overcome issues faced by students and teachers to locate student buses of university. We are mostly focusing on tracking university buses. That's why, we are introducing a track up system in our university for facilitate students as well as management system to track the location of the university buses. As we know students are facing a lot of problems to access their university buses because of this many students miss their buses. This project is key solution of that problem and focuses on four main ingredients: Desktop Application, Android App for Drivers, Android App for Students & Trackers. The integrated network of GPS and GSM is installed in the university buses. When requested by user, the location is obtained by GPS in the form of latitude and longitude which are sent to mobile application via GSM. Then App (Application) is created which successfully uses those coordinates and plots them on google maps for user to see in real time. After this project we can say that TRACK-UP SYSTEM in our university helps the students to access their university buses easily on exact location. It is also beneficial system for Mehran UET Transport O_ce to calculate the distance (Km) travelled and remaining by the buses and also calculate the time and cost via basic KPIs.

Using Optical Solitons in DWDM Networks

Shehroz Jehangir (G.L) (14TL07), Tarique Gulzar (14TL53), Abdul Karim (14TL49), Rida Zehra (14TL39), Bilawal (14TL56)

Supervisor: Dr.Abdul Latif Memon, Co-supervisor: Engr: Hyder Bux Mangrio

Abstract: In this project, we designed a soliton pulse based DWDM network and studied the impact of it. A comparative performance study of a normal (Gaussian) pulse and soliton pulse was also done in our thesis. In our analysis, we considered receiver power sensitivity and BER performance parameters. We found out in our research that soliton pulse retained its shape even after travelling at long distances (i.e., 70 to 80 km), whereas normal pulse was distorted after travelling 60 km. We also discovered that BER was much lower in case of soliton pulses compared to the normal pulse transmission for equal distances. We applied DWDM network with four tributaries using soliton pulses. We successfully achieved transmission over 80 km's without using any optical amplifiers. It is therefore concluded that soliton pulses already being used in long haul communication can also be applied in metro and access networks to improve the BER and quality of transmission.

An Effective Small-Scale Railway System

Muhammad Saleem (G.L) (14TL05), Jawaria Ashraf (14TL27), Azka Qadeer (14TL03), Moneeba Tarique (14TL55), Syed Haris (14TL01)

Supervisor: Engr. Imran Qureshi

Abstract: Railway transport is very efficient means of transportation and is considered as Life line of any country. It is different from road transportation in such a manner that in train transport the trains are guided with the help of the tracks. Many research, and implementation work has been done in order to improve the railway transportation across the world. In Pakistan, the railway system is yet to upgrade itself and catch up with the latest trends available in developed countries. Consequently many problems arise due to issues like unmanned railway crossings, track health and lack of signal between trains in proximity resulting in loss of life and goods. So, our main idea to make this project was develop an effective railway system addressing issues like anti-collision detection, track discontinuity and warning system for railway crossings. Working on this project we have used the equipment which is very coast efficient such as RF module, Ultrasonic sensor, Arduino. Designing of unmanned level crossing is used for the purpose of high reliability and time reducing without human errors. This system is much more efficient and safety to the road users that can helps to avoid the accident by using of RFID module with Arduino programming. And by using ultrasonic sensor through which can sense obstacles detection and collision on railway system and ultrasonic sensor continuously measure the minimum distance between the train and any

obstacle by placing it on front end of the train. When sensor senses any obstacle, it sends the signal to Arduino for monitoring and controlling purpose to stop the train.

Group 06

Secure IoT Based Home Automation System

Fayaz Ali (G.L) (14TL78), Nighat Raque (A.G.L) (14TL42), Aiman Khan (14TL04), Sunil Kumar (14TL52), Naseer Ahmad (14-13TL148)

Supervisor(s): Engr. Nafeesa Bohra

Abstract: People are getting more concerned to protect their houses from unauthorized users. In this thesis we have discussed various approaches and technical advancements of smart homes then concluded different challenges of security in Home Automation Systems (HAS) also highlights solutions to protect system and then we proposed a secure IoT based HAS for home environment as well as remote environment. We are controlling not only lights and fans but different home appliances such as water motor, air conditioners and microwave oven. The proposed system can monitor a house by use of an Arduino microcontroller and an Ethernet shield unit. User name and password have been used for authentication so that only family members can access the proposed system and in this way it can be saved from outsiders.

Group 07

Localization in Catastrophe Monitoring System Based on WSN and IoT

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Supervisor: Engr. Nafeesa Bohra, Co-supervisor: Engr. Anum Talpur

Abstract: Localization is an important field in the Wireless Sensor Networks WSNs. Recently, many localization techniques are developed to enhance the capability of the WSNs. The location information is critical for the WSNs deployed in monitoring system. Localization mainly divided into two categories range based and range free. Range based techniques are more accurate and expensive than range free localization techniques. Different available localization techniques are reviewed and RSSI based localization algorithm is implemented on software, RSSI is low cost, easily implementable, and it does not require extra hardware as well. A topology grid of 800x800m2 is created where 30 anchor and nodes 50 blind nodes are placed on random bases

as blind nodes are mobile and possess different locations. A node receives the RSSI signal from the closest anchor triplet and estimates the distance. The estimated distance are utilized using trilateration and centroid algorithms separately to estimate the coordinates of the blind node. The impact of increasing the number of anchor nodes is evaluated in both cases. Increasing the number of anchor nodes reduces the localization error. The RSSI is less accurate technique as compared to other ranging methods such as TOA, TDOA and AOA but they are much more expensive than RSSI. A case study was done using IRIS motes hardware measurements, and measured values were used in our proposed algorithm and localization error is presented.

Group 08

Air Monitoring System using Quadcopter

Maliha Ismail (G.L) (14TL81), Iqra Soomro (14TL21), Saqib Baiq (14TL57), Moosa Jatoi (14TL68), Rashid Ali (14-13TL124)

Supervisor: Dr. Fahim Aziz Umrani, Co-supervisors: Engr. Syed Mohsin Ali Shah, Engr. Saima Hafeez

Abstract: Many people living in or near large cities are subjected to poor air quality. The focus of this project is the development of air monitoring system that will measures atmospheric gases, temperature and humidity. Our task is to measure the concentration of ozone and other pollutants. The aim of this project is to design Arduino based air monitoring system using Quadcopter. We have proven that it is possible to produce a UAV that performs function in interest of environmental monitoring applications.

Group 09

Critical Node Detection and Cluster Head Selection Comparison in Leach Protocol

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Supervisor: Engr Mohsin Ali Shah

Abstract: Wireless sensor networks are composed of tiny sensor nodes that have the capability to communicate with other nodes through transceivers. These sensor nodes are energy constraint i.e. they have limited energy, and are deployed in a specific region to sense and gather

information about certain parameters like temperature, pressure, humidity etc. In recent years wireless sensor networks have found their way into several applications and systems. Due to their continuous sensing requirements, these sensor nodes face an eminent issue; the battery life time. Since, sensor nodes have limited life time therefore most of the attention now is given to energy aware routing protocols for these wireless sensor networks. Currently there are different energy aware routing protocols being implemented in wireless sensor networks and further work is also being done in other routing protocols, which makes it difficult for researchers and network engineers to choose an appropriate routing protocol for a specific research project or application. In our work we've simulated the LEACH protocol and tried to find out its cluster head selection, we then determined whether LEACH protocol's cluster head selection is effective or not, which turned out not to be true, therefore we placed certain critical nodes along with the cluster heads for better coverage and efficiency.

Internet Traffic Analysis of TL-MUET

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Supervisor: Dr. Faheem Yar Khan, Co-supervisor: Talha Ali Kaim Khani

Abstract: The Internet is continuously growing in size as well as in complexity, and to effectively manage and secure it is becoming a challenging task as it is inextricably linked to an understanding of Internet traffic. The area of Internet traffic measurement has enormously advanced in couple of years. This is mostly based on enormous growth in the number of connected users and in the appearance of network hungry applications. Measurements of Internet traffic provide valuable information of what is happening in network. The work analyzes the usage of Department of Telecommunication, MUET (TL-MUET) network system to identify network based applications responsible for consuming valuable bandwidth. The network traffic is captured and monitored using packet sniffer, namely wireshark. As a starting point, Internet traffic is monitored on a small scale considering 15 to 30 devices present at each PC laboratory of TL-MUET. Later, the Internet traffic of main distribution link is monitored to capture packets from 8 AM to 3 PM for 2 weeks. The packets were analyzed by specifying and isolating different protocols, calculating different packet length, sorting the packets according to specific time etc. The results suggest that the peak hour traffic was between 10 AM to 12 PM. Moreover, the finding suggest that most of the TL-MUET network bandwidth is utilized via multimedia applications and restriction on proxy sites plus bandwidth management techniques are required

so that the available limited bandwidth is utilized for academic purpose rather than for entertainment.

Comparison of Structured Peer-To-Peer Networks Using OMNeT++

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Supervisor: Dr. Faheem Yar Khan, Co-supervisor: Engr. Talha KaimKhani

Abstract: Peer to Peer (P2P) networking have been developed in recent past to overcome the fundamental limitations of client server architecture over the internet by using the overlay network which are basically the logical networks and run over the physical network. As compared to client server architecture, P2P communication or networking is a distributed application architecture where tasks are divided among the peers or users and there is no dedicated server. All the peers are servers and clients at any time according to the function they perform. If a peer is sending the contents then it would work as server and if it is receiving the content then it would act as the client. In P2P computing all the connected peers are equally treated and share same workload between each other as compared to the client server network where contents are distributed through the main dedicated server and so it does gives priorities to some clients. To overcome the issues regarding the client server architecture, a simulation based study have been done by comparing the performance of different structured P2P networks in terms of bandwidth and latency by using the software tool named as OMNeT++.

Energy Efficient UWSN Routing Protocols with Multiple MAC Protocols

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Supervisor: Rizwan Ali Shah

Abstract: The underwater communication is basically the transfer of information from one point to another through an underwater channel. The purpose of this thesis Energy Efficient UWSN Routing Protocols with Multiple MAC Protocols was to enhance the energy efficient routing protocols by implementing different MAC protocols. Given the fact it is difficult to change batteries in sub-aquatic environment hence energy consumption ought to be low and pro proficiently utilized. There are two routing protocols used in this thesis namely: Vector Based Forwarding Routing Protocol and Depth Based Routing Protocol. Further, to improve energy productivity in the overall system we device different MAC protocols namely: Broadcast MAC, OTMAN-MAC, GOAL-MAC, FAMA-MAC, SFAMA-MAC. Undergoing these various changes in the protocol we experienced different energy consumption rates within same network architecture and number of nodes. The response was measured, calculated and compared with dissimilar energy levels. To save energy, most of the proposed MAC protocols follow a pattern of sleeping and listening mode during communication, since the sleep mode energy consumption is much less than that of the idle listening mode. UWSN MAC protocols are classified into further two categories of sender-based and receiver based scheduling protocols. We evaluate the performance of both of these scheduling protocols as a sender-based and as a receiver-based scheduling using Aqua-sim, a ns-2 based simulator for underwater acoustic networks. Different scenarios are created with different number of nodes.

Performance Analysis of Forward Error Correction Codes in Long-Reach Passive Optical Network

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Supervisor: Dr. Abdul Latif Memon, Co-supervisor: Engr: Hyder Bux Mangrio

Abstract: Forward Error Correction (FEC) is one of the most useful technique used for data communication. The FEC codes have been widely used to battle the data errors caused by transmission of data through a noisy channel. The FEC technique adds redundant information along with original information to recover the lost data without frequent retransmission. The several FEC codes exists such as, Hamming, Turbo, RS and LDPC with different complexities and efficiencies. FEC has been used to enable an efficient and reliable transmission. The high performance of FEC leads the implementation of FEC in variety of applications such as wireless

communication system, satellite communication and fiber optic communication. The use of FEC in fiber optics communications has already involved in three generations of long haul optical communication. One of the key technology used in fiber optics communication systems is passive optical network (PON). Passive Optical Network is a broadband network access technology which provides a cost effective solution for providing high data rates. The length of an ordinary PON is extended by using Long-Reach PON (LR-PON). FEC techniques such as RS and LDPC are used in this project to minimize the extent of non-linear effects of fiber such as dispersion and polarization, besides the attenuation of a signal. The FEC codes such as RS and LDPC are deployed in LR-PON to achieve the better performance in terms of BER, SNR over large fiber span. The performance of LDPC and RS codes in the LR-PON is compared and analyzed in terms of different parameters such as BER, SNR (dB) and received power (dBm).

Group 14

Quadriplegic Wheelchair

Laraib Fatima (14TL22)

Supervisor: Engr. Shakeel A Laghari

Abstract: Quadriplegic Wheelchair (Head Motion Controlled Wheelchair) is a standard wheelchair that has been modified and altered in such a way that it can be in two modes either manually or by tracking the motion of the user's head i.e., tilt angle of the head and then moving accordingly. The motivation behind this project was to design a wheelchair for the use of the paralytics and the amputees. This automated system is an integration of electronic and mechanical components i.e., it is based on two systems. The electronics part is further divided into an IMU and programmed microcontroller i.e., the headset design, and the mechanical part being motors, gear assembly and the measured taken to ensure their stable connectivity with the wheels of the wheelchair so as to achieve the spontaneous output. The head set design comprises of an Inertial Measurement Unit which helps to keep track of the head orientation by using the accelerometer and gyroscope, and accordingly conveys this information to the Arduino Mega controller. The controller then translates this data and generates the movement command by using the conditions that have been setup in the control algorithm, these commands are then passed onto the H-bridge circuits which in turn drive the motors by either moving the motors clockwise or anticlockwise depending upon the direction of the head. Such a wheelchair has applications in old homes and hospitals with spine trauma centers. Also, bed ridden soldiers can benefit from the use of such a wheelchair.

Design of Wearable Antenna for Real Time Health Monitoring

Faisal Ali (G.L) (14TL50), Saqib Hussain (A.G.L) (14TL06), Bashir Ahmed (14TL70), Munawar Ali (14TL20), Inamullah Khyber (14TL24)

Supervisor: Engr. Saima Hafeez

Abstract: Miniaturization in electronic devices has paved the wave towards wearable antenna. The wearable Antenna is the new emerging technology used in wireless body area network (BAN) for constant monitoring of human health parameters with real-time updates. In this report, the wearable microstrip patch antenna is proposed to operate in Industrial, Scientific and Medical (ISM) frequency band at 2.45 GHz. The ISM band is free of cost and can be used for variety of applications. The proposed antenna is designed to achieve better return loss, VSWR, gain and low value of specific absorption rate (SAR) as compare to other existing wearable antenna. The achieved antenna return loss at 2.45 GHz is about -10.53 dB and gain of 7.81 dB. The achieved VSWR value at 2.45 GHz is 1.84, which is very good in terms of good impedance matching. Another antenna field parameters like 2D and 3D gain, radiation pattern, and SAR values have been calculated with FEM based software HFSS version 13.0.

An RFID Based Intelligent Transportation System Using E-Shaped Microstrip Patch Antenna

Asif Ali (G.L) (14TL46), Syed Saad Shah (14TL14), Waqar Nawaz (14TL36), Mumtaz Ali (14TL60), Abdul Ghani (14TL16)

Supervisor: Dr. Sajjad Ali Memon, Co-supervisor: Engr. Komal Memon

Abstract: The configuration of rectangular E-shaped microstrip patch antenna for microwave RFID reader applications is obtained. This antenna consists of a radiating patch on one side of the dielectric substrate and ground plane on other side, the main radiator is made up of copper. The

Microstrip patch antennas have huge benefits and better prospects compared to other antennas, such as; low weight, low cost, low profile, simple structure, smaller in dimension and easy to fabricate. The performance of this antenna has been discussed in terms of return loss, VSWR, radiation pattern and bandwidth. The antenna can be printed on FR4 substrate with dielectric constant 4.3; the size of substrate is 65*56 and operating frequency is 0.9GHz.At this frequency the gain of E-shaped microstrip antenna is 7.4dB, return loss is -12.34dB and the VSWR is 0.67.The research thesis demands for the reduction of antenna size efficiently without affecting its radiation pattern and directivity. With the substrate of low dielectric constant of E-shaped microstrip patch antenna it meets the demanding bandwidth specifications and its reflection coefficient at the input is below -10 dB over the entire frequency band. The benefit of substrate of low dielectric is that it is preferred for maximum radiation. Through the HFSS simulation it provides excellent measurements and good results.

Group 17

Anomaly Detection using Image Processing.

Muhammad Asfand (14TL08), Kashan Ali (14TL10), Ahmed Adeel (14TL32), Adeel Ahmed (14TL58), Syed M.Ali (14TL72)

Supervisor: Engr. Mohsin Ali Shah

Abstract: The focus of our project is to provide an intruder detection mechanism via camera connected to drone that will provide routine aerial survey of the intended site. We have used an ARF UAV with a high definition wide angle camera attached on it for surveillance and capturing images or video recording. Our Project is an improved version of the last year project titled as Drone for security surveillance of MUET. In this project, we use Image Processing method for the comparison of images to find differences among them. Out of those images, if any regular image of a particular area shows any sign of anomaly (intrusion), the authorities will be notified about the irregularity in the picture taken so that the authorities can take necessary actions as soon as possible. From the results we achieved we conclude that this project works very efficiently for the images of moderate quality with dimensions like 1280 x 720 because our program take 20 seconds maximum for comparing images and producing results and for the images with very high quality and dimensions like 3264 x 2448 our program take approximately 2 minutes 20 seconds for producing results, but for surveillance we do not need images with very high quality so with moderate quality image our project work very efficiently.