

UNIVERSITY OF BIRMINGHAM

**COLLEGE OF ENGINEERING
AND PHYSICAL SCIENCES**

SCHOOL OF ELECTRONIC, ELECTRICAL & COMPUTER ENGINEERING

MSc Project Conference

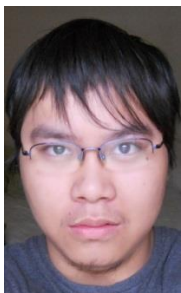
31st July 2013

Timetable, Delegate Information and Abstracts

Schedule

Time	N521 – Communications (Dr Hillmansen)		Time	N523 – Electronics (Dr Spann)	
09:00	General Introduction in N521				
09:20	Junjie Yang	Study of the Short range tactical UHF communication link fading due to vegetation in the outdoor environment by the analysis of the I- and Q- channel signals	09:20	Nataneal Viknaswarn	Advanced automatic train operation of fuel cell hybrid narrow gauge locomotive
09:40	Ming Teng	Investigation of signal fading in communication channel working in woodland	0940	Rui Song	Matlab base single train simulator or optimising railway vehicle operations
10:00	Jerry Ajaegbo	Compact reconfigurable antennas: a low-profile metamaterial-based folded monopole.	10:00	Sukhjot Pooni	A remote condition monitoring system for whole junctions of railway switches using a localised wireless network
10:20	Hiwa Sediq	Enhancing gain of a microstrip antenna using multiple-layer dielectric substrate in wireless communication	10:20	Isimenmen Obazele	Design of a self-balancing model bicycle
10:40	Hugh Hancock	Calibration of a microwave probe	10:40	Mohamed Shiblee Ahmed Masuik	Experimental modelling of implantable functional stimulator
11:00	BREAK		11:00	BREAK	
11:15	Yue Liang	Embedded Binaural Ambisonic Decoder	11:15	Bing Hua	A hardware accelerator for motion estimation in video data
11:35	Ruihao Yang	Microwave Bandpass filter	11:35	Saharsh Bishnoi	Vision based lane tracking
11:55	Hashir Kiani	Automatic identification and recognition of non-speech sounds in everyday environment	11:55	Guangqiao Xu	Vision based parking aids
12:15	Solomon Folorunsho	Codes for spectral-amplitude-coding optical CDMA systems	12:15	Ziwei He	A concept emergency services augmented reality system for building incident awareness
12:35	Rui Peng	Voltage multiplication in rectifier circuits	12:35	Yueting Feng	GLSL shaders for SSVEP image space modulation in 3D virtual environments
12:55	LUNCH		12:55	LUNCH	
13:45	Yifan Gu	Asymmetric dual band waveguide filter	13:45	Ahlam Saif Khamis Al-Ghafri	Educational game with open learner models (OLM)
14:05	Syrymzhan Mavlenov	Automatic detection and identification of non-speech sounds	14:05	Rui Fang	Using the RFID technology to recognise the human activities
14:25	Chao Han	Inverse synthetic aperture radar	14:25	Yeqin Li	Forward-looking imaging radar for land vehicles
14:45	Ji Zhang	Multiband lumped element quadrature hybrid coupler for LTE Equipment	14:45	Samuel Crooks	A system for vision based gaze estimation
15:05	Following Conference there will be a Social Event – details to be circulated in due course				

Communications

Name	Project Title	Supervisor
Junjie Yang 	Study of the short range tactical UHF communication link fading due to vegetation in the outdoor environment by the analysis of the I- and Q-channel signals. <u>Overview</u> In order to provide confident data transmission in communication link the rigorous estimation of the power budget is necessary. Weather conditions, terrain and operational frequency influence every specific communication link performance as they introduce: 1) fading; 2) scattering; 3) multipath reflection; 4) diffraction. In wireless systems, fading due to scattering from the obstacles and shadow fading affecting the wave propagation should be carefully investigated in order to develop appropriate models of link power budget estimation in the complex outdoor environment. Mathematically, fading is usually modelled as a time-varying random process of the amplitude and phase change of the transmitted signal. Therefore study of the statistical and spectral properties of the fading channel in the short range communication ground low-elevation channels are of the extreme importance to provide stable data link.	Dr Marina Gashinova
Mingguang Teng 	Investigation of signal fading in communication channel working in woodland. <u>Overview</u> Nowadays, node-to-node wireless communication network play as an important role in human daily life. The signal is sent by Transmitter and during the signal propagation, its amplitude and phase will experience different types of interference called fading. there are many reasons causing the signal interference, such as the Channel, the signal frequency, the antennas it used, and any other human factor/behavior. the measurement of my project is to record the signal fading in the Channel of woodland using directional antenna and omni directional antenna in different weather. the major goal is to compare the signal fading level and statistics for the case of above with operating frequency at 1.2 GHz and 25 m distance.	Professor Mikhail Cherniakov
Jerry Ajaegbo 	Compact Reconfigurable Antennas: A low-profile metamaterial-based folded monopole. <u>Overview</u> Antennas are integral parts of wireless communication systems and with the current trend in the development of compact/miniaturized communication devices, it becomes important to consider how to effectively design small/electrically small antennas that can fit into such systems. Technology has also evolved in recent years with wireless devices being able to multitask. This puts forward the need for the design of tunable antennas to support the various applications running on these devices. The project focuses on study of the design of pre-existing compact and reconfigurable antennas. The knowledge gained is applied to redesign a low-profile metamaterial folded monopole antenna by optimizing design specifications and making it tunable.	Dr Alexandros Feresidis

Name	Project Title	Supervisor
Hiwa Sediq 	Enhancing Gain of a Microstrip Antenna Using Multiple-layer Dielectric Substrate in wireless communication. <u>Overview</u> Antennas are also called aerial that are a conductor can receive and transmit signals such as radio, microwave, or satellite signals. They act as a transformer between a transmission line and free space and are also responsible for converting electrical signal to radio signal, as well as, vice versa. Antennas have several significant Fundamental antenna parameters like as bandwidth, directivity, gain and efficiency. Some transmission lines can be used for designing antenna such as microstrip line and wave guide to transfer the wave signals. However, it has only been focused on the design of fully printed microstrip patch antenna in this paper because it some crucial advantage as compared to other conventional antennas like Light weight and low cost. On the other hand this kind of antenna faces some problems during transmitting signals because it has limited gain and bandwidth. Therefore, Multiple-layer Dielectric Substrate has been designed and used to dominated these kind of issue and enhance its gain.	Dr Alexs Feresidis
Hugh Hancock 	Calibration of a Microwave Probe. <u>Overview</u> Microwave probes can be used to measure the dielectric properties of materials by measuring the reflection coefficient received when a radio frequency signal is applied. To do this accurately they need to be calibrated to remove the systematic errors. In this project an empirical model is used based upon the bilinear transformation. Firstly it is applied to a coaxial probe to prove the concept, then an attempt will be made to apply it to a near-field microwave microscope as a simple means of calibration.	Dr Tim Jackson
Yue Liang 	Embedded Binaural Ambisonic Decoder. <u>Overview</u> The binaural decoder can simulate the sound a listener would hear when subject to plane waves for different arrival angles. This decoder contains a ADC for converting input audio, a DSP broad (EZkit-BF561) for processing and a headphone as output. The input audio is a 7-channel signal (first order 3D audio), therefore, a multi-channel ADC is needed to receive these audio signals and transmit them to the DSP in SPI. Due to the various head shapes and ears shapes, each person has a different suitable hearing setup, which can normally be found in the HRTF database. By using FFT and HRTF database, the DSP can process the signals and customize them for different audience.	Dr Tim Collins

Name	Project Title	Supervisor
Ruihao Yang 	Microwave Bandpass Filter. <u>Overview</u> Bandpass analogue filters are used widely in communications and radar systems with centre frequencies ranging from a few megahertz to terahertz. One method of designing such filters is to take a set of electromagnetic resonators and couple the resonators together in the correct way. The resulting bandpass filter can have very complex passband and stop band responses. Most filters have a set of resonators in-line and by designing the correct coupling between the resonators a Chebyshev filter can be produced. This project will look at a filter where the resonators are coupled in parallel rather than in series. The first step in the design procedure is to work out coupling coefficients and centre frequencies of the resonators. The second step is to implement the filter with a specific type of resonator, in this case a rectangular waveguide resonator will be used. This type of filter is generally not used because of the complexity of coupling the resonators together in a real structure. However, the research group has observed that for specific filters which are small compared with the waveguide flange then there may be certain advantages. The filter will therefore be designed at 300 GHz and made with the EDT groups SU8 micro fabrication facility.	Professor Mike Lancaster
Hashir Moheed Kiani 	Automatic identification and recognition of non-speech sounds in everyday environment <u>Overview</u> The advancement of digital technology has allowed us to create and save large amounts of data containing speech and sounds which may be available in audio or video format. Such a huge database requires that some intelligent application be developed which could analyse the audio data in order to organise, search or tag it. The purpose of this project is to develop such an automatic application which would detect certain non-speech sounds in a typical recording which contains audio data. For example the sound of coughing, siren, something breaking or falling etc. are all non-speech sounds whose detection may inform about a dangerous situation and thus corrective action be taken to avert it. The application will be developed using MATLAB coupled with HTK toolkit which contains tools suitable for audio processing. Different audio processing techniques will be analysed and a combination found which is most appropriate for audio recordings of everyday events.	Dr Peter Jancovic
Solomon Folorunsho 	Codes for Spectral-Amplitude-Coding Optical CDMA Systems. <u>Overview</u> Optical code division multiple access (CDMA) systems are receiving a lot of attention in the field of optical communications as it allows several users access the network asynchronously with a good level of security and data integrity. Research has shown the performance is heavily degraded when large number of users try to communicate over OCDMA network, this is mainly due to multiuser interference (MUI). In SAC-OCMDA system it has been found that MUI is only determined by the In phase Cross Correlation (ICC) between address sequence between two codes because frequency components are inherently in order, hence MUI can be eliminated by fixed ICC. Although SAC-OCDMA suffers from Phase induced intensity noise, this noise can be reduced with small ICC making a small and constant ICC ideal for SAC-OCDMA. This project looks to analyze presently available OCDMA code with a constant in-phase cross correlation and tries to identify the codes with an ideal value of ICC.	Dr Hooshang Ghafouri-Shiraz

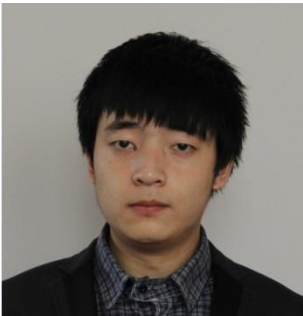
Name	Project Title	Supervisor
Rui Peng 	Voltage Multiplication in Rectifier Circuits. <u>Overview</u> The idea is to combine the concept of voltage multiplication in rectifier circuits with the concept of distributed components in microwave circuits, to produce a Schottky diode based detector that generates useful levels of output voltage and can detect microwave signals over a broad frequency range, in a low pass arrangement. The resulting module could find applications in power sensing for cognitive radio systems and energy harvesting.	Dr Peter Gardner
Yifan Gu 	Asymmetric dual band waveguide filter. <u>Overview</u> Waveguide is a hollow metal pipe used to carry radio waves and used as a transmission line at microwave frequencies, for connecting microwave transmitters and receivers to their antennas(e.g. Microwave ovens, radar sets, satellite communications, and microwave radio links). In initial project, a 4th order of 10GHz centre frequency bandpass Chebyshev rectangular waveguide filter will be designed. A rectangular waveguide and some cavity resonators inside the waveguide are used to make the filter. The first job is finding the right length of the cavity resonators then finding the external coupling and internal coupling of the resonators. Use the values figured out to simulate the filter in software CST. After the initial filter simulated, a new filter with some additional resonators besides the old filter will be considered to design to make a new dual pass band waveguide filter.	Dr Fred Wang
Syrymzhan Mavlenov 	Automatic Detection and Identification of Non-Speech Sounds. <u>Overview</u> In recent years, there has been an increasing interest in different types of digital multimedia data such as speech, music and video. Consequently, the development of systems that allow to search through multimedia data and use features from this data to some purposes becomes relevant task. The objective of this project is to develop an automatic audio processing tool to detect specific non-speech sounds as sounds of office environment. In order to tackle the issue the following intermediate tasks were elaborated. Firstly, one of the most important aims of this project is creation of corpus of office sounds. Secondly, analyse different features as Mel Frequency Cepstral Coefficient, Bank Frequency Cepstral coefficients, Linear Predictive Coding coefficients, Perceptual Linear Prediction, Relative Spectral Perceptual Linear Prediction, Loudness, Pitch, Spectral Flux, Brightness, Bandwidth, etc. to evaluate their efficiency for detection/identification of a non-speech sounds. Thirdly, consider different acoustic modelling approaches such as Neural Networks, Hidden Markov Models, Gaussian Mixture Models, Support Vector Machine, etc. to identify their suitability for the given task. Finally, this automatic system will be implemented in MATLAB programming language and the HTK toolkit will be involved to develop system.	Dr Peter Jancovic

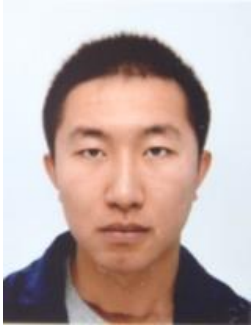
Name	Project Title	Supervisor
Chao Han 	Inverse synthetic aperture radar. <u>Overview</u> Inverse synthetic aperture radar is used for imaging the moving target in 2-D image using the static radar. This project will simulate an airplane moving in the sky and using Matlab for imaging plane moving with time. At first the airplane will be seen as a point and imaging this moving point, then add all the points of the plane and work out the shape of airplane moving with time. Also in this project I have to begin will 1-D image which include imaging the chirp signal, the received chirp signal and matched filter image to insure the fundamental of the project is right.	Dr Michael Antoniou
Ji Zhang 	Multiband Lumped Element Quadrature Hybrid Coupler for LTE Equipment. <u>Overview</u> The coupler is the device which can be used for coupling in the field of radio technology. They couple a defined amount of the electromagnetic power in a transmission line to a port enabling the signal to be used in another circuit. This project is to design a quadrature hybrid coupler in the LTE equipment for multiband. The design and the simulation can be achieved by the AWR software which helps simulating and testing the microwave design. Most couplers are working for the single band, the multiband quadrature coupler designed in this project should cover as many of the LTE bands as possible.	Dr Peter Gardiner

Electronics

Name	Project Name	Supervisor
Nataneal Viknaswaran 	Advanced Automatic Train Operation of Fuel Cell Hybrid Narrow Gauge Locomotive. <u>Overview</u> Implementing a GPS system on the railway trains with minimising the GPS accuracy. These accuracy errors are normally between 2 to 10 metres diameter without proper pinpoint position of the train. By using differential GPS, the error can be reduced by differentiating 2 different GPS system. Therefore, this will make the GPS location to pinpoint with an error of about 10 centimetres. The GPS will also be implemented on a MBed, which is the processor to control different subsystem on a train. In addition, sensors will be place on the wheel to calculate the distance travelled within a length. Every data collected will be stored in a memory card.	Dr Stuart Hillmansen
Rui Song 	MATLAB base Single Train Simulator for optimizing railway vehicle operations. <u>Overview</u> Using single train simulator (STS) written in MATLAB can explore a range of topical issues relating to railway vehicle motion. The existing STS can measure the time and the power consumption a train takes to get from A to B under differing infrastructure and driving style conditions. After running the STS, a m-file will open up the necessary input data files and will run a basic journey simulation and plot some results. The choice of train state can directly impact on train performance in terms of journey time and energy cost. In order to save the energy consumption of train, this project will create a system to find the most appropriate train state (Class 395) to minimise a function that includes energy consumption and journey time of train.	Dr Stuart Hillmansen
Sukhjot Pooni 	A Remote Condition Monitoring System for Whole Junctions of Railway Switches Using a Localised Wireless Network. <u>Overview</u> Railway switches allow trains to move from one section of track to another. These are normally controlled by points operating equipment (POE), and a set of switches are normally located close together within a 10-20m radius junction. When a switch or POE fails there is disruption to the operation of the rail network and at worst a possible train derailment. This project will create a system to monitor the individual POEs within a junction. At a junction there will be measurement nodes at each POE and a central communication node for the junction. When a POE is indicative of failure the measurement nodes will report this to communication node which will relay the system back to the network operator. In addition there will be an option to allow a tablet to link to the system to allow maintance staff to view the operation of the system, whilst repair work is being done.	Dr Edd Stewart

Name	Project Name	Supervisor
Isi Obazele 	Design of a Self-Balancing Model Bicycle. <u>Overview</u> A bicycle or motor bike is a simple adaptable form of transport that can be used on a wide range of ground conditions. The aim is to create a self-balancing 2-wheel bike. This will use a reaction wheel and control system with inputs from a 2 axis gyroscope or accelerometer. Care will be needed to balance the weight to power ratio.	Mr David Pycock
Mohamed Shiblee Ahmed Marsuik 	Experimental modelling of implantable functional stimulator. <u>Overview</u> Technology in the medical field has improved dramatically. A reason for this is the unfathomable research being carried out in this field. One of the researches being carried out is on functional stimulation. The aim of this project is to find out whether a passively powered functional stimulator can be implemented to stimulate breathing. Firstly, by investigating the electrical properties of the muscles using an appropriate substitute. Then building a parallel RC circuit with the investigated electrical properties of the muscle. Finally designing and making a pair of coils to passively power the RC circuit with the required current waveform.	Dr Ed Tarte
Bing Hua 	A hardware accelerator for motion estimation in video data. <u>Overview</u> Picture is made of thousands of pixels and video is made of many frames. When watching TV, things are moving most of the time. Motion estimation (ME) is the process of determining motion vectors that describe the transformation from one 2D image to another. For each microblock(MB) in the current frame (current MB), one reference block that is the most similar to current MB is sought in the searching range of size $[-P, P]$ in the reference frame. The most common used standard of the similarity is the sum of absolute differences (SAD). The MB with smallest SAD is what we need.	Dr Steven Quigley
Saharsh Bishnoi 	Vision based lane tracking. <u>Overview</u> Camera and sensor based systems are used in safety critical driver aids in commercial vehicles. Factors that may affect the robustness of a system to be used in an outdoor driving environment include ambient noise from varied lighting intensity as well as the accuracy and latency of detection of many different types of obstacles on different kinds of road surfaces. This is taken into account to design and develop a mathematical model based lane tracking image processing algorithm and an obstacle detection system for use in autonomous vehicles.	Mr David Pycock

Name	Project Name	Supervisor
Guangqiao Xu 	Vision based parking aids <u>Overview</u> Automatic/ Semi-automatic parking assistant system is one of the most attractive system in the vehicle industry. As shown in J.D.Power's 2001 Emerging Technology Study that more than 60% of consumers are likely to purchase those cars with parking aids. Although current systems generally use sensors like ultrasonic, laser scanner, Vision Based parking systems are expected to be the major research area of upcoming systems. This project will create an vision based parking aid system, using both computer vision and computer graphics techniques, to analyse input images from a camera (possibly on a model car). The whole system could be described as a software loop that first of all, parking slot will be correctly located, after which possible parking trajectory will be calculated based on the current position and destination, and also the pose of the vehicle will be simulated simultaneously. Any movement of the vehicle will trigger the whole system again, slot will be re-located, trajectory will be re-calculated, etc.	Mr David Pycock
Ziwei He 	A Concept Emergency Services Augmented Reality System for Building Incident Awareness. <u>Overview</u> Augmented Reality (AR) refers to the technology that aims to enhance the user's perception and interaction with real world by adding virtual information to physical real-world environment. This project sets out to investigate possibilities for using AR technologies to support the emergency services. When an incident occurs, the AR system would understand the spatial layout of the building and the existence of individuals or casualties in areas within the building. The project demonstrates a future concept of AR system , which can recognise specific buildings and supplement the current view of such buildings with an augmented 3D model of the building. The research and development effort focus on developing an AR version of part of the Gisbert Kapp Building, displayed via an appropriate tablet computer/head-worn goggles to the end user.	Professor Bob Stone
Yueting Feng 	GLSL shaders for SSVEP image space modulation in 3D virtual environments. <u>Overview</u> A steady state visually evoked potential (SSVEP) is a brain signal detected by Electroencephalography (EEG) when someone looks at a light flashing at specific frequency typically in the range 5 to 50Hz. This project will focus on how oscillatory visual stimulus can be achieved in 3D virtual environments. It is envisaged that the use of shader programming in hardware graphics pipelines will be used to add a dynamic graphical overlay to enable the SSVEP detection of 3D virtual world objects and user behaviors. The key challenge is to design image space modulation schemes that do not adversely affect users gaze behavior, which will require a human factors evaluation.	Dr Neil Cooke

Name	Project Name	Supervisor
Ahlam Saif Khamis Al-Ghafri. 	Educational Game with Open Learner Models (OLM). <u>Overview</u> Educational Game with Open Learner Models is the future of education :D This project explores the extent to which the metacognitive benefits of Open Learner Models, and the motivational benefits of video games could be combined. The game is designed to cover the "Basics of Electronics" course in an enjoyable way to kill the boredom of traditional way of study. While the OLM allows the students to view information that the system has inferred about them in a format that they can understand.	Dr Susan Bull
Rui Fang 	Using the RFID technology to recognize the human activities. <u>Overview</u> Radio-frequency identification (RFID) uses the wireless non-contact radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. Using RFID to recognize the human activities, a RFID reader should be designed so it can be used to collect the information of tags. PIC chip and MicroRWD Mifare chip with antenna are the two main parts of the RFID reader, and the ranger of the reader should be 30cm or less. The tags are attached to some objects, so the reader can transfer with it. Then data collection is the next step. If someone use these objects could be recognize and then save the data to the computer. After that do classification using WEKA and finally modeling of actions and sequences. So that the human activities can be recognized and predicted.	Dr Michael Antoniou
Yeqin Li 	Forward-looking imaging radar for land vehicles <u>Overview</u> A forward-looking imaging radar is a type of radar placed in front of a moving vehicle. It provides a profile of the area ahead of the vehicle, which can then be used for a number of applications. Unmanned Aerial Vehicles(UAVs) use it as a landing aid, while land vehicles rely on it to detect obstacles. This project is to provide a systematic study of forward-looking imaging radar in the context of land vehicles. The FMCW signal is transmitted from the antenna which is generated by radar system. Then the echo of this signal is be reflected by the target. The echo signal is received by the antenna through to the computer. After the signal processing in the computer, the height and the range of target can be calculated. So the position of target in front of the land vehicles can be identified by this equipment	Dr Michael Antoniou
Samuel Crooks 	A System for Vision based Gaze Estimation. <u>Overview</u> (Not submitted)	Dr Ginevra Castellano

Name	Project Name	Supervisor
Sarunya Kongtrakarnkul 	Building Digital Communities for international students. <u>Overview</u> Not Presenting on the 31st July 2013	Professor Chris Baber
Luke Peel 	Respiratory Weaning. <u>Overview</u> An application to help patients and their carers understand the progress made during respiratory weaning in intensive care, with the ultimate aim of accelerating the patient's return to a mainstream ward. An application to encourage breathing exercises with the use of an interactive 2D game, and/or a series of virtual "meters", with a method of gauging, displaying and storing/archiving (for subsequent analysis) the current breath statistics. Not presenting on the 31st July 2013	Professor Bob Stone