| Staff Member Antoniou, M | Project 1 Micro-Doppler analysis of helicopter rotor blade radar returns | Potential Student Mr Moaz |
|------------------------------------|---|------------------------------|
| | Description: The proposed project will apply an emerging signal processing scheme, called micro-Doppler analysis, to radar signal reflections from helicopter rotor blades. Radar returns from a number of different rotor blades will be modelled and simulated in MATLAB. The principles of micro-Doppler will be studied, and the appropriate signal processing algorithm will be built and applied to the simulated radar signals. The obtained results will be analysed and compared. | |
| Baber, C | Location-based Imagery and Augmented Reality to Support Search and Investigation | Miss Baharali |
| | This project will design, develop and evaluate an application to tags images and to use these tags to create Augmented Reality views of a scene in order to support search and investigation. It will build on previous projects I have supervised and published on. It is expected that the project will combine hardware and software. The aim of the project is to create an application which can allow the user to create a 'map' of important aspects of an environment quickly and easily in order to produce a report for other investigators. | |
| Bryds, MA | Stabilisation of Furuta pendulum with active actuator limits by nonlinear model predictive control. | Mr Jahanian |
| Collins, T | Spatial Audio Room Modelling | Miss Rosu |
| | This project will focus on modelling the acoustic properties of a room for spatial audio effects purposes. The resulting model will be implemented in a real-time effect allowing a monophonic source to be auralised in a virtual three-dimensional space. Modelling will be performed using either Matlab, C++, C#, etc. The real-time effect may be implemented either in C++ for a PC based effect or using a DSP or FPGA for a standalone hardware version. | |
| Constantinou, CC | TBD | Mr Proud |
| Gashinova, M | MIMO virtual array optimization for bistatic radar | Mr Aleem |
| | One of the most promising direction in the communication and modern radar systems is the use of multiple transmitters, that exploits orthogonal waveforms and/or multiple receivers in order to increase performance of the communication or radar system. Appropriate matched filters are typically used for separation of the transmitter waveforms so that Multiple Input Multiple Output (MIMO) system is realized. In radar applications the control of the sidelobe level of the virtual array obtained by MIMO system is necessary in order to achieve clutter suppression, better angular resolution and similar. | |
| | The project aims to study on modeling and theoretical level the basics of MIMO virtual array forming and sidelobe control. Advanced level assumes experimental confirmation of the proposed MIMO array. It is expected that e student will have to consider its own specific environment, number of elements in the virtual array and produce a computer code (Matlab) for simulation of the array pattern of desired sidelobe level, beamwidth and signal to noise ratio. | |

| Huang, F | Dual Band Spiral filters | Mr Nayebi |
|---------------|---|----------------------------|
| | Microwave filters based on spiral resonators on mircrowave PCBs are to be designed, mainly by e.m. simulation and a small amount of calculations. They are also to be fabricated and measured. | |
| Lancaster, MJ | 3D printing of microwave microstrip filters | Mr Bagherigolroodabri |
| | 3D printing (http://en.wikipedia.org/wiki/3D_printing) is now common place and companies allow the download of 3D objects files and for a payment will produce them. Such a service is available from shapeways (www.shapeways.com) and our own School of Metallurgy and Materials Science as well as many other companies. The aim of these projects to assess the various 3D printing processes for metal or metal coated dielectric for the manufacture of microwave filters. Microstrip microwave filters are conventionally made with printed circuit techniques where the filter shape is eteched to the the required shape. The project will design a microstrip or stripline microwave filter and then have it produced by 3D printing. It will be tested with a network analyser and the results analysed. The aim of the projects is to ascertain the usefulness of 3D printing for microstrip microwave filters. Typical questions which will be answered are: • What are the metal losses associated with the printed materials • What is the accuracy of the printing and how does this relate to the accuracy of the final filter response • How does the available construction methods affect the microwave filter response • Can tuning screws be used with 3D printing, if not are there other methods of tuning • Can snap-together or other forms of construction be used | |
| | Which is the best form of 3D printing for microwave filters. | |
| Pycock, D | TBD | Mr Lewis |
| Roberts, C | The development of a driver advisory system to help train drivers ensure trains arrive on-time while also minimising energy usage. | Mr Mashhadi Hossein Khabaz |
| | This project will require students to work with our existing single train simulator to create a version that can run on a laptop, tablet, embedded system (or similar) with an appropriate HMI (before Christmas). The second phase of the project will involve developing algorithms that are able to identify optimal, feasible driving trajectories to be shown to the driver. It will be beneficial to have good software skills, and an interest in developing skills in artificial | |

intelligence (e.g. genetic algorithms) and other approaches to optimisation.

Russell, MJ Computer recognition of children's speech

Despite all of the advances in computer speech recognition, automatic recognition of children's speech is still a problem. There are many reasons for this. For example (1) children's vocal tracts are shorter than those of adults, so that resonances and other related phenomena occur at higher frequencies, (2) children's speech has higher fundamental frequency (pitch) and this affects the approaches to signal processing and feature extraction that are typically used, (3) children's speech is acoustically more variable than adult speech, because children's motor control of their articulators is still developing, (4) young children may not have learnt the full inventory of phonemes and will struggle with complex combinations of phonemes such as consonant clusters, and (5) children's vocabulary is typically relatively small and they may use unconventional grammatical structures.

The objective of this project is to develop a speech recognition system using the PF-STAR corpus of British English children's speech. The system should include known techniques for vocal tract length and pitch normalisation. The final part of the project will be to conduct experiments to discover whether speech recognition errors for children's speech can be attributed to language development issues.

Stone, RJ Augmented Reality & Maritime Heritage - Interactive Visualisation Techniques Supporting the Restoration and Mr Amirsalar Hosseini Sohi Presentation of HMS Caroline

HMS Caroline is a decommissioned WWI Cruiser (http://en.wikipedia.org/wiki/HMS_Caroline_(1914)) that is being restored with the aim of becoming a floating museum in the dock adjacent to where the Titanic was built in Northern ireland. Following the signing of a partnership agreement between EECE and the Royal Navy's National Museum in Portsmouth, the Caroline was selected as an ideal candidate for digital heritage treatment using VR and/or AR techniques. This project will be based on the use of AR to visualise - in situ - one or more of the vessel's engineering spaces that are inaccessible due to their remote location or hazardous contents.

Tarte, E How does electrode shape determine the sensitivity of a neural electrode?

Mr Willetts

Electrical signals generated by electrically active tissue, such as nerve fibres and cardiac muscle can be measured using a glass micropipette or a metal electrode. Micropipettes give a highly localised electric potential measurement, but are difficult to mass produce. In contrast, metal electrodes are simpler to fabricate, but a large interface impedance generally exists between the tissue and the electrode. This can be reduced by increasing their area, at the cost of decrease sensitivity. In this project, the relationship between electrode shape and sensitivity will be investigated using a current dipole in saline to model a biological source of electric potential. Electronics will be constructed to allow the sensitivity of different electrode designs to be investigated.

Tricoli, P Single-stage boost inverters for storage devices

Energy storage devices can be successfully used for many applications in electric power systems and electric transport. They can be used to smooth the power diagram generated by unpredictable sources, like PV arrays, or absorbed by variable loads, like trains and trams. The basic cells of many energy storage devices (electrochemical batteries, supercapacitors) have a typical voltage of few Volts. Therefore, a large number of cells must connected in series to reach the voltage levels usually required by power applications (hundreds Volts). In order to reduce the number of cells in series, DC/DC boost converters are used. However, many applications require AC power and, therefore, another DC/AC converter has to be used, with consequent increase of costs and reduction of efficiency. This project aims to study possible new topologies to obtain a single-stage DC/AC conversion with a boost for the input voltage, that is not possible for traditional DC/AC converters.