

**La Trobe University
Department of Electronic
Engineering**

2009 Student Project List

*A prospectus of projects available to final year
undergraduate students enrolled in ELE4EPA
and ELE4EPB, and as major projects for suitably
qualified masters students*

28 November 2008

Introduction

This document is a prospectus of projects proposed by industry and staff in the Department of Electronic Engineering, La Trobe University for 2009. These projects are available to students in the final year of the Bachelor of Electronic Engineering (and associated double degrees) as well as suitability qualified masters by coursework students in appropriate courses offered by the Department of Electronic Engineering. This list is not exhaustive and may be updated from time to time.

Students may also propose their own project and discuss their project idea with a member of staff whose interests overlap with the proposed project area. Should the member of staff accept the proposed project as being of appropriate academic and technical merit then the student may sign up to undertake the proposed project with the member of staff as their supervisor.

Members of staff can only supervise a limited number of students (masters and final year) and may reach their limit before all projects offered by them (in this document) have been taken. Individual staff can advise on their current availability to supervise projects.

It is highly recommended that students sign up for projects early (well before the start of semester), not only to maximise their chances of getting a project and supervisor of greatest interest to them, but also to enable them to start early on their project. University tests have shown that students who get an early start on their project generally perform better, make more substantial achievements, learn more and hence, obtain better grades for their project work.

ELE4EPA and ELE4EPB

These two units make up the 45cp project for students in the final year of the Bachelor of Electronic Engineering (or 4th or 5th years of associated double degrees). It is the responsibility of ALL students enrolled in ELE4EPA and ELE4EPB to sign up for a project and supervisor. This is done by discussing a proposed project with a suitable member of staff and having the member of staff agree to supervise the student and project. To formalise this agreement the "ELE4EPA/EPB Engineering Project Administration Form" must be filled out, signed and submitted to the Department of Electronic Engineering Reception, BG 432. Any student enrolled in ELE4EPA who has NOT sign up for a project and supervisor by the start of semester, will have a project and supervisor assigned to them!

Key Dates for ELE4EPA/EPB Projects Starting 1st Semester 2009

Friday, February 27, 2009: Last day for submission of ELE4EPA/EPB Engineering Project Administration Forms
Monday, March 2, 2009: Start 1st Semester 2008
Monday, April 6, 2009: Project Plan Due
Monday, June 1, 2009: Mid Year Progress Report Due
Week commencing Monday, June 1, 2008: Mid Year Presentations
Friday, June 5, 2009: End 1st Semester 2009
Monday, July 27, 2009: Start Second Semester

Wednesday, October 28, 2009: Final Thesis Due

Friday, October 30, 2008: End 2nd Semester

Mon/Tue/Wed November 2, 3, 4, 2009:

Final Project Presentations/Demonstrations

Major Projects for Masters by Coursework Students

Suitably qualified masters by coursework students may be offered the opportunity work on a major project as part of their masters course. To undertake a 45 or 60 credit point (as appropriate to the course being studied) major project, students are normally required to have achieved average results of 75% or greater in their studies at La Trobe University so far. A student will also be required to demonstrate that enrolment in a major project will not compromise their ability to complete required units in their course.

Masters students interested in undertaking a major project should seek out a prospective supervisor from the members of staff in the Department of Electronic Engineering. Should an agreement to supervise the student be granted by the member of staff, the "Major Project – Postgraduate Coursework Administration Form" must be completed and signed by both the supervisor and the postgraduate coursework co-ordinator. Key dates for major projects starting in 1st semester 2008 will be the same or similar to those listed for the ELE4EPA/EPB projects, above.

Projects offered by staff not listed in this document

At time of printing not all staff in the Department of Electronic Engineering had provided project outlines. If you are interested in working on a project under the supervision of a member of staff not listed in this document please approach them directly. Some members of staff may have reached their quota of students to supervise. Individual members of staff will be able to advise on their current availability to supervise students.

Questions

Please contact the Department of Electronic Engineering Project Co-ordinator, Jim Whittington (BG436) j.whittington@latrobe.edu.au if you have any questions on the allocation of projects.

INDUSTRY PROJECTS

Integrated Debugging Environment (IDE) for Mobile Phone (Industry Project)

Sponsoring Company:
Softronics www.softronx.com

Industry Supervisor:
Dr Anthony Overmars
ao@softronx.com
0417 328 112

Abstract:

Based on previous work this project will use the Eclipse IDE to develop a code building and code testing interface for a real mobile phone accessing it via the JTAG port.

The project skills will require some aptitude for interfacing to undocumented hardware (hacking) of the highest order and will require mapping of memory and input output address maps. The project will form part of a much larger phone development platform which is currently being developed.

Special interests or skills in determining undocumented firmware using software probing techniques would be an advantaged, but not necessary.

On site training will be provided and all hardware and platforms will also be provided.

Required Student Skills:

C/C++ Software development;
An interest embedded processors and systems.

Confidentiality:

Because of the complex nature of the phone development platform a Non-disclosure agreement will need to be signed.

Contact:

Jim Whittington
Office: BG436
Email: j.whittington@latrobe.edu.au

Soft 3G Modem under Linux (Industry Project)

Sponsoring Company:
Softronics www.softronx.com

Industry Supervisor:
Dr Anthony Overmars
ao@softronx.com

Abstract:

This project builds on previous project work and involves the development of a software radio architecture for testing quality-of-service (QoS) aware IP data services over a typical third-generation radio interface. The testbed will be implemented using a hard real-time microkernel known as RTLinux, running beneath the Linux operating system for providing real-time end-to-end functionality. Will also include development of RF front-end - based on a reference design.

Desirable Student Skills:

Experience with Linux OS
Software Development on Embedded Platforms
Interest in 3GPP; IP networks, and RF desirable

Confidentiality:

A student working on this project will be required to sign a legal confidentiality agreement (NDA) as a number of trade secrets and methods will need to be disclosed. All the necessary training and support will be provided by Softronics.

Uni Supervisor and contact:

Jim Whittington
Office: BG436
Email: j.whittington@latrobe.edu.au

Audit of Electricity used in VE Commodore device. (Industry Project)

Sponsoring Company:
GM Holden Pty. Ltd.

Industry Supervisor:
T.B.A.

Abstract:
T.B.A.

Uni contact:

Jim Whittington
Office: BG436
Email: j.whittington@latrobe.edu.au

**Presentation of CAN Data for use in a supplementary receiving device.
(Industry Project)**

Sponsoring Company:
Howard Instruments Pty. Ltd.

Industry Supervisor:
Rodger Howard

Abstract:

Howard Instruments is involved in the calibration of original equipment instrumentation and the installation of aftermarket instrument systems and complementary products in automotive and commercial vehicles.

Although the CAN data link layer is standardized, the fact that other protocol layers are left to the designers choice means that the transmitted data is invariably presented in a different fashion in each application.

Analysis of the data being generated for use in supplementary devices is therefore laborious as a consequence.

Howard Instruments is interested in supporting a project that analyses existing CAN data stream's and presents the information in a manner that can be used to program additional data receivers.

Desirable Student Skills:

Appropriate understanding of CAN bus systems and data structure.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Industry contact:

Rodger Howard
Howard Instruments Pty. Ltd.
03 94574755
howardinstruments@bigpond.com

Uni contact:

Jim Whittington
Office: BG436
Email: j.whittington@latrobe.edu.au

Acoustic Performance of Speaker and Enclosure (Industry Project)

Sponsoring Company:
Continental Corporation Australia.

Industry Supervisor:
Danny Edmunds

Abstract:

Analysis and development of speaker enclosures for both low cost and high end applications. To improve overall performance in low cost applications some signal processing may also be added to enhance the frequency response/performance. This may also involve changing the feedback circuit of the driver amp to give more gain at low frequencies.

This project will involve design and construction of a test jig to take measurements. The student will also be required to construct various speaker enclosures.

Desirable Student Skills:

Some interest and skill in mechanical design and construction

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Industry contact:

Danny Edmunds
Continental Corporation Australia
danny.edmunds@continental-corporation.com

Uni contact:

John Devlin
Office: BG 434
Email: j.devlin@latrobe.edu.au

Smart Water Usage Management System with Persuasive Technology (Industry Project)

Sponsoring Company:
Centre for Technology Infusion (CTI)

Industry Supervisors:
Prof Jack Sigh & Dr Harris Le

Abstract:

Water conservation, along with increased recycling and boosting supplies, is a key part of the plan of the Federal Government of Australia to secure the country's water supplies. Given water is a very scarce resource, there is an increasing need for an improved method to manage and conserve water. One effective approach to conserve

water is to have real-time information on water consumption available at consumers' end, through a smart water metering and water usage management system.

The aim of this research and development (R&D) project is to develop a consumer responsive and intelligent water usage management system, including the required hardware, networking and software as an integrated system. More specifically, the project will involve design and implementation in two key areas: (i) an intelligent low power chip (integrated circuit) for water metering, and (ii) an effective and secured networking method for monitoring and management of information related to water usage.

Up to four (4) students can work on various components of this project. While each student will work on an individual part, work may also include integration of various parts to produce final system.

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Contacts:

Prof Jack Sigh or Dr Harris Le

Office: Centre for Technology Infusion; phone: 9479 3763

Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

Design and implementation of a RF front-end for a WiMAX receiver (Industry Project)

Sponsoring Company:

Centre for Technology Infusion (CTI)

Industry Supervisors:

Prof Jack Sigh & Dr Harris Le

Abstract:

Worldwide Interoperability for Microwave Access (WiMAX) technology provides fixed, nomadic, portable and mobile wireless broadband connectivity. Theoretically, WiMAX can support data rate up to 70 Mb/s and maximum coverage of 50 km. To achieve the benefits of WiMAX systems, high performance RF transceiver is required and is one of the major challenges in WiMAX system implementation. There are typically two types of transceiver architectures used for WiMAX, namely low-IF and zero-IF architectures. A Low-IF architecture relieves the DC offset and flicker noise problems encountered in a zero-IF receiver, but it induces higher power consumption and cost due to the need of extra IF filter and down conversion of IF to DC. High level of integration and low power consumption suggest the zero-IF architecture as the best choice for WiMAX transceiver. In this architecture, the down conversion process is done using I/Q mixer, which is one of the most critical components. This

project aim is to design and implement a low cost low power consumption RF front-end for a (fully on-chip) for a WiMAX receiver.

Up to four (4) students can work on various components of this project. While each student will work on an individual part, work may also include integration of various parts to produce final system.

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Contacts:

Prof Jack Sigh or Dr Harris Le

Office: Centre for Technology Infusion; phone: 9479 3763

Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

**Design and implementation of a baseband section of a WiMAX
receiver
(Industry Project)**

Sponsoring Company:

Centre for Technology Infusion (CTI)

Industry Supervisors:

Prof Jack Sigh & Dr Harris Le

Abstract:

Worldwide Interoperability for Microwave Access (WiMAX) is increasingly gaining interests as an alternative “last-mile” technology to DSL lines and cable modems. This technology has the potential to support up to 70 Mbps of data per channel cell distance up to 50km. For WiMAX systems, its delay spread is typically over several micro-seconds which is easily longer than the guarding interval. It is very challenging to maintain the system BER performance for non-line-of-sight (NLOS) channels at high data rate transmission with high bandwidth. Therefore, the design of the baseband section is very important to ensure the proper system performance.

The scope of this project is to design and implement a baseband section of a WiMAX receiver on Application-Specific Integrated Circuit (ASIC). This project will investigate the possible implementation of the ASIC, the optimisation of the design, validation of the gate count, determination of power consumption, etc of the designed ASIC.

Up to four (4) students can work on various components of this project. Work can also include integration of various parts to produce final baseband design

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals;
Good knowledge of Cadence Design Suite desirable.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Uni contacts:

Prof Jack Sigh or Dr Harris Le
Office: Centre for Technology Infusion; phone: 9479 3763
Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

Design and implementation of a receiver for a radio telescope application (Industry Project)

Sponsoring Company:

Centre for Technology Infusion (CTI)

Industry Supervisors:

Prof Jack Sigh & Dr Harris Le

Abstract:

Radio astronomy demands receiver systems of exquisite sensitivity to detect the faint signals emitted by distant astronomical objects. This sensitivity is achieved by building low-noise, low-power, broadband receivers. In order to achieve these specifications, the receiver systems will need to be built from highly-integrated components to convert the incoming signals from the universe and transfer it to digital systems for analysis. The scope of this project is to design and implement a low noise, low power, broadband receiver for radio telescope application. The big challenge is to overcome the inherent noise in an integrated circuit while achieving broad frequency band and high system gain.

Up to four (4) students can work on various components of this project. While each student will work on an individual part, work may also include integration of various parts to produce final system.

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Contacts:

Prof Jack Sigh or Dr Harris Le
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Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

Design and implementation of a 2.4GHz transceiver (Industry Project)

Sponsoring Company:
Centre for Technology Infusion (CTI)

Industry Supervisors:
Prof Jack Sigh & Dr Harris Le

Abstract:

The current trend is moving toward wireless communication for home/consumer products due to the convenience and portability of wireless technologies. Some of the application includes consumer electronics, wireless game controllers, wireless audio, wireless keyboard and mouse, etc. All of these devices typically work in the 2.4GHz frequency band of, which falls under the license free ISM (industrial, scientific, and medical) band. Single chip low cost low power 2.4GHz RF transceiver is, therefore, important to efficiently enable the industrial and domestic wireless communication applications

The scope of this project is to design and implement a 2.4GHz transceiver, using 0.25-micron SOS technology. The transceiver will be direct conversion architecture, which has been proved to be the most suitable architecture for ISM wireless systems. This project will involve the design of both RF front end and digital backend, together with the design optimisation, validation and layout implementation. This project will provide invaluable design experiences for students perusing degrees in electronic microelectronic and/or telecommunication engineering.

Up to ten (10) students can work on various components of this project. While each student will work on an individual part, work may also include integration of various parts to produce final system.

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Contacts:

Prof Jack Sigh or Dr Harris Le
Office: Centre for Technology Infusion; phone: 9479 3763
Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

Automatic Meter Reading Project (Industry Project)

Sponsoring Company:
Centre for Technology Infusion (CTI)

Industry Supervisors:
Prof Jack Sigh & Dr Harris Le

Abstract:

Current trend of energy management is changing toward real-time monitoring and control. There is an emerging trend to use powerline communication (PLC) technology to send and receive data over existing power lines, which is a very low cost solution for automatic meter reading (AMR) and advanced metering as no additional infrastructure is required for the data communication. With the increasing pressure on electricity utilities to reduce cost, provide excellent customer service and accurate billing, AMR has become an integral part of a strategic plan to offer better service and convenience while increasing the level of control and maintenance over the entire system. The aim of this project is to develop real-time AMR using PLC technology. Applications on automatic control and management of home appliances, lights will also be developed and tested in this project.

Up to four (4) students can work on various components of this project. While each student will work on an individual part, work may also include integration of various parts to produce final system.

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Contacts:

Prof Jack Sigh or Dr Harris Le
Office: Centre for Technology Infusion; phone: 9479 3763
Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

Reliable and Secure Wireless Ad-Hoc Network for Vehicle-to-Vehicle Communication using DSRC (Industry Project)

Sponsoring Company:
Centre for Technology Infusion (CTI)

Industry Supervisors:
Prof Jack Sigh & Dr Harris Le

Abstract:

The emergence of the Dedicated Short Range Communications (DSRC) standard, that is a short to medium range wireless protocol specifically designed for automotive use,

has paved the way to implement a wireless ad-hoc network for vehicles, which can be used for communication among vehicles (vehicle-to-vehicle) and between vehicles and roadside equipments (vehicle-to-infrastructure). This, therefore, will facilitate the development of an intelligent network, which will provide solutions to improve vehicle safety, intelligence and efficiency. For example, vehicles will be able to “see” the traffic congestions, hazard of accidents (even out-of driver sight), produce less emission (more efficient on high way), encourage behavioural change (of drivers), etc. One of the major issues with the vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications is the reliability and security of such network, especially at high speeds. This project will involve the research into novel architectures, protocols and algorithms to increase the efficiency, reliability, security of the V2V/V2I communications.

Up to six (6) students can work on various components of this project. While each student will work on an individual part, work may also include integration of various parts to produce final system.

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Contacts:

Prof Jack Sigh or Dr Harris Le
Office: Centre for Technology Infusion; phone: 9479 3763
Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

Wireless Technology for Reliable In-Vehicle Communication (Industry Project)

Sponsoring Company:

Centre for Technology Infusion (CTI)

Industry Supervisors:

Prof Jack Sigh & Dr Harris Le

Abstract:

The amount of in-vehicle electronic has increased significantly. Mature wireless technologies can be adapted for developing a wireless network that can link-up in-vehicle electronics and systems to offer a universal interface to all electronic devices while reducing the cabling required in the vehicle. Such wireless network will offer a greater flexibility and portability to car industry as well as improve safety, value to end-users and reduce cost. In order to achieve these benefits, in-car wireless network will need to be integrated to the current network. This research will access the potential of employing wireless technologies to in-car environment.

One of the major issues with the wireless in-vehicle network is reliability, security and the error rate of the wireless communication, due to ambient noise in the

automotive environment. Unexpected communication errors or device failure in receiving data can have major safety and implications especially when vehicles are travelling at high speeds.

Up to six (6) students can work on various components of this project. While each student will work on an individual part, work may also include integration of various parts to produce final system.

Required Student Skills:

Good knowledge of digital design, receiver and communication system fundamentals.

Confidentiality:

A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality agreement will likely be required.

Contacts:

Prof Jack Sigh or Dr Harris Le

Office: Centre for Technology Infusion; phone: 9479 3763

Email: Jack.Singh@latrobe.edu.au or h.le@latrobe.edu.au

Model Auto-Documentation System (Industry Project)

Sponsoring Company:

NEC Australia. www.nec.com.au

Industry Supervisor:

T.B.A.

Abstract:

Develop a software tool to extract documentation strings from Acacia model, and present the documentation in a well organized HTML file, or a set of files. Note: Documentation strings are already available in the acacia source code, but some may need to be updated.

Required Student Skills:

Python, HTML

Uni Supervisor and contact:

Song Wang

Office: BG442

Email: song.wang@latrobe.edu.au

Optimisation of 4x4MIMO demodulation. (Industry Project)

Sponsoring Company:
NEC Australia. www.nec.com.au

Industry Supervisor:
T.B.A.

Abstract:

This project contains work for 2-3 students, and consists of:

- research to compare size/performance tradeoffs of the published methods.
- selection of the best candidate or propose original ideas.
- modelling to verify performance
- architecture development
- FPGA prototyping.

Required Student Skills:

As per above activities

Uni Supervisor and contact:

Song Wang
Office: BG442
Email: song.wang@latrobe.edu.au

Scalable architecture for matrix inversion (Industry Project)

Sponsoring Company:
NEC Australia. www.nec.com.au

Industry Supervisor:
T.B.A.

Abstract:

This project consists of:

- research to compare size/performance tradeoffs of the published methods.
- selection of the best candidate or propose original ideas.
- modelling to verify performance
- architecture development
- FPGA prototyping.

Required Student Skills:

As per above activities

Uni Supervisor and contact:

Song Wang
Office: BG442
Email: song.wang@latrobe.edu.au

100mw Mains Supply Standby Controller (Industry Project)

Sponsoring Company:
Karl Reed

Industry Supervisor:
Karl Reed

Abstract:

It is currently estimated that the average Australian house is consuming 60-80watts of main's power continuously due to the standby power requirements of typical domestic appliances. The result is that for a large city like Melbourne, with around 1.4 million households, the continuous standby consumption may be more than 100Mw¹ There is an international proposal for a "standard" of 1 watt standby consumption per device by 2012. (Your job to find the references).

The objective of this project is the design and demonstration of a standby controller with a maximum consumption of 100mW or less, with a production cost equal to or less than current standby controllers.

Part of the project is to review the current state of the literature and data on this issue, and to document current international trends and associated current and projected standards.

The project could also be extended to having a "connectionless" system in which these controllers could communicate with each other so that one of a number of "master" controllers can activate-deactivate slaves. (One solution could be signalling over the 240v wiring in a house).

Required Student Skills:

As per above activities

Confidentiality:

1. This project idea is the property of Karl Reed until a student agrees to undertake it.
2. A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality and IP agreement will likely be required.

Uni contact:

John Devlin
Office: BG 434
Email: j.devlin@latrobe.edu.au

¹ The average standby consumption used is based on a Queensland survey.

Digital Imaging Backs for 35mm Film Cameras (Industry Project)

Sponsoring Company:
Karl Reed

Industry Supervisor:
Karl Reed

Abstract:

Developments in digital photography now mean that the best digital cameras can match all but the best film in terms of image quality and resolution. Even so, there must be millions of people around the world who have made significant investments in high-quality film cameras some with removable backs. (Part of the project is to address this issue also replacing backs).

In many cases, the lenses available for these film cameras from makers such as Zeiss, Nikon, Canon, Minolta and Olympus (to name a few) constituted a very major investment. They are often far better than the cheaper lenses provided with even high-end digital cameras².

There is, therefore, a prima facie market for “digital backs” that will enable the owner of a good high-end film camera to migrate to digital imaging without having to throw away their lenses. (Hasselblad offer backs which they claim will operate with “...*The CF is easily attached to most professional medium-format SLR cameras and view cameras on the market...*” [Hasselblad 2008]).

Of course, there are interfacing problems which need to be solved. For example, transmitting user selected ISO to the “back”, or from the “back” to the camera. Autofocus should not be an issue, since the camera bodies already do this, so the back will not need to logic for this. The extent to which camera metering modes need to be shared also needs investigation.

I suggest that the “back” actually be as simple as possible. Current digital cameras have very large numbers of options. Most are of no interest to a film-shooter. An important design question is.....

What is the minimum set of functions that are actually necessary?

This project is to produce a generic design with interfaces that can be readily adapted for a range of high-end 35mm film cameras. A number of issues need to be explored in addition to those already mentioned.

E.G.:-

- a) Sourcing of sensors,
- b) Whether the basic logic and sensor can be set up so that they can be fitted to different cameras? That is, can we develop a “kit” for manufacturers to use.

² I have a set of Zeiss lenses for a Contax G1. None of my top Nikkor lenses are as good as these..)

- c) How much of the image quality related logic in a current digital camera can be treated in a product-line manner?

Of course, there will be more issues, these are just a few..

Required Student Skills:

As per above activities

Confidentiality:

1. This project idea is the property of Karl Reed until a student agrees to undertake it.
2. A students working on this project may have access to commercial material of a confidential nature, as such, a legal confidentiality and IP agreement will likely be required.

Uni contact:

John Devlin

Office: BG 434

Email: j.devlin@latrobe.edu.au

Reference:

[Hasselblad 2008] CF and CF-MS Digital Backs

<http://www.hasselblad.com/products/backs/cf-and-cf-ms.aspx>

ENGINEERING & RESEARCH PROJECTS

Remote Power Monitoring System for Green Power (Engineering Project)

Abstract:

T.B.A

Required Student Skills:

T.B.A

Supervisor and contact:

Peter Stewart

Office: BG435

Email: p.stewart@latrobe.edu.au

WWLLN Lightning detector (Engineering Project)

Abstract:

This project will involve the construction and commissioning of a lightning detector. The detector will be integrated into the World Wide Lightning Location Network (WWLLN) which produces a global real time map of the location of lightning. The lightning detector is a simple VLF receiver and antenna connected to a linux computer which communicates individual lightning detections to central servers in New Zealand and the USA where the information from all detectors is used to determine the location of the lightning. The WWLLN provides a complete reference design. See <http://webflash.ess.washington.edu/> for more details.

Required Student Skills:

T.B.A

Supervisor and contact:

Peter Stewart

Office: BG435

Email: p.stewart@latrobe.edu.au

Vortex (Engineering Project)

Abstract:

T.B.A

Required Student Skills:

T.B.A

Supervisor and contact:

Peter Stewart

Office: BG435

Email: p.stewart@latrobe.edu.au

Sports Radar (Engineering Project)

Abstract:

A miniature radar to measure the speed of cricket balls, tennis balls etc. The radar will be battery powered and based on a 10GHz doppler module and a low power Texas Instruments MSP microprocessor. Speed data will be communicated via a 2.4GHz radio link to a remote pc for processing, display and data logging.

Required Student Skills:

T.B.A

Supervisor and contact:

Peter Stewart

Office: BG435

Email: p.stewart@latrobe.edu.au

Radar vehicle detector mote (Engineering Project)

Abstract:

A self-contained vehicle detector using microwave radar for sensing vehicle presence. The radar will be battery powered and will be installed on a road in the traffic lane. The sensor will produce an output when a vehicle is directly above it. Communication will be via 2.4GHz radio link. The detector will be controlled by a low power Texas Instruments MSP microprocessor.

Required Student Skills:

T.B.A

Supervisor and contact:

Peter Stewart

Office: BG435

Email: p.stewart@latrobe.edu.au

TIGER front Panel (Engineering Project)

Abstract:

This requires the modification of a circuit to remove an RS485 interface and add an Xport interface in its place. The PCB needs to be modified very neatly and carefully. Software to run on the embedded Z8 processor then needs to be written to monitor various analogue voltages, serial port messages, switches etc and display values on an LCD. The Z8 also needs to respond to requests to supply the data it displays over a network connection (Xport). A PC application will need to be written (in C++ or C#, or even Java) to access the Z8/Xport over the web and display the information. The PC application will need to have the ability to be able to access up to 50 different Xport/Z8 combinations plus other devices and display their data.

Required Student Skills:

Hardware design skills – moderate
Software design skills for embedded C - high
Software design skills for Visual C++ on PC – high

Supervisor and contact:

John Devlin
Office: BG434
Email: j.devlin@latrobe.edu.au

OMNIBOT (Engineering Project)

Abstract:

The omnibot has been developed over the past few years. It is a 3 wheeled robot with servo motors and feedback. It also incorporates distance sensing and “mouse” sensors for measuring distance. A demo system is to be developed using wireless access to control the system. Alternately an autonomous system could be developed for the robot to undertake a set sequence of tasks.

Required Student Skills:

Hardware skills – high
Software skills (embedded C, or real time Linux & C) - high

Supervisor and contact:

John Devlin
Office: BG434
Email: j.devlin@latrobe.edu.au

Train Velocity Control using Matlab (Research Project)

Abstract:

The project aims to design a system for velocity control of a train that ensures that the actual velocity is within a specified percentage of the desired range. The project involves:

- A continuous-time model of the DC motor and the train in the form of mechanical and electrical equations.
- Open-loop analysis in both time and frequency domains.
- Control configuration.
- Velocity controller design and evaluation.

Required Student Skills:

Strong Matlab (and in particular Simulink) programming skills
Theoretical research
Familiar with feedback control theory

Supervisor and contact:

Song Wang
Office: BG442
Email: song.wang@latrobe.edu.au

Wavelet Filter Bank Design and Evaluation (Research Project)

Abstract:

This is a research type of project to implement design algorithms on a GUI driven user-friendly platform. Both Matlab and web-browser based platforms will be considered. User-friendly platforms for evaluation in applications such as denoising will also be considered. Algorithms such as Zero Pinning, developed by A/Prof. Tay, will be implemented. The outcome of the project will be a user friendly software platform that can be accessed by anyone through the web for design and evaluation.

Required Student Skills:

Good knowledge in DSP and mathematics.
Good programming/debugging skills in Matlab and C.
Web-based programming utilizing (Java) applets.

Supervisor and contact:

David Tay
Office: BG440
Email: d.tay@latrobe.edu.au

Limited Word Vocabulary Recognition using Wavelets and Neural Networks (Research Project)

Abstract:

The aim is to be able to automatically recognize simple spoken words like “zero”, “one”,, using a computer / microprocessor. This project will examine the feasibility of using wavelets as a feature extraction tools to be used as inputs to the neural network which performs the task of recognition. It will involve some research to determine what type of wavelet decomposition will give good recognition performance and the limitations of the system. The outcome of the project will be a software platform that implement the algorithms and enable the user to test and perform recognition.

Required Student Skills:

Good knowledge in DSP and mathematics.
Good programming/debugging skills in Matlab and C.

Supervisor and contact:

David Tay
Office: BG440
Email: d.tay@latrobe.edu.au

Digital Watermarking using Quantization Index Modulation (QIM) (Engineering Project)

Abstract:

This is a research type of project which will first involve reviewing watermarking algorithms based on Quantization Index Modulation. The second part of the project will involve implementing several of the algorithms in Matlab for testing the performance of the algorithms and for demonstration purposes. The outcome of the project will be a software platform that implement the algorithms and enable the user to test and perform watermarking.

Required Student Skills:

Good knowledge in DSP and mathematics.
Good programming/debugging skills in Matlab.

Supervisor and contact:

David Tay
Office: BG440
Email: d.tay@latrobe.edu.au

Insectabot (Engineering Project)

Abstract:

Biologically inspired design describes the process where engineers copy aspects of nature which work well and integrate them into their designs. The aim of this project is to create and design algorithms to control a 6-legged, insect inspired walking robot. The student will need to design the hexapedal walking system, which will likely be implemented by using dual servos to provide two degrees of freedom for each leg. A microcontroller will be programmed to drive each of the legs and allow the robot to walk.

Different walking algorithms will need to be evaluated and chosen based on trade-offs between stability and speed. Additional extensions which would be highly desirable are: obstacle avoidance, line following capability, autonomous control and maze traversal.



Required Student Skills:

Proficiency in embedded C programming

PCB design skills will prove valuable

Mechanical/physics background would prove to be valuable

Supervisor and contact:

Robert Ross

Office: BG417

Email: r.ross@latrobe.edu.au

Near Space Sensor Package (Engineering Project)

Abstract:

On a daily basis, meteorologists routinely launch disposable radiosondes – small packages of embedded sensors which are carried by high altitude weather balloons. These packages typically have an array of sensors and a RF link which transmits sampled data back to a ground station.

The goal of this project is to create a reusable, recoverable radiosonde, which will reach an altitude in the order of 30km. Redundant communications interfaces will need to be designed and interfaced with a GPS and various atmospheric sensors (temp, pressure ect). The student will need to design their device to withstand cold temperatures (-45 degrees), a landing (parachute based) whilst devising hardware to capture data, photographs and video from altitudes up to 30km.



Required Student Skills:

Proficiency in embedded C programming

PCB design skills will prove valuable

Mechanical/ Physics background may assist – but is not mandatory

Supervisor and contact:

Robert Ross

Office: BG417

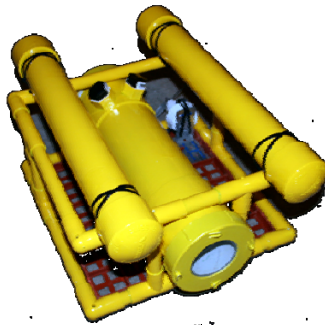
Email: r.ross@latrobe.edu.au

**ROV Mk II
(Engineering Project)**

Abstract:

Submersible ROV's are small underwater vehicles designed to be driven remotely for underwater exploration with video and sensory feedback. The first La Trobe ROV project was undertaken in 2008 and featured a rather bulky yet functional ROV which was completed with limited functionality. Some details on the original project can be found at: www.rross.com.au/rov.html

The plan for Mk II is to create a streamlined ROV - providing better speed and handling (including roll control – constituting an additional degree of freedom). The student will need to develop hardware to drive the ROV motors, make sensor measurements (pressure, temperature, battery, inertial) as well as providing back to surface communications (both data and video). Some extensions could include Pan/Tilt camera, wireless optical communication to a buoy, and remote control over the internet or using an XBOX controller.



Required Student Skills:

Proficiency in embedded C programming

PCB design skills will prove valuable

Mechanical or physics background may assist – but is not mandatory

Supervisor and contact:

Robert Ross

Office: BG417

Email: r.ross@latrobe.edu.au

Robosoccer (Engineering Project)

Abstract:

Robosoccer is a fascinating and competitive area of AI research providing huge scope for testing and future development. The aim of this project is to create a pair of small robots which would be suitable to play Robotsoccer with. Their features will included – bi-directional differential control, a ‘kicker’, wireless communications to a computer coupled with sufficient torque and speed to push around a small ‘soccer’ ball.

Ideally it would be excellent to provide a connection to the web – allowing people to log in and play Robosoccer against each other or other autonomous robots based on the live video feed. Robot autonomy would be considered an extension project

**Required Student Skills:**

Proficiency in embedded C programming, and PC software development

PCB design skills will prove valuable

Mechanical/physics background preferable

Supervisor and contact:

Robert Ross

Office: BG417

Email: r.ross@latrobe.edu.au

Smart Tap (Engineering Project)

Abstract:

Electronic controls to automatically turn on a tap (when hands are been detected) have been around for years. These systems provide little fine-tuned control – when hands are detected they open a valve fully and allow as much water flow as manual valve allows. The aim of this project will be to create a ‘smart tap’ which will provide (non-touch) adjustable control as well as water flow monitoring.

Using an array of IR transistor/LED pairs a gesture control system will be created – when a user swipes his hand past left to right the system will increase the flow of water – in the opposite direction the flow of water will be decreased. Flow sensors will be used to measure the amount of water flowing and display this on a LCD screen – along with other useful metrics (eg. Water used over last 24hour period, water temperature).

An additional feature which could be implemented would involve creating gesture control for the temperature of the water – allowing hot and cold water to be mixed in together.



Required Student Skills:

Proficiency in embedded C programming
Mechanical/physics background preferable

Supervisor and contact:

Robert Ross
Office: BG417
Email: r.ross@latrobe.edu.au

Design and Evaluation of Digital Transceiver Hardware for HF Radar System (Research Project)

Abstract:

The TIGER Radar research group is involved in the design, development, installation and use of HF radar systems. The Tiger group is interested in the design, evaluation and refinement of digital transceivers and/or sub blocks of digital transceivers for potential installation at one of its radar sites. Xilinx FPGAs are used as the digital hardware platform for implementation of the transceivers are Xilinx FPGAs.

This project will initially involve the evaluation of current digital transmitters and receivers through modelling and laboratory experimentation. Followed by an investigation of adaptations and refinements required to incorporate digital receivers into the current radar systems (hardware and software). Should the project progress well some studies in the field may be possible.

This project would be particularly suited to students in the Bachelor of Electronic Engineering/ Master of Telecommunication Engineering program.

Required Student Skills:

There may be scope in this project to support more than one student. Skill coverage of one or more of the following will be essential.

- FPGA Design and testing;
- DSP, digital design and communication system fundamentals;
- Good programming/debugging skills in Matlab and C/C++.

Supervisor and contact:

Jim Whittington

Office: BG436

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