CONVEYOR FEASIBILITY STUDY (12cp)
Adrian Fernandes - A07-101

Supervisor : Mr Garry Marks
Assessor : Mr John Dartnall
Major: Mechanical and Mechatronic Engineering

Conveyor technology used by the Australian logistics sector has been the same design and functionality over the past three decades. Innovation into using self-driven brushless DC motors instead of AC motors has allowed for smarter conveyor functionality, more product throughput, and power savings. The main drawback to these new conveyors is the initial capital costs and also the time required for installation.

This feasibility study looks into a new conveyor product developed as a global effort to standardise the equipment that is supplied from a global materials handling supplier. This new conveyor product is based on a principle of plug and play modularity, on-board controls devices and fewer spare parts. This study focuses on the implications of using this equipment in Australia with regards to the key factors of why a customer will chose to automate their logistics system. It will also go through what changes need to be made to ensure that this conveyor meets Australian Standards. This study also provides a literature review into the technical, political and cultural factors among others that are driving the materials handling company to modernise their conveyor equipment.

EVALUATION OF PERLITE FINES IN RELATION TO CONTROL WITH COMBINED SILICA FUMES
Ken Vo - S07-175

Supervisor : Ravi Ravindrarajah
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Civil Engineer

The production of Portland cement (PC) can have damaging effects on the environment, in terms of its amount of greenhouse gases emitted during its manufacturing cycle, which contributes to global warming. On a global scale, PC production is responsible for generating about 5% to 10% of total CO_2 emissions derived from anthropogenic human induced activities.

A reduction in PC consumption therefore will significantly reduce energy consumption for the building and construction industry, thus, reducing CO_2 harmful emission pollutants. In this perspective, the use of industrial derived waste products to blend with PC helps not only to reduce energy consumption but also assists to conserve depleted natural resources and to help problems encountered in disposal of the waste, destined for landfill purposes

One way of reducing PC consumption is by using supplementary cementitious materials (SCM) from the siliceous-aluminous rich waste by-products of industrial operations that fall under the classification of pozzolans. While artificial created pozzolan wastes from industrial by-products have been an accepted well-established practice in recent years, the potential of naturally derived mining wastes as a SCM for construction material is yet to be fully explored. In this study, the use of one such waste material is to be investigated, perlite fines, resulting from ore processing to expanded form.

This study involves investigating the pozzolanic reactivity of perlite fines at substitution levels of 20%, 40% and 10%/10% silica fume blends over PC replacement in mortar cube specimens, at periods of 3, 7, 14, 28, 56 and 91 day ageing in terms of strength activity index development through compressive strength testing. Additionally, the effects of drying shrinkage over 7, 14, 21, 35, 63, 119, 231, and 455 day ageing will also be examined for these mixes.

INVESTIGATION INTO LOCALLY FIRED CERAMIC WATER FILTERS (6cp)
Luke Evans - S07-041

Supervisor : Dr Prasanthi Hagare
Assessor : Associate Professor Huu Hao Ngo
Major: Civil and Environmental Engineering

Lack of access to an adequate supply of clean water for drinking, cooking and sanitation affects 1.2 billion of the Earth's population, and is a direct cause of 2 million deaths annually, most of these children under 5. The global community sees this as such a significant issue that it was incorporated into the UN Millennium Development Goals (MDG), and the 2005 to 2015 decade was declared by the UN as the International Decade for Action: Water for Life.

In response to this issue, new technologies have emerged that allow point-of-use treatment of water. These technologies are of a great importance, as they allow low cost, low technological solutions and can be applied to a variety of situations with only minor changes.

One such treatment method is ceramic filters. These filters are made using locally available clay, mixed with some form of organic material that can range from sawdust to rice husks. These filters have proved effective in the removal of faecal coliforms such as E. coli as well as having positive effects on suspended solids, turbidity and other water quality parameters.

However, at present these filters are fired in kilns – which require a significant capital outlay to buy, and which create a centralised operation that may prevent access to this technology by rural populations.

This project examined filters that were fired in small, local fires that may be fuelled by manure, wood, or some other locally available fuel. These filters were compared with their kiln fired equivalents to determine if they were still capable of the same level of water quality improvements. If so, it would allow a great many more people access to a simple technology that could greatly improve their health and quality of life.

DESIGN & TESTING OF MOUNTING MECHANISMS FOR SANDBLASTING & SENSING APPARATUS (12cp)
Benjamin Gilles Metman - A07-115

Supervisor : Dr Dikai Liu
Assessor : Gamini Dissanayake
Major: Mechanical & Mechatronic Engineering

A number of steel bridges were originally covered in paints containing toxins such as lead and asbestos. The use of such substances has inadvertently created environmental and health risks that, with the benefit of improved chemical understanding, we are now able to appreciate. The ongoing maintenance and repair of such bridges poses significant problems for responsible parties.

In order to achieve the design goal, an automated robotic system was proposed, capable of sensing and mapping the bridge environment before sandblasting the desired areas to remove paint.

For this system to operate, various pieces of sensing and sandblasting equipment must be attached to robot's end effector, without restricting the robot's motion. The aim of this thesis was therefore to develop and test mounting mechanisms able to accurately and precisely attach the necessary apparatus.

Designs were created and modelled in 3D CAD software to suit the required OEM parts, before being manufactured out of lightweight and cost-effective aluminium. As mounting mechanisms are likely to experience excessive wear, the parts were kept modular (i.e. fastened rather than welded) so that only worn sections need be replaced. Bearings were incorporated into the sandblasting mechanism to alleviate some of the potentially dangerous forces caused by the rigid hose. Space is also allocated on the sensing mechanism for future hardware expansion.

Lab testing should prove that both systems provide cost-effective, strong and reliable means for mounting to the robot. It is likely however, that the design will need to further adapt as force reduction and hose management systems are incorporated onto the autonomous sandblasting system.

VIRTUAL PORTAL
Wanwen Wen - A07-089

Supervisor : Dr Zenon Chaczko
Assessor : Dr David Davis
Major: Software Engineering

The growth of software applications and tools being used to enhance team collaboration for software development is becoming a trend. Failure of some projects is not from a lack of reports, charts, or expertise of project members, but from a lack of effective collaboration.

There are changelings for multiple work centers distributed worldwide to effectively work on a project via the same development environment. Each team may have their preferred applications and tools for managing tasks, allocating resources and conducting clear communication channels among team members. It is necessary to have a centralized application that has access to various other applications within the same development environment.

Virtual Portal (V-Portal) solves this problem by providing portal-based solutions that improve the collaboration between multiple teams working on the same project. The V-Portal is a prototype built in this Capstone Project over a period of two semesters in 2007. It is intended to provide services for aggregation and organization of applications and tools, as well as for synchronization of data and other information services within one portal environment.

Apart from offering above primary services, the motivation behind the development of V-Portal is to enable effective task allocation, task execution, task transfer coordination and communication among collaborating team members in all distributed work centers. The benefit of using the V-Portal is to reduce the time and the cost of travel abroad and to allow all members of the community to experience international collaboration.

RETROFIT APPLICATION OF ELECTRONIC ENGINE MANAGEMENT AND TURBOCHARGING TO THE BMC A-SERIES ENGINE (12cp)
Daniel Osborne - A07-033

Supervisor : Dr Guang Hong
Assessor : Mr John Dartnall
Major: Mechanical Engineering

Engines designed in the modern era make efficient use of complex engine management systems to reduce emissions and increase performance. Retrofitting electronic engine management systems to older engine designs will become essential in future years as part of reducing greenhouse gas emissions, especially of popular classic cars still in existence.

Unfortunately, retrofitting engine management has proven difficult with particular engine designs, the BMC A-series being one of those. The problems faced in dealing with the retrofit are not just physical limitations within the engine compartment but also with the control of the fuel timing due to shared intake port arrangement. This problem is not unique and work from this project can be equally applied to other engines that have similar intake port arrangements.

The project covers the retrofit design, installation and experimental testing of an electronic engine management system and associated components fitted to the BMC A-series engine. The engine is also equipped with a turbocharger to increase output and complicate the intrinsic problems of the engines design. Part of the project details the fitment of the engine to the dynamometer and testing processes.

The engine testing results are covered in detail and show how the engine management system deals with the problem through individual cylinder tuning. The results also show that the only significant limiting factor to retrofitting engine management systems to older designs is cost.

AN INVESTIGATION INTO MICRO SYNTHETIC JET ACTUATORS (12cp)
Anthony James Schiemer - A07-058

Supervisor : A/Prof Guang Hong
Assessor : Dr Phuoc Huynh
Major: Mechanical Engineering

This investigation was developed in order to explore the effects of varying electrical inputs and determine the relevance of the positioning of micro synthetic jet actuators (SJA) on certain boundary layer properties of an air stream, and the subsequent impact on the boundary layer short bubble separation across a flat plate experimental rig. Several independent variables were incorporated into the experimental analysis, including forcing frequency, forcing amplitude (voltage) and jet position. An analysis of a selection of boundary layer properties was made at a variety of positions along the air stream. The subsequent results were recorded and illustrated graphically in order to determine the relevance and significance of each variable.

By introducing instabilities from synthetic jet actuators at three different positions along the rig, a comprehensive compilation of data was obtained throughout the course of the experimental procedure. This data was then analysed, and various values for boundary layer properties were determined for different forcing frequency and forcing amplitude inputs for each individual jet position. The primary properties that provide the focus of this project consist of momentum thickness and displacement thickness and their subsequent contribution to the collapse of an artificially generated short bubble detachment.

It was previously known that the positioning of the jet and the forcing frequency were of critical importance to the preferred generation of a turbulent air stream, and that the forcing amplitude affected the air stream momentum. All three variables have been tested in conjunction with one another throughout an assortment of settings, and their effects analysed and discussed. In conjunction with previously conducted studies on the same experimental data, it has been determined that the effects of flow instabilities (created by the fluctuation of the micro jet membrane due to the applied forcing frequency) in conjunction with the addition of momentum (as a result of the forcing amplitude) create an environment where the detachment bubble will be considerably affected. Whilst the outcomes of this study have shown that the forcing amplitude has little effect on relevant boundary layer properties, the forcing frequency and the position of the jet both prove critical with regard to their effect on desirable boundary layer properties, including a reduced displacement thickness and an increase in air stream momentum.

ENABLING ADAPTIVE MOBILE ACCESS TO SERVICES AND PORTALS (12cp)
Gia Hieu DINH - A07-064

Supervisor : Johnson Agbinya & Jenny Liu (NICTA)
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Software Engineering

Currently, enhancing the interoperability of Web 2.0 Technologies over mobile devices remains a challenge to software engineering. Resource limitation of mobile devices and non-adaptability of web server application has restricted the interaction between the two aforementioned technologies causing clients difficulties in handling the response in an appropriate manner. This project proposes an Adaptive Service Middleware Architecture liable to enhance interoperability of Web 2.0 Technologies over mobile devices through minimizing the barrier from web server application non-adaptability. The architecture makes a twofold contribution to enable the mobile access to web services and interactive portals. As for web services, a proof-of-concept implementation has been developed to demonstrate the adaptiveness of the architecture while invoking a third-party Amazon Web Services. A number of performance measurements have also been conducted based on this implementation to evaluate the performance overheads of the adaptive components. The results have proved that the overheads that adaptive components incurred are insignificant to the non-adaptive approach. In addition, the architecture can also be extended to an interactive portal which is accessible from mobile devices. This portal can adaptively render other third-party portlets that follow the Java Portlet Specification (JSR-168) standard and Web Services for Remote Portlets (WSRP) standard. Once the architecture is implemented, it can act as a transparent middleware that enhances the adaptiveness of the servers to minimize the resources required from mobile devices.

A LIGHTWEIGHT TOOL FOR RELEASE MANAGEMENT IN SMALL-MEDIUM ORGANISATIONS
Michael Davidson - A07-070

Supervisor : Dr YourSupervisorsName
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

Making software applications available to their intended users can be a complicated problem. A lack of engineering knowledge and resources in small-medium organisations often means that many projects end up being deployed by inflexible tools or manual processes. This can lead to problems in the deployment, lengthening of the release cycle or schedule blowouts when deploying a release.

This capstone shows that formal Release Management processes are often outdated or unsuited to Web Applications or small-medium organisations. Case studies of several small and medium organisations and their current methods for Release Management confirm this hypothesis.

The diversity of Change Management and Configuration Management systems, deployment techniques and Definitive Software Libraries lends itself to a flexible and extensible approach. Capstone case studies determine what the Release Cycle, as seen by a Release Management tool, constitutes and a set of interfaces required for support. The capstone proposes an architecture for a suitable Release Management tool, in full detail, including a working prototype, which is undergoing initial tests at one case study site, with good initial results.

In addition the Capstone reports on the effect of release automation and subsequent reductions in the Release Cycle when using the tool. While the focus of this effect is generally in the context of Agile Development technologies, such as eXtreme Programming, conventional Software Engineering management models and practices, such as the Capability Maturity Model and the I.T. Infrastructure Library are also considered.

DESIGN AND DEVELOMENT OF A DVT PREVENTION DEVICE (12cp)
Melissa Hayes - A07-026

Supervisor : John Dartnall
Assessor : David Eager-As Advised By John Dartnall
Major: Mechanical Engineering

"The research and design of a preventative device for flight related Deep Vein Thrombosis and an investigation into the condition and its affects to the flying population."

Deep Vein Thrombosis is a common disease related to extended periods of immobility. There are a number of devices on the market that currently treat this and more specifically to prevent its occurrence in long haul flights. One main issue with these devices are the restrictions associated with carry-on luggage on board passenger planes. This thesis details the research and design of my device that does not only meet market and customer requirements, but also compiles with airline safety standards.

The investigation and research into the areas of Deep Vein Thrombosis covers a literature review of the disease in order to gain an understanding of the area being addressed, the affects, causes and possible preventative measures. To support the sources used in the literature review and thus the data gathered, opinions from experts are supplied.

An in-depth analysis of current devices and potential up-coming devices has been performed to set up comparison criteria for my resulting device. In relation to the devices, airline companies are extensively examined to gain the knowledge of the restriction variations between carriers.

The design concentrates on increasing the movement of the legs and thus increasing the flow of blood through the veins and to the heart. A seated stepping exercised is required to operate my product by stepping up and down onto a small, light weight polyurethane device. Designed in a rectangle shape the device is made of two halves, one for each foot, with a top and bottom plate supported by flexible bends, which deform and compress when pressure is applied by the users feet.

A COMPARISON OF REAL TIME RENDERING TECHNIQUES (12cp)
Timothy Cooper - S07-029

Supervisor : Kevin Suffern
Assessor : Zenon Chaczko
Major: Software Engineering

Since the advent of hardware Graphics Processing Unit's (GPU) the field of realtime computer graphics has taken a number of leaps forward in regard to the quality and performance of the effects that can be achieved. In the current state of the art these effects are achieved using 'shaders', small applications which are executed on the graphics hardware which allow a three dimensional scene to be shaded and illuminated in a realtime fashion.

The field of realtime computer graphics has many applications, ranging from military simulation software, all the way through to entertainment software such as video games. The goal of all these applications is to effectively model the real world, and provide an immersive environment which the users 'avatar' can navigate. Unfortunately for the developers of realtime graphical applications, it is difficult to predict the performance trade-offs associated with each specific graphical technique.

A rendering engine has been developed to analyse and compare different rendering techniques subjectively. The engine, in conjunction with an array of implemented graphical techniques, has provided performance and quality metrics on a variety of rendering techniques with regards to the performance of a realtime rendering engine. The project addresses several cutting edge techniques such as High Dynamic Range Lighting, Ambient Occlusion, and Deferred Shading. The engine was designed and developed to allow addition of new techniques using a plug-in based architecture, ensuring that it can be used in the future to implement and analyse new rendering techniques as they become available on the graphics hardware.

Due to the rapidly moving field of realtime graphics, there is currently a lack of data relating to the performance of cutting edge realtime rendering techniques. The developed engine, and implemented rendering techniques form a basis for this Capstone which provides useful information to industry about how a specific technique will effect the performance of graphically intensive applications.

TUNNELS IN GENERAL ROADS
Xin Yu - S07-184

Supervisor : Ken Halstead
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

Continuing metropolitan development has imposed great pressures on the transport network in Australia. In recent years, tunnels have become a popular solution to accommodate traffic on overcrowded roads. Hence, it is necessary to evaluate the impact of tunnels, and investigate the suitability of their design and construction under various conditions.

The objective of this report is to recognise the importance of tunnels, explore the procedures of design and construction, investigate the essential service facilities and maintenance programs, as well as examine the environmental and social impacts of tunnels. Secondary research was conducted, focusing on books and articles published by academic institutions and professionals in tunnel engineering.

The research has revealed that tunnels can reduce traffic congestion and improve travelling conditions by offering a safe alternative corridor. Geology plays a dominant role in many major decision-making in designing and constructing a tunnel. Factors such as ground water, risk management and safety remain as the major concerns in all tunnelling projects. There is a range of standards and legislation governing the design, construction and impacts of tunnels. As an underground structure, tunnels are less vulnerable to seismic actions.

Furthermore, adequate facilities for services such as the ventilation system, and sufficient maintenance program should be available to ensure public safety and achievement of the design life of the tunnel. Adverse effects of tunnels on the environment should be avoided or minimised during the construction and operational phase of the tunnel. They also have both positive and negative social influences on the nearby community.

On the basis of this study, it is recommended that intensive geotechnical exploration should be carried out to minimise the uncertainties of ground conditions. Adequate design and safe construction should be promoted to enhance the quality of the final product. Environmental and social impacts of tunnels should not be overlooked during all stages of a tunnel project.

CASE TOOL FOR REQUIREMENTS ANALYSIS FOR 24/7 CONTINUOUS SOFTWARE DEVELOPMENT (12cp)
Jenny Quang - A07-072

Supervisor : Zenon Chaczko
Assessor : Dr Xiaoying Kong
Major: Software Engineering

The most important stage of the software development lifecycle is the beginning. At the beginning is where the foundations of the project are laid. At the beginning is where the requirements for the project is documented, agreed upon and forms the basis of a contractually binding agreement. The ability to cultivate a quality software requirements document is a skill that is uncommon, however, at this point in time; the human function of analysing requirements cannot be replaced. So as a means of aiding this important phase of a project and the people involved, a simple, no fuss CASE tool for requirements analysis will be developed, as a structured approach to improving documentation and increasing its effectiveness.

As more and more organizations expand their operations across the globe, a new phenomenon has emerged where 24/7 development is occurring. Where the sun sets in one location, the sun rises in another, making it possible for teams geographically located at differing sites to collaboratively and continuously work on a project and effectively keep a project running at all times. So with the internet growing rapidly and the trend to shift applications from the desktop to the web, this 'CASE Tool' will be web-based – allowing access to the tool at all times and at all locations.

There are many different CASE tools on the market today, focusing on writing use cases and are generally so overloaded with gratuitous features, the tool itself becomes a impediment, becoming too complicated and inefficient to use, and just getting started will require extensive overhead. This 'CASE Tool' focuses on the documentation, not just parts of it, and enforces the use of industry standards, such as IEEE Recommended Practice for Software Requirements Specifications (IEEE 830-1998), in producing a structured software requirements document. It will also serve as a centralised data repository and enable data sharing across differing time zones, locations and system platforms/formats. To minimise any unnecessary overhead, the aim of 'CASE Tool' is to be quick and simple to use, straight to the point without any of the superfluous features we see in tools today.

TO BE SOLAR, OR NOT TO BE?
Liang - ???

Supervisor : Dr YourSupervisorsName
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

To be solar, or not to be? The bloom of semiconductor technology excites the development of photovoltaic and this leads to a rapid increase in use of solar energy applications with a statistic of 5.7GW of photovoltaic power capacity available in 2006, which is an increase of 15% over the previous year, 576% over the past five years, and 2,334% over the past decade according to a 2006 survey report by International Energy Agency (IEA). That is a big step solar energy technology has made to be recognised. But why do we need solar energy technology to provide such an immense amount of energy? This thesis begins with an overview of our global energy demand both historically and statistically in detail to draw an estimation of our future energy need with a brief analysis in current global energy issues such as depletion of fossil fuels, booming greenhouse effects and CO_2 emissions. A brief is then presented that explores and analyses energy alternatives, i.e. renewable energy technologies to demonstrate that solar energy technology is the most appropriate option to tackle current global issues. A study follows that investigates current development of solar energy technology and systems and physics of photovoltaic in depth providing background knowledge and scientific concepts that form a variety of categories of solar photovoltaic panel. This understanding is inherited to support a Remote Area Power Supply (RAPS) solar system design in regards of numerous aspects using a systematic approach with components selected through an exploration and analysis stage with a wide range of availability. A methodical integration procedure is then implemented to turn the system design into a prototype with a number of interfacing methods for communication between interconnecting components. In the final chapter, the prototype is implemented in accordance with test criteria to provide practical data and results for a set of engineering calculations in terms of system output voltage and current and a comparative analysis with electrical outputs of an existing RAPS system to demonstrate the performance of the designed system and to analyse relevant factors such as type and area of the photovoltaic material, the intensity of the sunlight and the wavelength of the sunlight, and errors and uncertainties, that influence the efficiency of the designed system. A test conclusion is then drawn with a possible alternative design concept presented in considerations of the test outcome and the relative factors. The work presented in this thesis demonstrates the applicability of a solar energy storage system and shows how the solar energy storage system can be designed and implemented in a systematic method with calibration to the relevant factors to improve the performance of the solar energy storage system.

AGILE METHODOLOGIES AND THE ENTROPY THEORY OF THE HUMAN MIND
Samyukta Menon - ???

Supervisor : Dr YourSupervisorsName
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

For many years, scientists and mathematicians have been applying the theory of entropy and the second law of thermodynamics to social systems, in particular human behaviour. Physical entropy is defined as the unavailability of energy within a system to do work. Entropy law states that all systems tend toward high entropy states spontaneously, that is, all systems naturally tend towards a state of disorganisation and degradation. While this definition is pivotal to the mechanics of the Second Law of Thermodynamics, this article aims to use it, with its various forms, to provide explanations for certain human behaviour. The focus of the article is how human behaviour and social attitude when applying Agile Software methodologies in developing software, diffuses software entropy within a system. Physical entropy laws can be used to explain the degradation and disorganisation within a system, specifically software systems, and the ways in which development teams aspire to conquer such calamities, thus decreasing software entropy and advertising attractiveness of products. Results: The generalised entropy theory of information is first looked at in relation to the transfer of information amongst customers and the development teams and between development team members, to illustrate how in the process of agile methodologies, information is the reduction of entropy. Shannon's entropy theory of information is a powerful quantifier of the importance of the transfer of information between two minds, with respect to software development. It is seen that cognitive human biases also play a role in the efficient information processing during the software development process. The ideas extracted from the entropy theory of value in economics are proven to be extremely effective in determining the value of a software system. A quantitative relationship is formed between value, probability of software process adaptability and the number of errors (which increase software entropy) in a system in relation to system entropy. Thermodynamic characteristics are used to derive a relationship between fixed costs, variable costs, uncertainty of the external environment and the duration of a project and the affect of this relationship on the value of the final deliverable. Conclusion: The second law of thermodynamics, and the entropy law, which is the most fundamental law of nature, plays a fundamental role in explaining the reasons why the Agile Manifesto developed a methodology such as the Agile ones to perform software development. It explains the struggle of software development companies to not only keep their software products in low entropy state, but also extract low entropy from the environment so that they themselves are able to increase their own attractiveness in society.

A ROBUST TRAFFIC SURVEILLANCE SYSTEM FOR DETECTING AND TRACKING VEHICLES AT NIGHTTIME (12cp)
Hue Tuan THI - A07-094

Supervisor : Hung Nguyen
Assessor : Zenon Chaczko
Major: Software Engineering

Intelligent system for traffic surveillance and monitoring is increasingly a vital requirement for each and every urban city in the world (Sydney is an obvious instance). There are currently several systems in the world that attempt to solve the complication of automatic traffic surveillance. However, those systems normally involve costly equipments; highly technical requirements in installation, and above all, most of the systems could not provide desired results under nighttime scenes where the surveillance conditions are not as good as in daytime. This capstone project tries to develop a real-time traffic surveillance system using the computer vision approach. Our system is highly cost effective since it only reuses the existing roadside cameras to capture traffic scenes, it requires least attempt in installation since most of the processes are automatic, and finally, it particularly solves the problem of nighttime traffic surveillance. In fact, as tested on different sequences, this system provides robust performance in both accuracy and processing time.

The system consists of a preprocessing module, which responsible for offline setup on each particular traffic scene, and a traffic analyzing module, which responsible for real-time detecting and tracking vehicles in that scene. The preprocessing module is important for this system to be installed in a new traffic condition. It first generates the static background of the traffic scene from various traffic images, then automatically detects all the available traffic lanes in the scenes, and finally calibrates the roadside camera to obtain the actual relationship between the 2D traffic images with the 3D real world coordination. The results obtained from the preprocessing module are then passed to the traffic-analyzing module to detect and track moving vehicles. This second module first tries to locate possible vehicle positions in the scene using feature-based detection. Those possible vehicle positions are then verified using a classification machine learning technique. Finally, those detected vehicles are tracked during their motion in the traffic scenes.

The traffic information obtained from the system during the surveillance includes number of traffic lanes in the scenes, each particular vehicle location, vehicle status (moving with what speed or stopping for how long, on which lane); all information is displayed through a graphics user interface. This system provides robust performance tests on different traffic locations and evaluated to be promising for various future applications in smart transport system.

THE EVALUATION OF FLY ASH IN RELATION TO PERLITE FINES & COMBINED SILICA FUME MIXES
Padraic Joyce - S07-067

Supervisor : Dr R. Sriravindrarajah
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

The production of Portland cement (PC) has adverse effects on the environment in relation to the release of ozone depleting greenhouse gas emissions generated during the calcination process of the raw materials fusing for the clinkering stage of PC manufacture, and the energy further required from fossil fuel combustion in pulverising. With the additional impact of human induced activities affecting global warming, countries are now participating in time constraint programs for effectively reducing CO2 emissions.

An effective way to reduce PC consumption is by utilising supplementary cementitious materials (SCM) as a partial cement replacement. SCMs derived from industrial waste by-products in the form of pozzolans, are widely used to decrease PC consumption and they aid the engineering related aspects of concrete construction by offering enhancements in strength, workability, and durability. While SCM usage derived from industrial by-products has been well established in practice for many decades, the potential of using natural based mining pozzolan wastes as SCMs is yet to be fully explored. In this study, the use of an artificial pozzolan by-product, fly ash (FA) will be evaluated in comparison to a mined ore waste material, perlite fines (PF).

It is well known that fly ash is generally regarded as one of the most popular forms of commercial SCMs in the cement-based market, with its main interest in structural and infrastructure usage. Recent studies indicate the potential use of fly ash in high volume additions will profoundly affect the way we use cement in concrete. This study reports on the results of an experimental investigation into the pozzolanic activity of FA compared to that of PF. PC was replaced at 20% and 40% levels with FA and PF and 20% PC was replaced with a 10% plus 10% blend using FA and PF with silica fume (SF). Strength activity index (SAI) values were evaluated for 3-day, 7-day, 14-day, 28-day, 56-day and 91-day compressive strengths for all FA, PF and blended PF/SF and FA/SF substitution levels, with flows and wet densities of mortar mixes reported. Additionally, drying shrinkage which covers the determination of length change due to causes other than externally applied forces and temperature changes was evaluated over 7-day, 14-day, 21-day and 35-day ageing.

???
Kwok - A05-999

Supervisor : Dr YourSupervisorsName
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

Sydney Water is a state government authority that is responsible for the provision of drinking water, recycled water, wastewater services and some stormwater services to approximately 4.3 million people in Sydney, Illawarra and the Blue Mountains.

Sydney Water is Australia's largest water utility and is also in the top 10 largest water utilities globally with an area of operations covering around 12,600 sq km and consisting of 9 Water Filtration Plants, 30 Sewage Treatment Plants, approximately 800 Water and Sewage Pumping Stations and 45,500 kms of water mains, sewer pipes, recycled mains and stormwater channels.

Due to the immense size of the network, it is not feasible to have operators at each site to monitor equipment at all times, hence the need for standardised control systems is vital.

One such critical control system are sewage pumping stations, which has a configuration of one wet well (a compartment or tank in which wastewater is collected) and two pumps (one running and the other acting as backup)

Sewage Pumping Station's aid the transportation of raw wastewater from homes, businesses, industrial estates to sewage treatment plants, where the wastewater is treated. Depending on the required quality levels of the treated wastewater, different levels of treatment can be applied to the raw wastewater, each with their own individual processes and technologies. Once treated, the treated wastewater is released back into the neighbouring environment, which may be the local river or the Pacific Ocean.

The purpose of this Capstone is to design and implement a control system for a sewage pumping station using PLC and SCADA applications, as well as to highlight the importance of having such control systems in place. This report details the project process which involves identifying the needs, design, implementation, testing and commissioning

BRIDGE EXPANSION JOINTS - PERFORMANCE REVIEW AND SELECTION CRITERIA TO MAINTAIN A SUITABLE JOINTING SYSTEM
Mohamad Khalil - S07-072

Supervisor : Prof. Keith Crews
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

Bridge deck expansion joints are an important element in the functioning of bridge structures. When joints fail to function properly, they can create problems in proportion to their size. Selection of a good joint for use can create fewer bridge maintenance problems.

Engineers and Suppliers continue to develop new joint configurations and materials in an attempt to improve upon the poor record of serviceability. The authorities have experienced the difficulty of selecting the appropriate type of bridge deck joints. Data collected from surveys on joint performance, have concluded that the life span of a jointing system depends on the material of the joint components, the water tightness, resistance to temperature, resistance to wear and tear, and fatigue load.

A literature review of various jointing systems and their performance is presented. This has been achieved by reviewing the performance of different joints in a variety of design criterions, in bridges around the world. The review of survey results will also be presented to aid in the assessment of joints within Australia. A further investigation and analyses of these results have been used to devise a methodology for determining the type and design of expansion joints best suited for different bridges and environmental conditions.

This methodology is used to aid the selection of the most appropriate joint system. The methodology will focus on been a guide for selection based on past performance of different joint systems. The result of this report will enable a better understanding of how joint systems operate, perform and which system applications is best suited.

This report also identifies the current selection process of joints in the design process in accordance to the Australian Standards

DEVELOPMENT OF APPROPRIATE DESIGN METHODOLOGY FOR REINFORCED CONCRETE PANELS USED AS WALLS IN BUILDINGS SUBJECT TO SEISMIC FORCES (6cp)
Luke Anthony Gladwish - S07-050

Supervisor : Prof Keith Crews
Assessor : Prof Bijan Samali
Major: Civil Engineering

Since its inception in the late 1950's here in Australia, concrete wall panel construction has developed from limited use in industrial warehouses to current day trends – where nearly every commercial, industrial and large residential complex is adopting reinforced concrete (sometimes known as tilt-up) panels. This explosion in use is largely due to the ease of construction and achievement of major cost/time savings. The opportunities to incorporate architectural finishes also provide these buildings with an aesthetically pleasing appearance.

With such a wide variety of structure types now using concrete wall panels, engineers are required to analyse and design these structures for different loading conditions, including seismic forces.

During an earthquake, ground motions occur in a random fashion in all directions. When a structure is subjected to these ground motions, it responds in a vibratory manner. The general attributes which govern a structures dynamic response to ground motion are strength, stiffness, ductility and damping.

This year alone, there have been six major earthquakes worldwide registering above 6.4 on the Richter scale. 5 out of 6 of those earthquakes have occurred in the Pacific Rim.
Unfortunately, codes and standards usually take a large event (such as the 1989 Newcastle earthquake) to stimulate changes or updates.

This paper looks at the structural design aspects of reinforced concrete wall panels under seismic forces and the provisions set in the relevant Australian Standards and other building codes in the US, New Zealand and Japan. It also investigates different structure types and particularly connection design detailing, where many structural problems in these sorts of buildings occur.

Papers from the USA and New Zealand which investigate related design issues are reviewed, and some of the methods adopted in the design of a single storey shear wall building, then compared to an equivalent structure using Australian Standards only.

Finally, some passive energy dissipation systems will be investigated to see whether they can be incorporated in the connection design to reduce the impact of laterally induced seismic forces.

GETTING TO THE BASIX OF AFFORDABLE HOUSING WITH CONCRETE TILT-UP CONSTRUCTION
Aaron Smith - S07-146

Supervisor : Anne Gardner
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

In recent years its has become increasingly difficult for first home buyers throughout NSW to afford their own home. With prices still rising today, despite government incentives, the search for affordable housing needs to widen its investigation to every different element of a new home. In this challenge for cost reduction investigations into the home's construction method have been largely ignored. These alternative methods need to be investigated to discover if they can mitigate the current financial problems facing the housing market.

One increasingly popular and versatile method currently entering the construction market is concrete Tilt-up construction. Extremely different to the highly skilled requirements of single brick veneer, currently dominating the home market, Tilt-up's onsite wall fabrication and lifting method requires an vital degree of correct planning, design and monitoring to ensure all the pieces fit together correctly to result in a structurally stable home. Currently common for warehouse construction, this study investigates if Tilt-up can be economically designed for the residential construction market.

Through all this concentration on affordability it is also important that new homes look at their final environmental footprint. With the NSW State government applying the Building and Sustainability Index (BASIX) for all new homes, people are now forced to incorporate sustainability in their home. With the new sustainable measure designed for all new homes any investigation of Tilt-up construction also must look at the compatibility of a new home with BASIX's sustainability levels.

With these goals this project will look at creating a viable Tilt-up design, providing all the requirements requested by new small home buyers while maintaining sustainability, structural safety and an affordable price. Through this process the viability of a sustainable residential Tilt-up construction can be assessed against current construction methods of the industry.

INVESTIGATION AND ANALYSIS OF PERFORMANCE MEASUREMENTS IN SOFTWARE DEVELOPMENT ORGANISATIONS
Christina Tan - S07-153

Supervisor : Ravindra Bagia
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

Organisational performance measurement is being considered as one of the indispensable practices in today's competitive industry of software development and maintenance. Organisations are now constantly seeking to improve their software processes in order to maintain and enhance their market positions and to present their quality software products to the market. Although there are many organisational measurement guidelines available, a specific set of key metrics that can generally be applied to any type of software development firm does not exist.

This Capstone project concentrates on identifying organisational metrics for the software development life cycle with particular focus on organisations that specialise in the area of defence and commercial software development. Performance indicators are used as a means to monitor and measure the performance of business processes in order to continually improve on the existing practices. Various Key Performance Areas (KPAs) and a set of corresponding Key Performance Indicators (KPIs) can be used to assist in fine-tuning an organisation's software development operations to ensure that the organisation's goals and objectives are maintained at all times. The use of KPAs and KPIs can also contribute significantly to the quality of software products.

This report evaluates how KPAs for the software development organisations have been identified through the exploration of different process models and industry surveys. It also investigates the current state of software process measurements and identifies a set of KPIs for each KPA through analysis of existing measurement methods. This is subsequently validated through surveys and case study analyses. Finally, the KPAs and KPIs identified for both defence and commercial software development organisations are analysed and evaluated. The findings from this report will suggest the areas in which a set of common indicators can be applied to a general software development organisation.

QUALITY MANAGEMENT SYSTEMS AND THE "FAILING CULTURE" RELATED BASED COMMUNICATION IN CIVIC WORKS
John Bernard Vicente - ???

Supervisor : Dr. Hasan Akpolat
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

With Australian organizations partaking larger and more lucrative projects, there are procedures to be followed and standards to be uphold. However, with larger projects, so as the mistakes and failures will arise from these. This will also reflect the purpose and direction of organizations' personnel: lack of motivation, direction, and support. Tracking the Quality Managements Systems, the overall description of the general attitudes of organizations to civic projects will be shown.

Using a questionnaire to gather information from large enterprise constructing organizations, behaviors, attitudes and culture of organizations in general in terms of Quality, the "Failing Culture", and the overall attitudes of personnel within the Australian Civic Industry. Investigating the matters such as the organization's general information, characteristics of organizational Quality Systems, perceptions to Quality Systems, and the success factors to Quality will aid to create the description of the general attitude of organizations in terms with Quality and failure.

Through the responses of organizations to the questionnaire given, identifying the strong points that features Quality will aid develop it into a more robust and consolidated structure that will aid the fast development of techniques and technologies. Identifying weak points will encourage organizations to improve the approaches to Quality statements that are insufficient, which results to failures and mishaps within projects of organizations. Furthermore, identifying the attitudes and cultures of personnel within the organization will demonstrate the efficiency of work: analyzing features such as culture, problem solving, and leadership.

STAND-ALONE OCEAN WAVE DATA RECORDER (12cp)
Timothy Davies - S07-035

Supervisor : Dr KK Fung
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Electrical Engineering

Measurement of near-shore ocean waves is often carried out using an Electromagnetic Wave Staff (EWS). In some cases, the EWS needs to be deployed for short-term studies of several weeks at a time, in which up-to-date information is not required, and the data needs to be collected at the end of the deployment. It was thus proposed to design an addition to the EWS system which allows for the output signal of the EWS to be logged on-site.

The low cost and high performance of modern microcontrollers and flash memory devices has allowed for the development of an embedded system much smaller and cheaper than commercially available data loggers. This project includes an assessment of alternative options available for developing such a system.

Accurate timing is essential in this system, as the data recording involves pulse-width measurement at fixed intervals. The device also includes a real-time clock to allow time-stamping of records.

A prototype has been developed using a PIC24 microcontroller, interfaced to a Secure Digital (SD) flash memory card. Data is stored in the FAT16 file format, compatible with most PC operating systems. Initial setup of the device is carried out via RS-232 serial communication.

MODEL PREDICTIVE CONTROLLER DESIGN FOR STATIC VAR COMPENSATOR (12cp)
Nadarajah Veluppillai - S07-172

Supervisor : Dr Steven Su
Assessor : Prof. Hung Nguyen
Major: Electrical Engineering

Static Var Compensator (SVC) is shunt connected equipment in a complex nonlinear power system to control reactive power by absorbing or delivering the reactive power. The control of reactive power increases the transmittable power in the power system as the SVC eliminates or minimizes the adverse effects of the reactive power such as power losses, voltage dip and drop. Furthermore, the SVC stabilizes raising voltage of bus bar in off peak demand. A Fixed Capacitor (FC) or a Thyristor- Switched Capacitor (TSC) with a Thyristor-Controlled Reactor (TCR) is combined forming a common type SVC. Integration of a superior controller in an SVC can efficiently respond in controlling the reactive power in the power system. In this capstone project, a new control strategy using Model Predictive Control (MPC) is designed and implemented on a SVC as it has many advantages including its ability to handle multivariable systems, constraints and disturbances.

The MPC controller is designed and tested on a Single Input Single Output (SISO) linear experimental SVC, which is located in control laboratory at the UTS. In addition, a Proportional Integral (PI) controller, which is the most common type controller of SVC widely in use, is also designed to compare the results. Both the MPC and PI controller are tested for various condition of the power system, in this case various power factors, to compare the results. The test results show that the response of MPC control is faster than the PI controller. As well, the MPC controller achieves the control objective with lesser oscillation.

DEVELOPMENT FRAMEWORK/APPLICATION FOR EDUCATIONAL PROGRAMS USING THE NINTENDO DS (12cp)
Hung Trang - A07-071

Supervisor : Zenon Chaczko
Assessor : Dr Johnson Agbinya
Major: Software Engineering

In this era of electronic gadgetry, gaming consoles, whether it be hand held or otherwise, have begun to evolve from single purpose consoles to multi purpose consoles. The Nintendo DS (NDS) is an example of this. In the past, gaming and application development for these types of consoles have always been somewhat of a mystery to enthusiast developers outside of the electronic entertainment industry. It was not until the release of these next generation of consoles that programmers can learn to develop and gain experience on console programming.

Internally, the NDS contains two powerful ARM processors, an ARM9 main CPU and an ARM7 co-processor and has built in 802.11b wireless capability. Externally, the NDS boasts dual screens, one of which is a touch screen, and a sound system including microphone features. The use of these popular ARM microprocessors has allowed some developers to reverse engineer the NDS and develop public libraries for use.

This capstone project will attempt to design and model a framework for developing educational games on a resource constrained device such as the NDS. Investigations will be conducted to identify the most suitable IDEs and software development libraries currently available for this console. The resulting proof of concept will be a menu system with two educational games utilising the touch screen, navigational pads, buttons, microphones and speakers. These games will also be designed with consideration of future developments to incorporate wireless capabilities.

Like most other resource constrained devices the NDS have restrictions on memory size and display quality. The designed game in this project will identify possibilities of optimisation for the content and source code to minimise the performance loss of the game, to prevent jagged movement of video graphics.

From the engineering perspective, this capstone project can form a basis of research on the development environment of the Nintendo DS and other sophisticated handheld consoles, so that many more useful applications and ideas can be derived to identify an economical alternative solution to a laptop.

AN INVESTIGATION INTO RETROFITTING BUILDINGS 01 AND 02 OF THE UNIVERSITY OF TECHNOLOGY, SYDNEY (UTS) TO BECOME SUSTAINABLE IN THIER USE OF WATER (6cp)
Andrew Debeck - S07-037

Supervisor : Ken Halstead
Assessor : Assoc. Professor David Eager
Major: Civil/Environmental Engineering

The University of Technology, Sydney (UTS) is one of Australia's leading universities with more than 32,000 students enrolled last year. This number is continually growing and the university is always looking to cater for the increase in numbers and changing societal, environmental and economic factors that are present in today's society. The university has been actively involved in adapting to the changing environmental focus, sourcing out water and energy savings opportunities that would help pave the way for more sustainable practices. This capstone project will investigate options for the University of Technology, Sydney (UTS) to reduce their ecological footprint by reducing water consumption.

This report will detail the systems in place at the university and the water usage patterns over the past six years. Once a background is established, this report will present options to reduce water consumption and each opportunity will be reviewed for its feasibility. Water savings options to be discussed will include providing a recycled water source and modifying the air conditioning system to use less water.

This report will investigate each of the opportunities for their economic feasibility, build-ability, potential for disruption to the operation of the facility, capital outlay required, projected savings and impact on the environment. The investigation will include an investigation into the rising cost of water, maintenance of existing systems and rising student numbers.

The final section of this report will detail conclusions reached and give recommendations on achievable water savings options.

WIRELESS COMMUNICATION NETWORKS UTILISING HIGH BRIGHTNESS WHITE LIGHT EMITTING DIODES
Dino Talic - A05-999

Supervisor : David Davis
Assessor : Steve Murray
Major: YourMajor Engineering

As a result of a growing social need for energy conservation and the common use of wireless-based communication technologies, this capstone examines the role of light emitting diode (LED) technology in illumination lighting systems and residential/commercial digital networks.

High brightness white LED technology as residential/commercial illumination lighting systems is reviewed which includes a detailed analysis of the current performance and future research trends of the technology. The performance of high brightness white LED technology is contrasted with traditional illumination lighting technologies, such as fluorescent and incandescent lamps. Based on this analysis, the capstone shows that high brightness white LEDs (solid state lighting) will surpass all other forms of illumination lighting, in terms of performance (luminous efficiency, colour rendering) and cost efficiency by the year 2015.

Large scale use of solid state illumination lighting systems provides an infrastructure which can be utilised to create wireless communication digital networks, due to the ability of LEDs to both detect and emit light (free-space optics). This capstone then examines a number of free-space optic communication systems, from published literature, with a particular emphasis on solid state illumination lighting models as viable communication networks.

Free-space optics as a viable communication mechanism was tested by a purpose-built prototype (proof of concept) utilising high brightness white LEDs. The test results are recorded and show the technology is a viable. Research done for the capstone, showed there are presently no known prototypes of this kind, which could be implemented and extended for future academic and industrial research.

COMMERCIAL PROPERTY HEADING GREEN
Dylan Baudinet - ???

Supervisor : Dr Stuart Nettleton, Dr Ken Halstead
Assessor : Dr Stuart Nettleton, Dr Ken Halstead
Major: Civil Engineering

Question: To investigate, analyse and report on how market leaders are positioning themselves for development and investment in green / sustainable commercial property.

Sustainability awareness throughout society has grown significantly in recent years. The built environment around the world consumes 32% of the world's resources, 40% of energy, 40% of the waste going to land fill and 40% of air emissions. The commercial property industry has evolved rapidly in recent years with a significant number of commercial towers incorporating green principles and achieving high green certifications.

A questionnaire was designed around the critical green principles and issues affecting commercial property. Twenty four market leaders completed the questionnaire which was followed up with a meeting or phone conversation to further understand their views and position.

A computer programme called R was used to run a factor analysis on the results. The factor analysis reduces and summarises the data to identify the core underlying factors. These underlying factors are considered the core drivers. Four core drivers were identified and are summarised as follows:
1.   There will be a strong market demand for green property development and investment in the future. Investment in a good design now will be expensive but worthwhile.
2.   The government should support green development, especially the short term business case.
3.   There is a low awareness of green buildings and the benefits are yet to be proven and understood.
4.   The commercial property market is not yet green, however the future business case advantages will be associated with staff, branding, investors and/or shareholders.

The market leaders are aware the market is changing and are incorporating green principles into their development and investment to effectively position themselves for the future market demands.

AEROSPACE PROJECTS IN SOFTWARE ENGINEERING
Gayithri Sridhar - A07-059

Supervisor : David Davis
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

In the last fifty years, Software has been pre-dominant in all branches of Engineering. Almost every mechanical tool, equipment and machine has some sort of integration with software to perform automation and enabling machines to 'think'. Equally, Software has influenced our transport system, including aviation and aerospace, in a critical way.

This Capstone focuses on the effect of software engineering on aviation/aerospace projects. From World War II when high performance aircrafts were purely mechanical, software slowly began to be integrated into the engineering of aviation systems, to monitor operations and add more functionality to flight operating systems, thus increasing performance, endurance, reliability and maintainability. The use of software in aerospace, expanded to operating missile flights, space station operation and communications, and even made autonomous flight possible.

Questions investigated by this Capstone include: extent of software intensive system development incorporated into a cockpit equipment and core aircraft functionality; how much software integration into aerospace machine is really necessary; is there loss of human control in autonomous aviation machines utilising artificial intelligence?

Other factors reviewed include: how current software development practices used while creating Aerospace software system affect the quality of the end product; life cycle models (waterfall model, DOD standard 2167 has been used for 20 years to develop software for defence systems); current development methodologies used especially in the test and validation of software system which is ever expanding and highly complex; software engineering management and other organisational factors affecting the development of aerospace software intensive systems; quality assurance mechanisms and software reuse in mission critical systems; and finally, autonomous systems: can they be relied upon during emergencies?

COMPUTER SIMULATION OF ANIMAL BEHAVIOUR (12cp)
Mahati Prabhala - A07-014

Supervisor : Dr David Davis
Assessor : Dr Zenon Chaczko
Major: Software Engineering

Swarm based emergent behaviour, observable in most "social animals", often provides the metaphor for designing engineering systems, constituted of individual interacting components that require the exhibition of cooperative behaviour at a macro/ system wide level. Emergent behaviour has been long observed in natural, principally, biological systems. The challenge in engineering has been to reproduce the conditions leading to the emergence of such behaviours in "artificial systems" while simultaneously ensuring no undesirable global behaviour emerges. This involves a systematic study of interactions at the local level that collectively forms the intended behaviour at the macro level.

This Capstone reviews the results of historical and current research conducted on the emergence of cooperation in artificial social systems. The Capstone highlights the limitations of the research with specific reference to the environment in which the experiments were conducted. The Capstone concludes that the research utilizes neither situated or embodied approaches, but only abstract task domains that limit the derivation of cooperative behaviour to simple or trivial forms. Case studies are used to illustrate this concept. The Capstone advocates the engineering of simulation environments which overcome the limitations of traditional static and deterministic environments and the inclusion of "real- world" complexities, so as to enable a workable application of this concept to real world scenarios.

A PRELIMINARY INVESTIGATION IN TO THE PERFORMANCE CRITERIA USED TO ASSESS PLAYGROUND SURFACES (6cp)
Mark Collins - S07-191

Supervisor : A/Professor David Eager
Assessor : Mr Chris Chapman
Major: YourMajor Engineering

This capstone is a preliminary investigation into performance criteria used to assess the falls on playground equipment surfaces. This report presents the results of an experimental investigation. It also presents a theoretical analysis this data and to presents conclusions on whether additional performance criteria should be included.
The purpose of this project is to review at and examine whether additional criteria should be included to provide a better analysis of the safety of playground equipment surfaces. The existing criteria used by the Australian Standard 4422:1996 are the Head Injury Criteria (HIC), maximum acceleration (gmax), and contact time.
The investigation involved experimental testing of numerous rubber samples using previously developed and verified equipment and software. Values for existing and additional criteria were calculated and analysed to determine whether there were any trends of inconsistencies. The additional criteria analysed are maximum jerk (rate of change of acceleration), delta time, impact velocity, bounce, power and work.
From the results, it was observed that there is some inconsistency in the existing performance criteria. This is because different materials reached the critical values for HIC whilst having vastly different values of other existing and proposed criteria. Thus it was concluded that including a maximum jerk limit of 40,000 g/s and power limit of 4 kW/kg could assist in strengthening the existing performance criteria.

FEASIBILITY STUDY AND APPLICATION OF TOSHIBA'S HYDRO EKIDS TO FACILITATE A MICRO-HYDRO SCHEME STUDY SITE – AFTER AICV, MINTO VALVE STATION (6cp)
Edward Hyun Jin Kim - S07-075

Supervisor : John Dartnall, industry co-supervisor Mr Glenn Haywood (Worley Parsons)
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Mechanical Engineering

The feasibility and application of Toshiba's eKids to facilitate a micro-hydro scheme at the Minto Valve Station (MVS) was carried out under the supervision and guidance of Glenn Haywood, a senior consultant engineer from Worley and Parsons, and from John Dartnall, a senior lecturer at the University of Technology, Sydney. This study was undertaken during the spring semester of 2007 and carried out in a group consisting of two members, Bryan Li and Edward Kim.

Free flowing water is a source of life but also energy and so, the water flowing in our pipelines are potential sources of energy and essentially energy lost. This project aims to study the possibility of recovering energy from the Sydney water supply system by implementing existing micro hydro turbine technology to the MVS. Previous study conducted at the MVS suggests that energy can be efficiently recovered but not by conventional technology and so the Toshiba eKids was put forward as an alternate technology in recovering energy.

Due to the nature of this study, the first step in the methodology of the feasibility study was to create a project plan which was followed by an extensive literature review into hydrology, micro hydro turbine and its applications. Afterward, an in-depth site analysis was conducted in order to determine the site conditions of the MSV. Once the site conditions were determined, a turbine suitability analysis was carried out to determine any appropriate turbine technology. It will then look at implementing the eKids after the AICV placed in the MSV and determine the arrangement, power yield and modifications to the existing AICV.

The outcomes of this project has the possibility of opening up new avenues in clean and alternative methods of power generation by recovering energy from the water flowing in existing water supply system and recognise the importance of micro hydro turbines technology.

FEASIBILITY STUDY AND APPLICATION OF TOSHIBA'S HYDRO EKIDS TO FACILITATE A MICRO-HYDRO SCHEME STUDY SITE – AFTER AICV, MINTO VALVE STATION (6cp)
Bryan Pak Yun Li - S07-085

Supervisor : John Dartnall, industry co-supervisor Mr Glenn Haywood (Worley Parsons)
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Mechanical Engineering

The "Feasibility Study and Application of Toshiba's Hydro-eKids to Facilitate a Micro-Hydro Scheme" project was completed by Bryan Li and Edward Kim from the University of Technology, Sydney (UTS). Under the supervision and guidance from staff at Worley Parsons (Sydney Water consultants), Toshiba International Corporation (TIC) and John Dartnall from UTS, the project was completed in the semester of Spring 2007.

Within the Sydney water supply system, there are numerous sites that have the potential for accommodating micro-hydro plant facilities whilst performing its regular functions. These micro-hydro plants can be a tool for harnessing the distinct energy losses through the system and hence be a form of energy recovery. Minto Reservoir is one of the most appropriate sites technically, and also in terms of location, infrastructure, and accessibility.

Previous studies conducted by Worley Parsons have shown micro-hydro turbines are suitable for the valve station at the reservoir and will be evaluated covering all aspects for implementation and the feasibility of these technologies. TIC claim to have technology, Hydro-eKids, which will be suitable for the Minto Reservoir Valve Station (MRVS). Therefore, this project will focus on the feasibility of implementing the eKids, and evaluate other possible turbine technology that may be appropriate.

The process used to determine the most appropriate technology involved following standard engineering procedures and in the best interests of Sydney Water - a major stakeholder for the project to continue after this study - under direct guidance from Worley Parsons. The methodology included: background research, project planning, site analysis, turbine analysis, turbine selection and feasibility study.

A strict selection process indicated no single turbine unit provided any value for implementation. Hence, with the eKids technology allowing alternate arrangements (cascade and parallel), further analysis showed a cascade arrangement of three eKids would be a promising solution.

Feasibility of the application will result in a greater awareness of sustainable engineering, and utilising new and current turbine technology to find innovative methods of energy recovery, especially in the water supply systems.

VOICE ENABLING FOR MOBILE DEVICE APPLICATIONS (12cp)
Thi Khanh Van TRAN - A07-063

Supervisor : Dr. Johnson Agbinya, co-supervisor Dr. Raymond Wong (National ICT Australia)
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Software Engineering

The rapid development of the Internet coupled with the growing amount of data and information has called for a better data management in the last few years. The advent of mobile technologies has been proven to be one of the qualified solutions for this. Since mobile devices are becoming affordable to many users and capable of functioning as a computer system, they are appraised to provide a better way for accessing and managing data due to its mobility advantages. Data management can now be conducted without geographical constraints as with fixed computer systems.

When using a mobile device, it is not always convenient for users to use stylus, such as when their hands are not free, or when they have to 'type' long sentences, which is hard using a stylus. More importantly, for mobile devices, voice appears to be the primary feature and usage while stylus is the secondary option. Therefore, more applications controlled by voice would provide more convenience for users. So far, there have been some existing applications allowing users to communicate with their mobile devices using voice. Due to limited resources in mobile devices, the users may desire to retrieve useful information not stored locally in their devices. However, there has not been any voice mobile applications around to assist users communicate with a server via the Internet.

My thesis aims to build such an application to support the mobile device users communicate with a server via the Internet using voice. For example, while driving home, a user can 'talk' to her PDA to search for information residing in a server in her company; then her PDA will 'talk' back to her whatever results it gets. The result of my thesis is a working prototype to demonstrate how that concept works. Besides that, an alternative approach is also discussed and compared with the prototype that I have built.

Key technologies used are:
•   .Net CF
•   Windows Mobile Edition for PocketPC
•   Microsoft Speech SDK 5.1
•   NHibernate

A REVIEW OF THE DEVELOPMENT OF INTEGRATED MANAGEMENT SYSTEMS OVER THE LAST TEN YEARS (12cp)
Zekiye Seval Teoman - A07-066

Supervisor : Dr. Hasan. Akpolat
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Electrical Engineering

This review of the literature offers a brief historical perspective and a critical analysis of the contemporary issue of Integrated Management Systems. A number of management systems have been used by organizations since the 1950s, changing when new theories emerged or as new initiatives were devised. It was in the 1980s when separate standards were introduced, that businesses could seek certification attesting to their company's commitment to dedicated control procedures in relation to Quality Management (ISO 9000), Environmental Management (ISO 14000), Occupational Health and Safety Management (OHSMAS 18000), and Management for social accountability (SA 8000). Each of these standards is discussed. Because each of the standards evolved at different times, and new editions were issued, each has traditionally been managed separately. However, within a context of change in the business world, as new government policies have been introduced, as customer demands have grown, and public concerns have arisen, the concept of 'integrating' these separate management systems has come to the fore. Different models of Integrated Management Systems (IMS) have been developed over the last ten years, and different levels of integration have been proposed, in order to augment existing systems and schemes. Nevertheless, developing a coordinated management system that provides a holistic service to a company's core business has proved challenging. This review of the literature, therefore, deconstructs the components within an organization that are considered to be critical for an IMS, and identifies various approaches taken by some companies: from the integration of training programs, to linking management systems, and by creating a cross-functional horizontal management structure: both process and systems approaches to integration. Throughout, an emphasis is placed on the importance of management structures, and the internal processes of PDCA that underlies the notion of 'continual review' of a company's management system. The classifications of the different levels of integration from 1999 to 2005 are presented, and the more important management systems that have helped organizations to improve their effectiveness in modern management are discussed: Total Quality Management (TQM), Operational Risk Management (ORM), Enterprise Risk Management (ERM) as well as the recently proposed Integrated Operational Risk Management framework (I-ORM). To appreciate the global impact of standards, the results of the 1995 ISO Survey are presented. Within the local context, the results of the 1997 Survey for Operational Risk Management are also included. In conclusion, the major issues surrounding the concept of IMS are distilled from the literature as are its many perceived benefits and the obstacles to its successful introduction. Establishing an integrated management system is a complicated process. Any company faced with the decision as to whether or not integration is in its best interests should find ample information within this review on which to base their choice of strategy.

COMMUNICATION THROUGH AVATARS: A STUDY OF CURRENT RESEARCH AND FUTURE APPLICATIONS (12cp)
Leandro Balan - S07-010

Supervisor : Mr Zenon Chaczko
Assessor : Prof R. Braun
Major: Software Engineering

The idea of Earth as a 'global village' is fast becoming a reality, and the use of avatars to facilitate communication and collaboration between people of different cultures and credos provides a viable path for the future. An avatar is a virtual representation of a person; they can interact with each other in a virtual environment, generally in an online context. This means that anyone with a computer and access to the internet could enter a virtual environment and interact with people from around the world through their avatar, by speaking naturally (using a microphone) or through text-based chat.

This thesis explores the various implications of avatars and virtual environments, particularly how avatars can assist communication and collaboration between culturally diverse groups. In addition, there are several key areas of research, one being the concept of presence: how avatars and virtual environments can be designed in a way to make the people using them feel as if they are actually there. Another explores the idea of 'transformed social interaction', the ways in which human behaviour can be edited and enhanced in an avatar to increase the effectiveness of communication.

An Avatar Telecare System is designed to demonstrate an important and effective application of avatar-facilitated communication. Telecare refers to remote care given to elderly or disabled people who are living independently but require constant monitoring in case of an emergency or accident. A system is designed to monitor their activities and health statistics, and transfer this data to an avatar living in a carer's virtual environment. A prototype of the rendering component is developed to demonstrate and evaluate its functionality. This thesis describes the results of the prototype implementation and outlines key areas for future research and development in the field of avatar-assisted communication.

LOW FLOW FILTRATION SYSTEM, POLLUTANT LOAD ANALYSIS (12cp)
Benjamin Kus - A07-016

Supervisor : Dr Jaya Kandasamy
Assessor : Prof S Vigneswaren
Major: Civil Engineering

Low flow filtration systems in the form of a gully pit is a relatively new technology which is being explored to determine if it can be accepted as an urban storm water BMP (Best Management Practice). The objective of this study is to provide modern engineers with knowledge for selecting the appropriate available media for individual circumstances to ensure acceptable reduction levels of certain pollutants occurring from urbanisation.

Widespread urban development is resulting in significant environmental impacts due to the increase in impervious areas. A primary concern for the future with higher density urban areas is the quantity and the quality of the stormwater drainage.

Water Sensitive Urban Design (WSUD) is an approach to urban stormwater management which explores systems to minimise the damaging effects on the surrounding environment and the value of reusing stormwater.

In 2002 Kogarah Council developed and constructed a 'low flow filtration system' for treating and reusing stormwater from Belgrave Street in an attempt to prevent the high level of pollutants in the first flush during a storm event from draining to the Cooks River.

In this experimental study, several types of low flow filters were tested using flow columns in the laboratory to examine the effectiveness of various depths of different media combinations based on the removal of certain common pollutants.

The pollutants analysed in this study were zinc (Zn), total phosphorous (TP), total nitrogen (TN), total petroleum hydro carbons (TPH), total organic carbon (TOC), the turbidity and PH level.

The results show that the Low Flow Filtration Systems work exceptionally well in removing large pollutants such as suspended solids, metals and sediment and improves the turbidity of the water to acceptable levels. The system however has minimal effects on dissolved pollutants. Total organic carbon, total phosphorus and total nitrogen had a low removal rate and required further treatment to reach BMP guidelines.

Recommendations have been made for further testing and designs where alternative experimental methods can be undertaken while utilising other available filtration media setups.

SAMPLE CAPSTONE PROJECT TITLE – PLACE YOURS HERE AND THE NUMBER OF CREDIT POINTS OF YOUR PROJECT (6cp)
Hien Trang Nguyen - A07-087

Supervisor : A/Prof Robert Steele
Assessor : Dr George Feuerlicht
Major: Software Engineering

Spreadsheet application with its combination of data grid, functional and visual programming model is a powerful tool for end-users to manipulate data. In the trend that many applications are becoming services, service oriented architecture (SOA) emerges as a solution for enterprise application integration because it offers a high-level access to data and applications from various sources, systems and locations. However this integration now is only useful mostly to professional developers who are skilled at programming. This capstone project is aimed at bringing the benefits of SOA to non-professional programmers or business objects that use spreadsheets very often but may find difficulty in handling complex data and micro language.

This project proposes a software tool as a bridge to integrate spreadsheet with SOA so that spreadsheet users can easily make use of existing web services to dynamically access and manipulate complex data.

Although there are already some efforts in this topic, this kind of integration remains challenging and not successful enough because firstly it requires adapting complex data or objects inside poorly structured flattened data grid model of spreadsheet; secondly when interacting with web services it is difficult to preserve the spreadsheet programming model and its simplicity of visual assistants.

Through clearly considering the criteria for a good integration of spreadsheet with SOA, this project proposes solutions to the above two issues and mechanisms for service interaction in terms of: (i) Service consumption – using web services to import and manipulate complex data into spreadsheets; (ii) Service Invocation – mapping spreadsheet data to complex XML schema of services then exporting and invoking the services and (iii) Service Orchestration or Composition – through scenarios of multiple interaction of spreadsheet – services.

The prototype is implemented not as a standalone system but as an add-in of Microsoft Excel so that users can easily perform all service interaction tasks above.

ALLEGRO HEALTH SYSTEM (12cp)
Huy Nguyen - S07-116

Supervisor : Stuart Nettleton
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Software Engineering

The health information system has always been a niche market with a small number of players controlling a large array of customer. The existing products, such as Medical Director from HCN, Ferret from PENCS and Monet from IPA, have two main disadvantages.
Firstly, they suffer from scalability issue. Once a health provider expands to cover more than one clinic, these software system breaks down in the form of communication, con-currency, reliability and efficiency.
The second disadvantage is that most current solutions are not extensible. This means there would be a large cost in integrating different health professions such as dental or psychology.

This Capstone project aims to address those two main concerns.

The Allegro Health System's strategy in addressing the scalability problem is to model the software as a distributed thin client – fat server architecture. It provides the Graphical User interface over a common web browser. This reduces the large deployment cost to multiple clinics. The fat server would consist of a load balancer, web servers and a database server.

Furthermore, the architecture of this system would also be model as a pluggable design pattern which would address the extensibility issues allowing different health professions to add their customise solution to the project without affecting the core nature of the system.

In addition to developing the software, this project will demonstrate that classical software engineering principle still applies to modern web applications. It would employs strict software engineering methodologies using the spiral development model including, Requirement Engineering, Architecture and Design, Testing and Object Orientated Development.

The presentation will be open to the public especially those who are in the medical field such as general practitioner, nurses and government health agency.

ARCHITECTURAL BASED TRADE OFF BETWEEN FINANCIAL PERFORMANCE AND SERVICE LEVELS IN ENTERPRIES (12cp)
Ryan Christopher Kelly - A07-056

Supervisor : Lian Loke
Assessor : Tim O'Neill
Major: Software Engineering

Senior Management, Architects and other stakeholders often make decisions on the structure and operation of IT systems and Business Processes. The use of architectural model in this context ultimately leads the design and evolution of enterprises systems and processes. However, sound decision making requires relevant and adequate information, for enterprises, financial performance and service levels are of particular interest.

An issue with quantitative measures for financial performance and service levels was their separate presentation in an unrelated fashion. It is believed that by communicating these two qualities together in a more structured way will add to their usefulness and value. To achieve this, a service orientation was proposed with the traceability of the costs they incurred on the underlying (shared) infrastructure. These services would be triggered by events to represent the places where activities are initiated within an enterprise.

This project involved the conceptual development of an analysis technique to determine the quantitative qualities through simulation. It was developed through the establishment of a generic enterprise model and its rationalisation into abstracted elements. It also involved the development of a software prototype designed to execute the analysis technique. The software prototype was developed for use with ABACUS, an enterprise modelling tool by Avolution.

When linked with existing practice on architectural design optimization and trade-off analysis, this analysis technique can provide deeper insight into the trade-off that exists between financial performance and service levels in enterprises.

OPTIMIZATION OF A DYNAMIC ABSORBER FOR AN EXISTING CHAIR LIFT (6cp)
Gaston Chan - S07-018

Supervisor : Dr A/Prof Nong Zhang
Assessor : Dr Chris Chapman
Major: Mechanical Engineering

The use of ropeway carriers is an effective and efficient means of transportation. Ropeway carriers such as chair lifts, utilize efficiency by taking the shortest distance between two points, which is a straight; they are not affected by factors such as fog, snow or rain and are able to provide a low cost transportation means in areas where the construction of a railway due to terrain would be too expensive. However the only form of bad weather which can affect this mode of transport is wind; it causes excessive oscillation of the transport vehicle which is both unsafe and can cause motion sickness.

In order to solve this problem special dynamics absorbers have been designed and applied in both real world applications and here at UTS Dynamics and Solids Laboratory by a previous Capstone student. The UTS was designed to replicate existing systems, this design was effective however the dynamics of the system was not understood analytically and additionally was not optimized so that the maximum efficient design was achieved.

The research focus of this Capstone project seeks to understand the dynamics of the existing system and with this gained understanding provide a solution to its optimal design theoretically. The solution is then validated through experiment. So far the research conducted has achieved the understanding of the dynamics of the system and has provided a theoretically solution for optimization. The research has discovered a flaw in paper on which the UTS previous design was based.

It is envisaged that the planned experimental validation to be conducted will show that the proposed optimal design effective and additionally will show that the errors presented in the published paper is insignificant and have not affected greatly the validity of its results.

PAY AS YOU PLAY - GOLF STATISTICAL ANALYSER
Nicholas Black - A07- 111

Supervisor : Robin Braun
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

Introduction
The pay as you play golf statistical analyser capstone project incorporates a flightscope. A flightscope uses phased array radar to track a golf ball and determine a players swing characteristics. Its intended use is as a golf teaching aid. The projects outcome is to create a system for commercial use of this $10,000 radar so that a golfer of any standard can have 10 shots analysed for a fee of $5. The idea is that a card can be pre purchased and the booth will read the information from the card and store the data from the player's shots to create an email send out and a visual display of the player's golf play statistics.

Technical
Firstly an in depth business report including a financial analysis of the viability of this project was undertaken. Then an in depth software requirement specification was written. Next the preliminary software was written. The program that runs the booth and the email send out has been written in visual studio using the C#.net language. Preliminary software has been written but the software was never finished due to the fact that the kernel software that was promised by the supplier was never delivered. The project shall be assessed on the business report, the software requirement specification and the preliminary software.

Presentation
This presentation will:
•   Outline the viability of this project and the financial implications that are involved.
•   Give an in-depth analysis as to how the flightscope radar works and its advantages in using it as a golf teaching aid.
•   Give insight into the programming learned and used in writing the preliminary software.
•   Give an insight into the software requirement specification.
•   Show the work of the preliminary software.

HUMAN COMPUTER INTERFACE USING HAND GESTURE (12cp)
Silas Wan - A07-017

Supervisor : Professor Hung Nguyen
Assessor : Dr Peter McLean
Major: Electrical Engineering

Hand gesture is a very natural form of human interaction and numerous attempts have been made to utilise hand gesture in human-computer interface. This project involves the design of a human computer interface using a small hand-worn wireless module with a 3-axis accelerometer as the motion sensor.

The small standalone unit contains an accelerometer and a wireless Zigbee transceiver with microcontroller. To minimize intrusiveness to the user, the module is designed to be small, at 3cm by 4cm. A time-delayed artificial neural network algorithm is used to analyse the time series data from the 3-axis accelerometer. The neural network algorithm is embedded into the module so that only a command is sent when a hand gesture is recognized, instead of a continuous transmission of time series data to the PC. Power consumption is reduced by the non-continuous transmission of data, use of low-power components, use of efficient algorithm and putting the wireless module into sleep mode between sampling.

A home control interface is designed so that the user can control home appliances by moving through menus in the PC. This application is targeted towards disabled people who have problems using remote control. Their hand gestures are also likely to be irregular and quite different to that of able-bodied people. The neural network can be re-trained to recognize any hand gesture and the new parameters can be re-programmed into the module wirelessly. This means that the algorithm can be adapted to any user easily.

DEVELOPMENT OF A PROTOTYPE CAR BATTERY REPLACEMENT USING SUPER CAPACITOR TECHNOLOGY (12cp)
Ajay Pala - S06-052

Supervisor : Prof. Jianguo Zhu
Assessor : Dr. Ben Rodanski
Major: Electrical Engineering

Energy storage is largely the domain of batteries. However, improvements in super capacitor technology may eventually replace conventional batteries. The requirements for any energy storage solution are high power density, high energy density, long life cycle, rapid and efficient charging and efficient discharging. Batteries do possess some of these properties but they are not capable of efficient and rapid charging or discharging and their life time is relatively short. This is where the super capacitor excels.

Super capacitors are essentially like an ordinary capacitor except that they have energy densities almost as high as batteries with capacitances in the order of thousands of farads. Super capacitors can be rapidly charged or discharged in minutes compared to hours for a battery. Additionally, super capacitors' charging and discharging is almost 100% efficient, meaning significantly less energy loss. The life cycle of super capacitors is many times greater than that of batteries.

This project experimentally investigates and develops a prototype energy storage device using super capacitors to replace the conventional battery in a typical car to determine how viable super capacitor technology is as a battery replacement. The demands on a car battery and its operating environment were experimentally investigated along with the capabilities of super capacitors before a prototype was designed and constructed. The prototype was designed to be a direct drop in replacement requiring no modifications to the car. Finally the prototype's performance was evaluated against the design specifications and the viability assessed.

Super capacitor technology has come a long way in recent times. The price, availability, energy density and performance of super capacitors have improved enough to begin entering the domain of batteries. Although this prototype is currently not a commercially viable product due to the cost differences, it will be in the near future when prices come down.

ON-DEMAND DEPLOYMENT OF VIRTUAL DEVELOPMENT ENVIRONMENTS
Ramy Ibrahim - A07-031

Supervisor : Dr Matt Gaston
Assessor : Steve Murray
Major: Software Engineering

The nature of software development has changed over the course of the past few decades; the need for specialised hardware is becoming less and less popular. However the need for custom development environments has increased with specialised configurations needed in place. Restrictions on computer laboratories have increased and limiting students at universities to apply their specialised configurations for development. These restrictions are in place to protect the computers from viruses/spyware/malware that are circulating on the internet and infect computers if improperly used.

There are some legal issues which affect computer laboratories, administrative rights to the computers are removed to prevent users from installing illegally obtained or downloaded software and music.

Unfortunately all those restrictions interferes with some of the software development, to avoid having to assign a computer to each student which can be very costly and infeasible, a virtual computer can be created for the student or staff to host their development.

Through the use of Virtualization technology, multiple virtual computers can be hosted on one server. Each virtual computer can be assigned to a student or development project with administrative privileges granted.

Each project can have a dedicated development environment without the need of a physical computer, Virtualizing the environment also eliminates the need to physically interact with the computer and remote development can also occur which can be useful for large development projects involving multiple users.

CONSTRUCTED WETLANDS IN AUSTRALIA- SUMMARY OF PRACTICE (6cp)
Parissa Ghanem - S07-047

Supervisor : Dr. Jaya Kandasamy
Assessor : Dr. James Ball
Major: Civil and Environmental Engineering

This literature review analyses and discusses functions of constructed wetlands, treatment processes, types of vegetation, design, construction, establishment and maintenance operations for their optimum efficiency.

Wetlands are areas of land functioning as treatment systems for stormwater and wastewater by use of vegetation and providing habitats for flora and fauna. They provide extensive detention time for stormwater and wastewater which results in sedimentation of suspended solids. Constructed wetlands are being used increasingly in Australia and overseas as a means of improving water quality.

Besides the aforementioned functions constructed wetlands have a variety of other purposes such as aesthetics and recreational values, flood control, provision of a range of food and fibre products such as fish, aquaculture, timber and pasture and stock feed.

Pollutant removal processes in wetlands occur by interaction with wetland vegetation, water column, and wetland substrate and may be physical, chemical or biological. Removal of pollutants can be accomplished by direct root uptake of pollutants or providing a large surface area for proliferation of micro-organisms by wetland plants (macrophytes) which have a significant role in a wetland system. It may also be achieved by adsorption of nutrients by soil and substrate media, extended detention time resulting in die-off of pathogens or UV radiation.

As ecological sustainability is becoming a global concern natural treatment methods for stormwater and wastewater such as wetlands are gaining more popularity compared to more energy intensive methods. This paper focuses on the technology developed for Constructed Wetlands as another option to address stormwater and wastewater treatment and enhancement of degraded flora and fauna habitats.

INTERACTIVE COMPUTING TO AID GUITAR LEARNING AND PROGRESSION (12cp)
Graeme Smith - S07-147

Supervisor : Andrew Johnston
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Software Engineering

Practice is an important aspect of learning to play guitar. However, it can become frustrating and unproductive, especially without continual feedback from a professional guitar tutor. When learning to play a song, the player's concentration may be focussed so much on trying to play correctly, that they do not realise when or how they have played incorrectly. Learning to hear mistakes in performances is an important skill to develop; the player may become discouraged if they do not improve and do not understand why.

An interactive and intelligent software system has been designed and prototyped to provide intuitive feedback to a user, highlighting sections they played well and also mistakes they made. This provides a means for the user to improve their ability to hear mistakes in their performance. A fun and entertaining learning environment motivates the user to continue practising, allowing them to improve their skills.

Software design and development drew upon agile techniques, such as active user involvement and flexible approaches to design and requirements. A variety of users were involved in testing, ranging from people who had never played a guitar before to professional guitar teachers. The usability testing produced a range of interesting feedback and suggestions for improvement, such as giving control to the user and allowing them to customise the program to meet their needs. The early involvement of users focussed the design more on the actual needs of the target users.

A limitation of the software is that it can only accurately process monophonic performances. Polyphonic pitch detection is a problem yet to be solved, and is an area of avid research. The use of hardware, such as divided pickups, could be utilised to greatly improve the accuracy of the software and allow for more thorough and intelligent feedback.

**THE COMMUNITY AS A STAKEHOLDER: COMMUNITY CONSULTATION ON
LARGE INFRASTRUCTURE PROJECTS (12cp)**
Hassan Makkouk - A07-116

Supervisor : Ms Mary Walmsley
Assessor : A/Prof David Eager
Major: Civil Engineering

Community consultation creates synergy between engineers and members of the community
which enhances the planning and execution of large infrastructure projects. Consultation also
promotes sustainability, community education and ownership of projects. To achieve the best
results, community consultants must use a vast array of techniques, and ensure that they plan
and undertake consultation with the proper principles in mind.

The principles of community consultation were evaluated using a three-tiered research
approach. This involved primary and secondary research. The primary research was comprised
of a community survey, and a consultant survey. The secondary research encompassed a
literature and case-study review.

The literature review analysed four academic texts to establish the most important principles of
community consultation. The tools and techniques of community consultation are thoroughly
discussed, as well as a brief guide on how to undertake many of the different tools.

Three case-studies were studied to see how techniques and consultation principles fit into real-
life applications. These case studies were the Tintenbar to Ewingsdale Pacific Highway
Upgrade, the Brisbane Airport New Parallel Runway Project and the Caboolture to Beerburrum
Railway Upgrade, all major infrastructure works.

The consultant survey required ten consultants to give their opinion on the most important
principles of community consultation. Forty community members were also surveyed to gain
insight on their perspectives.

These results helped establish the most important principles of community consultation when
viewed from academic, commercial and community viewpoints. Results of the research showed
that the consultation process must be well budgeted for, take place early in the project life, be
interactive with plenty of two-way interaction and information sharing, be representative of all
views in the community, and be conducted with respect, honesty and integrity.

EXPERIMENTAL ANALYSIS OF MATERIAL SELECION FOR COLD SLUDGE TRANSFER PIPING (6cp)
Jason Goodman - S07-052

Supervisor : John Dartnall
Assessor : Garry Marks
Major: Mechanical Engineering

The management of wastewater in Sydney is achieved via a number of primary treatment facilities located around the city. As a part of the primary treatment process, sludge is removed from the effluent through the use of a mechanism such as sedimentation. Once collected, the sludge must be transported to later stages of the process. Currently this is achieved using a series of pumps and piping.

At a number of Sydney Water Sewage treatment plants, the buildup of material in sludge piping is a significant problem. The buildup of material in sludge lines can affect the performance of the plant as well as having the potential to cause personal injury, equipment damage, economic loss and damage to the environment.

Currently, methods to overcome this problem are costly, inefficient and can affect the performance of the wastewater treatment process. The primary purpose of this report is to investigate the effect of material selection on build up in cold sludge lines. To achieve this, an experimental investigation was undertaken at an operational wastewater treatment facility, North Head STP. A number of test pieces of different materials were installed and the buildup recorded. Based on these findings and consideration of other factors, recommendations as to the most effective option may be put forward.

The report will also include an investigation into the characteristics of sludge and material properties which may be facilitating the buildup. Furthermore, a discussion on the feasibility of alternative solutions will also be included.

A PROFESSIONAL DIGITAL AUDIO SAMPLE RATE CONVERTER AND DAC
John Callaghan (10025486) - S07-???

Supervisor : Dr YourSupervisorsName
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: YourMajor Engineering

The goal of this project was to design and build a self contained device that will asynchronously convert the sample rate and word length of digital audio embedded in an AES/EBU or SPDIF data stream. Sample rate and word length conversion is necessary because of the historical legacy of technological advancement in digital audio over the last 25 years. Sample rates and word lengths have increased as digital hardware has improved since the introduction of the CD in the mid 1980s. This solution is a universal interface between any AES/SPDIF digital audio source and any AES/SPDIF digital audio hardware platform. The device incorporates a high quality Digital to Analog Converter (DAC) for monitoring the audio output of the system.

The Sample Rate Converter ise based on state of the art Application Specific Integrated Circuits (ASICs). The ASICs are controlled by a uController. The hardware is realised on a PCB designed by the author. Firmware to run the Sample Rate Converter is written by the author.

This project covers the entire engineering process from conception to final product testing and release.

COLLECTION, WIRELESS TRANSMISSION AND DISPLAY OF THE ELECTROCARDIOGRAM BIOSIGNAL (12 cp)
Luke Parr - A07-032

Supervisor : Dr. Hung Nguyen
Assessor : Dr. Ben Rodanksi
Major: Electrical Engineering

The viewing and analysis of Electrocardiogram (ECG) signals has always been an important part of medicine. ECG signals, like any signal, can be analysed to ascertain certain information about their source (patient). These can include basic information such as the patient's heart-beat, to detection of arrhythmia and physical heart abnormalities. The collection, transmission, display and analysis of this biosignal presents very interesting problems for engineers to solve.

These three elements are essentially the core elements of the project. Collection and digitisation of the signal before transmission is a complex task requiring a great deal of work. Wireless transmission presents dozens of options which all need to be considered based upon the other two elements of the system. Software to display the received waveform also presents many problems.

The analogue input signal was collected by low-pass filtering it at a frequency of 150Hz. This filter was realised by two methods – firstly by a 1st order analogue Butterworth filter – and secondly, by passing the digitised signal through the equivalent difference equation embedded into a dsPIC30F6010 DSP. The signal was digitised by the DSP's on board ADC, prepared for transmission and sent to the chip's UART buffer for transmission.

The choice of an RS-232 transmission medium was important because of ease of troubleshooting and testing. Standard COM port software can detect the presence of a signal, and software can be readily written to read and display the signal's contents accurately. Two wireless transmission media were chosen based upon this RS-232 backbone – transparent Bluetooth and Wireless LAN serial links.

Displaying both the time and frequency domain waveforms is equally important. By viewing the t-domain it is possible to visually identify aspects of the signal, and the f-domain waveform can easily show aspects of the signal's spectral content. The final versions of the software developed to achieve this were written in C++, but were originally written in C under Turbo-C, with initial simulations done with MATLAB.

The project essentially produced a wireless, low-frequency PC-based DSO which is incidentally suited to the ECG's frequency band. While this project has already successfully been completed elsewhere, my experience throughout this process has been of significant personal and educational value.

CAPSTONE PROJECT TITLE – FACTOR OF SAFETY IN AS4678 (6cp)
Mojdeh Gholami - S07-048

Supervisor : Dr Hossein Taiebat
Assessor : Dr Ali Saleh / Prof. Bijan Samali
Major: Civil Engineering

The objective of this capstone project is to determine the equivalent Global Factor of Safety inherent in the Australian Standard for design of "Earth-retaining Structures", AS4678-2002. The current Australian Standard is based on the Partial Factor of Safety method. This method has many advantages over the more traditional method which has been based on the Global Factor of Safety. It is important to know the difference between the designs based on AS4678 and those based on the traditional method, as many of the existing structures are based on the traditional design method. Hence, their margin of safety needs to be evaluated based on the current standard.

An array of hypothetical retaining walls was designed based on minimal requirements of AS4678-2002, thereby calculating the minimum dimensions required. These dimensions are then used to calculate the Global Factor of Safety based on the traditional method. A range of soil properties and wall heights are used in the design and the factor of safety for each case is obtained.

The results indicate that a correlation exists between the designs based on AS4678 code and those based on Global Factor of Safety method. For cohesionless soils AS4678 shows an equivalent Global Factor of Safety between 1.9 to 2.5, which has been common in the design based on Global Factor of Safety method. However, for cohesive soils the results vary significantly, with a large Global Factor of Safety for retaining walls less than 5 meter in height, and showing less deviation for retaining walls taller than 5 meters.

The findings clearly reveal a correlation between AS4678-2002 and the Global Factor of Safety methods, in particular for cohesionless soils. This is a valuable result in terms of understanding the direct relationship between the new AS4678, which is based on limit state method, and the traditional design method, which is based of the Global Factor of Safety method for the design of retaining walls.

BOAT TRAILER AND NOVEL LOADING SYSTEM DESIGN (6cp)
Peter Haylock - S07-057

Supervisor : Matthew Low
Assessor : John Dartnall
Major: Mechanical Engineering

This Capstone project involves the design of a boat trailer to suit 20ft American imported boats using modern materials and components. Particular attention is applied to the design of the loading and launching system of the trailer. The loading system is designed to enable effective single handed loading and launching in a range of weather conditions that may be encountered whilst utilizing Australian waterways. This loading arrangement has been designed to reduce the frustration experienced by boat operators at the ramp when weather changes unexpectedly.

As the Australian dollar continues to soar against the US dollar, imports of American built recreational boats are increasing. As many Australian dealerships take on American brands little thought is given to the standard of trailers supplied with these craft. Differences in American road rules and design standards mean that many imported trailers are not legal on Australian roads, an area which is often overlooked by the cost conscience dealerships.

With many cities being located on the coast, many Australians take advantage of our prolific waterways through boat ownership. The low cost of American imports are making owning a boat more affordable to many Australians who may have little to no experience in handling and trailering a boat. Poorly designed loading arrangements on both Australian and imported boat trailers mixed with a lack of operator experience often result in frustration and sometimes personal injury during loading and unloading at launch ramps.

The trailer has been designed to meet all applicable Australian standards and Design Rules. It is to be cost competitive with other alternatives available on the Australian market whilst providing advantages over existing models through superior corrosion resistance and loading system design.

DIGITAL IDENTITY MODELLING AND ANALYSIS (6cp)
Rumana Islam - A07-080

Supervisor : Prof. Johnson Agbinya
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Computer Systems Engineering

Identity Management is facing major transformational change as digital technology fundamentally alters how businesses are conducted. This change in identity in this digital era has prompted businesses to deliver more services across the Internet. Due to the unrestrictive nature of the Internet, without proper identification and authentication, users are becoming more vulnerable to identity fraud and theft. Identity crimes are a major concern and users are now increasingly becoming more hesitant in providing their personal information online.

This thesis is aimed at developing a solution that accurately authenticates a person on the Internet. The idea is to go beyond the simple use of username and password when accessing an online service and instead creating a system that uses a combination of attributes of a person to validate, verify and authenticate a user.

A Digital identity Management System (DIMS) using multi-modal authentication would play a very big role in reducing cases of identity theft and fraud on online services. The system will incorporate the use of physical metrics (full name, passport number and race) pseudo metrics (password), device metrics (IP and MAC address) and biometrics (fingerprint and face recognition) when authenticating a user. These credential attributes are then combined using an artificial intelligent technology to derive the overall combined weight of all the submitted credentials. With this combination of credential attributes, the aim is to make it difficult for hackers to guess or forge the combined set of the submitted credential attributes thus reducing cases of identity fraud and theft seen on most online services today.

DESIGN OF A GENERAL PURPOSE EMBEDDED DSP SYSTEM (12cp)
Russell Lowes - A07-075

Supervisor : Dr Peter McLean
Assessor : Mr Anthony Kadi
Major: Electrical Engineering

The increasing pace of technological development in the field of embedded systems has left a void in the UTS Electrical Engineering program for a high speed Digital Signal Processor (DSP) based embedded processing system for course and laboratory project work. ModCon, the system currently used, is based on the FreeScale MC9S12A512 processor. This system is used in the subjects Embedded Systems, Analog and Digital Control, and Signals and Systems. Although adequate in its implementations in these subjects, it doe not provide enough processing power for more advanced applications.

This capstone project focused on the development of a new general purpose DSP based embedded system. Following this an implementation of a Digital Storage Oscilloscope (DSO) was completed to demonstrate the successful design and prototyping of the hardware.

Research was conducted into appropriate component selection and hardware design. This necessitated reviewing many possible component options to allow an appropriate component selection to be made. This process culminated in the design of detailed electronic schematics and the design and manufacture of printed circuit boards for the initial prototype.

Following the design phase, prototypes were constructed and tested to ensure that the design was functional. Required modifications to the initial prototype were documented and a revised prototype was produced.

The final stage of the project involved the design and implementation of a DSO with the embedded system working in conjunction with a PC using the Universal Serial Bus (USB) interface. This stage included the design of both embedded system and PC user interface software.

The outcome of this capstone project is a working prototype DSP based embedded system, its capabilities and functionality demonstrated by the working and functional implementation of a USB DSO.

MAINTAINING CONSISTENCY BETWEEN TEST CASE DEFINITIONS AND TEST SCRIPTS (12cp)
Mark Coleman - S07-028

Supervisor : Dr Zenon Chaczko
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Software Engineering

Testing software is becoming increasingly important in today's software driven world. As software systems become larger and more complex society's reliance on software increases, as does the need for more robust, fault tolerant and error free software.

With the competitiveness of the software development industry, and project schedules being so tight, there are increasing pressures placed on software testing teams to verify the absence of defects. Due to these tight schedules the test team is forced to begin working on a project before the requirements are finalised. This causes issues with managing test documentation, such as a test plan and the related test scripts, as inconsistencies may arise.

Through a collaborative process with the test manager and test team at a Sydney based software engineering firm, a set of requirements for test metadata management were defined. Building upon this, using an evolutionary design and test-driven development methodology, a software tool has been developed to empower software test teams to better manage test metadata and improve software testing productivity.

The Test Metadata Management system was the result. Utilising a configurable plug-in architecture, the system allows any software test team to customise the application to their specific needs. The Test Metadata Management system is a test requirement database that allows a test team to generate a project test plan, and synchronise test metadata between the requirements database and external test scripts, thereby greatly lowering the chance of test metadata inconsistencies.

Using the Test Metadata Management system a test team is able to focus more attention to the actual testing of software. This is done by reducing data management overhead helping to improve the productivity of the team as a whole to test software, locate issues and certify software releases.

SERVICE MODEL OF SMALL BUSINESS (12cp)
Phuong Hoang - S07-059

Supervisor : Mr Stuart Nettleton
Assessor : Mr Alan McNamara
Major: Computer Systems Engineering

Service Oriented Architecture (SOA) is Enterprise Architecture (EA) framework that facilitates Business-IT architectural alignment. Current industry trend is a move towards SOA – according to Gartner research, by 2008, 60% of enterprises will be using SOA as a guiding principle when creating mission critical applications and processes.

In large organisations, SOA is implemented to enable the delivery of business objectives and strategies which include:

•   Enhancing/enabling business agility
•   Reducing Total Cost of Ownership (TCO)
•   Enhancing/enabling compliance
•   Increase reusability in IT
•   Increasing customer satisfaction

At present, the potential of SOA in a Small or Medium Enterprise (SME) has not yet been explored by the industry and no framework exists in guiding SME towards SOA. The focus of this project is to develop a Service Model which will describe the structure and behaviour of an SME business; and through this, document the methodology in applying SOA to an SME.

Through using Service Modelling as the guiding principle to performing business analysis, the process of identifying and defining of business services is documented. Further to this, compositions of shared services were analysed to extrapolate a framework to assist in the identification of weaknesses and/or faults in existing business processes, information and/or IT infrastructure such as redundancies, utilisation, and manual processes vs. automation.

PEDESTRIAN SLIP RESISTANCE PERFORMANCE OF FOOTPATH PAVING MATERIALS IN HIGH PEDESTRIAN TRAFFIC AREAS (6cp)
Stuart McTaggart - S07-100

Supervisor : Dr Ravi Sri Ravindrarajah
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Civil Engineering

Slippery walking surfaces are widely considered to be dangerous and are a common cause of injury in Australia and overseas. Safety and liability issues and an increasing focus on responsible asset management suggest that Local Governments need to consider the continued safe performance of footpath surfaces. While current Australian Standards specify levels of slip resistance for new pedestrian surfaces, they do not provide methods for predicting the potential long-term slip resistance performance of such surfaces.

A study of the sustainability of slip resistance of paving products was undertaken to provide an indication of the rate of change in slip resistance and to assess the suitability of different surface materials for use in high pedestrian traffic areas. Materials included in the study were clay brick, granite, sandstone, asphalt and various concrete products. These materials were installed in high and low pedestrian areas and the slip resistance measured using a pendulum device to AS/NZS 4586:2004 and AS/NZS 4663:2004 over a two month period. The same materials were also tested for slip resistance after undergoing accelerated wear using a process developed by Strautins (2007).

The slip resistance of the materials tested in service showed an initial rapid decline in the first two weeks followed by a steady but significant decline for the remainder of the test period. With the exception of standard footpath concrete, all the materials tested in the high pedestrian area exhibited a large reduction in slip resistance of up to 15-25% when measured with 4S rubber and 25-40% using TRL rubber. Tests with TRL rubber indicated a greater reduction in slip resistance at the high pedestrian site however this was not observed when tested with 4S rubber.

Accelerated wear testing indicated a rapid initial loss of slip resistance for all materials, which slowed after approximately 2000 wear cycles. Rank correlation of material performance after 2000 cycles under the accelerated wear test and two months in the field shows only limited comparability at this early stage in the life of the installed pavers.

This study has shown the difficulty of maintaining the slip resistance of pedestrian surfaces in busy areas. Useful information has also been gained about the accelerated wear test. Continued field testing over a longer period is warranted to allow more meaningful comparison between the accelerated test method and actual paving installations.

ANIMATIONS OF THE STRUCTURAL RESPONSE OF PLANE FRAMES – A LEARNING TOOL FOR STRUCTURAL ANALYSIS (6cp)
Nicholas Morphett - S07-106

Supervisor : Dr Ali Saleh
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Civil and Environmental Engineering

The understanding of structural behaviour is a crucial element in the work of civil and structural engineers. In professional practice today it is increasingly common for structural designs to be carried out using the aid of computer software. This has advantages in great speed and accuracy of design, but it also comes with its dangers. If the engineer using the software does not have a good conceptual understanding of what the software is doing, they are unable to critically assess the results. This inability could lead to poor designs and potential structural failures.

The project hopes to address this issue by providing a series of animations to help students of Structural Analysis better understand the behaviour of structural frames. The animations show in a dynamic way how structures react when subject to various types of loading. This will help students to develop an ability to visualise what is occurring to the structure when they are solving a particular structural analysis problem.

This ability will assist students in their future careers. When designing they will be able to visualise how they expect a structure to behave. Then when they are interpreting the results of computer calculations they can determine whether or not the results are in line with what they would have expected. Suspect results can then easily be identified and corrected. This will lead to safer and more efficient structural designs in the future.

A SIZING MODEL FOR THE ADEMPIERE APPLICATION (12cp)
Leroy Pinto - S07-123

Supervisor : Mr Stuart Nettleton, industry co-supervisor Mr Alan McNamara
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Computer Systems Engineering

Enterprise Resource Planning (ERP) is an industry term for a broad set of activities, supported by a software application, which aid a business. For example, a manufacturer managing the critical sectors of its operations, such as interacting with suppliers, would benefit from the implementation of an ERP application.

ADempiere, an Open Source ERP Solution, is a powerful tool for businesses. ADempiere provides all critical functionalities expected of a commercial-grade ERP software application, such as customer relationship management, financials and supply chain management.

For large scale commercial ERP software applications to add value, they require adequate sizing models and performance testing frameworks. These functions allow for effective planning, overall costing and satisfying resource needs of a business. ADempiere lacks a sizing model and performance testing framework. In respect to this present gap, this Capstone project's main objective is to determine the best way to fill this requirement and contribute to the existing and future ADempiere community. This will be achieved with:

    An ADempiere Implementation Plan
    An ADempiere Performance Testing Framework
    An ADempiere Sizing Model

The ADempiere sizing model is to be developed using the IBM Work Load Estimator. The IBM Work Load Estimator is a useful tool in determining the hardware characteristics needed for a business wishing to pursue an Open Source ERP solution. The Workload Estimator provides current and future growth recommendations for the hardware characteristics of the system, which satisfy the client's performance requirements.

This Capstone project outlines and details the successful implementation and optimisation of ADempiere, on the IBM System I, under SUSE Linux Enterprise Server 10. Using an Open Source commercial grade performance testing application, named WebLOAD, a performance testing framework was developed to enhance the ADempiere community.

HVAC SYSTEMS AND MODELLING OF DESIGN FOR ENERGY EFFICIENCY (6cp)
Julian Spoor - S07-149

Supervisor : A/Prof Guang Hong
Assessor : John Dartnall
Major: Mechanical Engineering

The energy consumption of the building sector represents approximately 23% of Australia's greenhouse gas emissions (Piddock:07). Up to 55% of this is due to heating ventilation and air-conditioning (HVAC) systems (Mcann:07). A recent focus on energy performance of buildings in regard to building fabric, and the services contained within, has been prompted by recent amendments made to Section J of the Building Code of Australia BCA 2007. This code sets minimum energy targets for the building industry.

This report looks at the voluntary classification that buildings energy performance can get to reference against other buildings, such as the Greenstar Energy Rating Scheme and the Australian Building Greenhouse Rating Scheme. This information has a value to building owners and tenants by enabling them to estimate lower running costs represents both a financial saving, as well as representing an image that a building owner or occupier might want to portray.

With the relevance of energy efficiency to the market now show, we will look at a development which represents typical design of an office building. We will model the building structure and services using BEAVER Building Energy Simulation in its base design form getting a quantifiable building energy consumption figure. We will then modify the design to comply with recent amendments made to section J of the BCA and compare the energy simulation of this new design to the base building. This case study will be used to show how building energy can be simulated while at the same time showing how improvements in design translate into a quantifiable reduction in building energy consumption.

THE DEVELOPMENT OF A TEST METHOD FOR IMPACT ATTENUATING SAND – PLAYGROUND SAFETY (6cp)
Daniel Weaver - S07-177

Supervisor : A/Professor David Eager
Assessor : Mr Ken Halstead
Major: Civil Engineering

In children's playgrounds within Australia and abroad, sand may be employed as a surfacing material to yield the benefits of its impact attenuating characteristics, its aesthetic appeal and its high play value to children. As a consequence of general use and environmental activity, this material will deteriorate over time – leading to inferior performance in terms of impact attenuation. When this happens, children are exposed to increased risk – in terms of both likelihood and consequence.

The purpose of the project was to establish an accelerated ageing test method to simulate the deterioration of sand over time and in use in a children's playground setting. The intention is to apply the test method as an extra-over to the existing Australian / New Zealand Standard 4422 – 1996 requirements for playground surfacing at the material selection stage, to ensure that sands employed will provide superior impact attenuating performance for extended service life.

The project explored alternative degradation methods, focusing on the geotechnical fields Standard Compactive Effort. Using this method in a laboratory environment, sands known to perform well were characterised and compared to those known to have lesser performance. Performance was measured based on the change in a sands particle size distribution. Field tests were thereafter conducted to identify correlations between the proposed method and performance requirements specified in the Australian / New Zealand Standard 4422 – 1996.

The project has successfully established a method to assess the deterioration performance of sand. The project has also identified, and thereby analysed, three key variables which influence the impact attenuating performance of sand – specifically (i) the percentage fines (a function of degradation), (ii) the particle shape, and (iii) the grading, which the project has defined through statistical analysis coefficients. These findings are significant as they are unprecedented and provide the fundamental basis by which material selection approaches in the field may be advanced.

ANONYMOUS FILE SHARING IN N-TIER ARCHITECTURE (12cp)
Shuvo Debnath - A07-013

Supervisor : Dr David Davis
Assessor : Dr Zenon Chaczko
Major: Software Engineering

This capstone focuses on dealing with the difficult problem of protecting users from measures, implemented by a third party, to prevent them from using peer to peer file sharing applications. Among many solutions researched, the most practical turned out to be anonymous file sharing protocol, based on swarming theory.

The problem was approached by initially examining the architecture of established protocols such as Napster and BitTorrent. Each of the protocols represented a generation of peer to peer file sharing protocols, ranging from "first" to "fourth". Analyzing the evolution of those protocols gave a clear picture of what an anonymous file sharing protocol should and should not have.

The capstone provides a solution, dubbed the "ProxyPeer protocol"; a protocol designed to be compatible with an existing 4th generation protocol – BitTorrent – and includes the features of anonymity and swarming. Research on other protocols had shown that having a heavy emphasis on privacy would lead to an imbalance between three other most important system qualities – Performance, User Friendliness and Anonymity. This ultimately led to the unpopularity of most protocols, and rendering them useless as a large scale peer to peer network. To ensure balance, the focus shifted from Anonymity to "Plausible Deniability". Essentially, this functioned by having users, "sometimes", having their traffic routed through a proxy (but most of the time would not). Using this technique, there would be no easy way for a third party to differentiate between a real peer and a proxy peer, therefore leading to a reliable, usable form of protection.

A COMPARISON OF REAL TIME RENDERING TECHNIQUES (12cp)
Timothy Cooper - S07-029

Supervisor : Kevin Suffern
Assessor : Dr YourAssessorsName-AsAdvisedByYourSupervisor
Major: Software Engineering

Since the advent of hardware Graphics Processing Unit's (GPU) the field of realtime computer graphics has taken a number of leaps forward in regard to the quality and performance of the effects that can be achieved. In the current state of the art these effects are achieved using 'shaders', small applications which are executed on the graphics hardware which allow a three dimensional scene to be shaded and illuminated in
a realtime fashion.

The field of realtime computer graphics has many applications, ranging from military simulation software, all the way through to entertainment software such as video games. The goal of all these applications is to effectively model the real world, and provide an immersive environment which the users 'avatar' can navigate. Unfortunately for the developers of realtime graphical applications, it is difficult to predict the performance tradeoffs
associated with each specific graphical technique.

A rendering engine has been developed to analyse and compare different rendering techniques subjectively. The engine, in conjunction with an array of implemented graphical techniques, has provided performance and quality metrics on a variety of rendering techniques with regards to the performance of a realtime rendering engine. The project addresses several cutting edge techniques such as High Dynamic Range Lighting,
Ambient Occlusion, and Deferred Shading. The engine was designed and developed to allow addition of new techniques using a plug-in based architecture, ensuring that it can be used in the future to implement and analyse new rendering techniques as they become
available on the graphics hardware.

Due to the rapidly moving field of realtime graphics, there is currently a lack of data relating to the performance of cutting edge realtime rendering techniques. The developed engine, and implemented rendering techniques form a basis for this Capstone which provides useful information to industry about how a specific technique will effect the performance of graphically intensive applications.

OPTIONS FOR RETROFITTING THE UNIVERSITY OF TECHNOLOGY SYDNEY BUILDINGS 1 AND 2 TO BE MORE ENERGY EFFICIENT
Brendan Muscat - S07-108

Supervisor : Civil & Environmental
Assessor : Mr Ken Halstead
Major: Mr David Eager

Through the daily operations and communications taking place in the numerous campuses of the University of Technology Sydney (UTS), there is a significant environmental footprint produced. A large proportion of this footprint can be attributed to its large energy consumption and resultant greenhouse gas emissions. Focussing solely on UTS Buildings 1 and 2 of the city campus, this report will aim to discuss the different technologies that are available to implement, in order to reduce the energy consumption of the University, thus reducing its footprint.

The current practices and projects that are currently being undertaken at the University as well as current energy consumptions will be investigated, with the trends and patterns found for the past few years used to extrapolate consumptions and carbon dioxide emissions for the future. These forecasted figures can then be used in the report to determine a relevant payback period for the different technologies available to the University. This financial assessment will allow a clearer understanding into the economic viability of the different options. This payback period will be based on data such as initial capital outlay, operational costs, maintenance and servicing costs and respective costs savings per annum.

Upon completion of an economic and technical analysis of the different technologies, final recommendations and conclusions will be made based on the findings of the primary and secondary research, in order to determine the most appropriate technologies and systems that can be used to reduce the energy consumptions and environmental impacts of the University Buildings 1 and 2.

AUTOMATED TERRESTIAL TV ANTENNA
Mark Beacroft - A07-095

Supervisor : Nong Zhang
Assessor : Dr. Haiping Du, Senior Research Associate MIS Centre
Major: YourMajor Engineering

Camping is a very popular pastime for many Australians, it allows them break away from the hassles of their everyday life and experience the freedoms of Australia. However campers nowadays wish to be able to take the creature comforts that they have become accustomed to at home, with them when they go camping. One of these creature comforts is the television, and the ability to watch any show, that's on any channel, at any given time. The television however, becomes much more of a luxury when camping as every time campsites are changed you must undertake the arduous task of re-orientation the TV antenna for optimum reception.

Currently there are a select few manufactures who produce TV antennas that can be remotely controlled from inside the caravan, allowing the user to adjust the orientation of the antenna remotely. These antennas however only move according to the user's input: that is if the user sends the command to turn right, they turn right. These antennas have no knowledge of the strength of the TV signal being received or the orientation of the antenna that would obtain the optimum reception for that channel.

This report details my design and construction of a proof of concept prototype, for an Automated TV Antenna that will autonomously determine its optimum orientation for each TV channel that the user wishes to view. Upon user input the antenna will move to the orientation that provides optimum reception for the selected TV channel. In addition the method used for determining the strength of the received TV station signal, could also be used to develop a low cost hand-held TV station signal strength meter that could be used by TV antenna installers, or the everyday person, to install TV antennas at fixed locations in the correct orientation so as to obtain optimum reception.