



Department of Computer Science and Software Engineering

SENG402 Project Presentations 2017

Thursday 12 October 2017
Kirkwood KC04 and KC05



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Software Engineering Showcase 2017

SENG402

The final year project is a required course for all software engineering students. The project provides the opportunity for the student to demonstrate their preparedness for real world software engineering. Students on the final year project build on the project they have completed in previous years of the programme, in particular the single semester project in 1st Pro (SENG202) and the whole year project in 2nd Pro (SENG302).

Since 2016, the department has offered students the opportunity to work collaboratively on their final year software engineering projects as 'teams'; and to offer the opportunity to work with industry on company-sponsored projects.

The projects presented today are a therefore a combination of individual and team-based projects, with the projects typically being proposed by companies or academics.

Programme

9:30-10:15am: Morning tea and Welcome

9:30-10:00am	Morning tea	KC04
10:00-10:15	Welcome	KC04

10:15-11:15am: Session 1

Session 1A: Education I

Session Chair: Richard Lobb

10:15	Kanyakorn Kitisopakul: Extending UCanAsk, UC's Audience Response System	KC04
10:30	Thomas Wilding: Discrete Mathematics Puzzles for Learning	KC04
10:45	Will Richardson: Improved Teaching of Group Projects with Lens++	KC04
11:00	Emily Price: Developing UI Plugins for Coderunner	KC04

Session 1B: Computer Vision and AR/VR

Session Chair: Andreas Willig

10:15	Dale Baker: Detecting Branches In Depth Images Generated By An R200 Camera	KC05
10:30	Patrick Nicholls: Ravensdown UAV Crop Metrics	KC05
10:45	Liam McKee: HoloLens Geology Model Visualisation	KC05
11:00	Adam Hunt: HoloLens Geology Model Visualisation	KC05

11:15-11:30am: Break

11:30-12:15pm: Session 2

Session 2A: Education II

Session Chair: Dongseong Kim

11:30	Nicolas Robinson-O'Brien: Improving Stochastic Petri Nets (SPNP) software package: SPNP Gui	KC04
11:45	Isabelle Taylor: Interactives in the Computer Science Field Guide	KC04
12:00pm	Josh Nimmo: Pedestrian Detection and Collision Avoidance	KC04

Session 2B: AR/VR I

Session Chair: Mukundan

11:30	Jonty Trombik, Hamish Christeller and Nic Christeller: Model Visualisation and Furnishing in VR	KC05
12:00pm	Nick Russell: Virtual Reality Engineering & Construction Collaboration	KC05

12:15-1:00pm: Lunch

12:15-1:00pm	Lunch	KC04
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1:00-2:00pm: Session 3

Session 3A: Applications I

Session Chair: Matthias Galster

1:00	James Bayly: UC Student Reps Management	KC04
1:15	Sarah Jackson: Using sensors to provide movement feedback to aid patients with physical rehabilitation	KC04
1:30	Vincent Reilly: Inexpensive Vehicle Tracking System	KC04
1:45	Elora Walmisley: Gathering and Interpreting Data from Sensors to Help with Physical Rehabilitation	KC04

Session 3B: Mobile Applications

Session Chair: Tim Bell

1:00	Angeli Arino: UCIRO Health and Safety Travelers Application	KC05
1:15	Regan Gully: LOVEChristchurch	KC05
1:30	James Watson: NextGig – Connecting musicians and venues	KC05
1:45	Aaron Wilson: Revolution Youth App	KC05

2:00-2:15pm: Break

2:15-3:00pm: Session 4

Session 4A: Applications II

Session Chair: Andy Cockburn

2:15	Joseph Weaver: FlatMum: All-in-one Flatting Utility App	KC04
2:30	Elliot Lines Smith: FlatMum: All-in-one Flatting Utility App	KC04

Session 4B: Applications III

Session Chair: Walter Guttmann

2:15	Sam Cassidy: Gamification for Project Priorities	KC05
2:30	Jonathon Garratt: Gamification for Project Priorities	KC05

2:45-3:30pm: Close and Afternoon tea

2:45	Closing comments	KC04
3:00pm	Afternoon tea	KC04

Abstracts

UCIRO Health and Safety Travelers Application

Angeli Arino

Company: UCIRO

Supervisor: Matthias Galster

This project aims at developing a cross-platform mobile app that provides health and safety information (e.g. basic information about a country or emergency information) and services to UC students travelling overseas. Some initial features of the app include support for different travel programmes and support for different users. The content provided in the app should be managed through a user-friendly web interface. Maintaining the app as well as information and services in the app must be simple. Once set-up, someone with limited technical knowledge can use it to set up new programmes and add/update information.

Detecting Branches In Depth Images Generated By An R200 Camera

Dale Baker

Supervisor: Richard Green

Pruning trees is a dangerous and laborious job for which there is a shortage of workers. The University of Canterbury is developing UAV drones capable of autonomously pruning tree branches. These UAVs are equipped with two r200 cameras and must be able to locate appropriate branches. Point clouds from footage are stitched together using key features to create a single point cloud of the target tree. The tree has its trunk detected by fitting a cylinder to the point cloud. Points that do not are not near the circumference of the trunk are removed and the remaining points are grouped and clustered together as branch locations. This method effectively detected all of the 12 branches in a given test point cloud

UC Student Reps Management

James Bayly

Company: University of Canterbury & University of Canterbury Students Association

Supervisor: Matthias Galster

Student representatives play a vital role in student engagement at the University of Canterbury (UC). They are the first point of contact for students, they help solve academic issues at the lowest level, and they give essential feedback to UC. However, administering this program has become a nightmare and a solution is needed to allow this program to be greatly expanded. This project delivers a modern online experience to UC students to allow them to get the support they need and help student representatives engage with their colleagues in class.

Gamification for Project Priorities

Sam Cassidy

Jonathon Garratt

Company: Christchurch City Council

Supervisor: Tom Young

The importance of utilising funds for maximum value is a critical part of every organisation. In order to do that, organisations need to prioritise what the funds should be spent on. The problem is no-one likes to prioritise. The prioritization meetings can take a long time, in particular when coming to a consensus is problematic, and budgeting/allocating funds is often seen as a chore rather than an important activity. In large organisations the process of prioritization is usually done by a select few high level individuals and as such the process is not transparent. This means that the front line staff tasked with implementing the projects do not have a chance to voice their opinions of the details and the viability of projects. Our project hopes to address these problems within the Christchurch City Council by giving them a new tool to use within their current prioritization system. Our application endeavors to make the process of prioritization more interesting by providing a gamified view of the proposed project ideas, which encourages staff to engage with the process. By removing the need for a single prioritization meeting by providing a website that is accessible to all Christchurch City Council staff, staff are empowered to participate in the process, thus making it transparent. Our application's forums allow front line staff to convey their opinions about proposed ideas allowing for a clearer feedback loop between upper management and front line staff. This results in better refined ideas and a more inclusive atmosphere within the organization.

Model Visualisation and Furnishing in VR

Hamish Christeller

Nic Christeller

Jonty Trombik

Industry Sponsor: Intranet

Industry Advisor: Dominion

Supervisor: Rob Lindemann

Accurately conveying a 3D design can be the difference between a new client and a lost one. Traditionally, 3D designs are displayed using 2D mock-ups or an artist's impression. This project explores the use of Virtual Reality to display 3D visualisations of such designs to a user, giving a sense of scale not available through 2D mediums. Virtual furnishing is used to further extend the user's perception of the design, and allow them to customise it as they had envisioned.

Gamification for Project Priorities

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LOVEChristchurch

Regan Gully

Company: UC International Department

Supervisor: Austen Rainer

LOVEChristchurch is a mobile application designed to make it easier for University of Canterbury international students to find activities and events that interest them. The app acts as a student's digital brochure providing in-depth information such as pricing, related images and reviews sourced from reliable local knowledge. It utilises modern mobile sensors such as GPS to suggest activities nearby and provides offline saving so that the app's information is always available, even when on the go.

HoloLens Geology Model Visualisation

Adam Hunt, Liam McKee

Company: ARANZ Geo

Supervisor: Rob Lindemann

The purpose of this project was to explore the visualisation of geological models in augmented reality. This was achieved using the Microsoft HoloLens, an augmented reality headset. Visualising models in augmented reality would benefit the geology industry as analysing them is much easier to do in a 3D space, than on a monitor.

The prototype we designed sources models at runtime from a remote database through a RESTful API and allows the user to view/interact using gestures. The user can view the model in the real world, remove and add sections and scale to their preference. Users may also access different versions of the model to see the progressive changes made over time.

Using sensors to provide movement feedback to aid patients with physical rehabilitation

Sarah Jackson

Supervisor: Moffat Mathews

This honours project focuses on building a system that will provide meaningful feedback to patients undergoing therapy in regards to mobility disabilities after a stroke or traumatic brain injury.

Harnessing the technology of intelligent tutors, this project enables a user to be provided with feedback in regards to how one side of their body is moving in regards to the other, and compare their movement to previous sessions with data from the sensors.

A wearable apparatus with sensors attached is worn by a patient whilst they are performing an exercise. The patient will upload the data from the sensors to their profile on a web app that will analyse the data, send it to an intelligent tutoring system, and return corresponding feedback.

Extending UCanAsk, UC's Audience Response System

Kanyakorn Kitisopakul

Supervisor: Moffat Matthews

UCanAsk, a web-based Audience Response Systems (ARSS), was first developed in 2011 by a group of software engineering students from the University of Canterbury under the supervision of Moffat Mathews. UCanAsk has been used in a number of courses by lecturers in the university to interact with his/her students by opening questions and allowing students to answer using their smart mobile devices during lectures. UCanAsk has become increasingly popular as lecturers find ways of incorporating interaction during lectures, especially in large classes. Since 2011, UCanAsk's technology stack has not been updated. There have also been many requests from lecturers for easier ways to administer their questions including deleting questions and clearing responses. They also want to export course and lecture data in different formats for offline analysis. Additionally, administrators want to be able to archive, delete, backup, and restore courses. Administrators also need to be able to search for a user. Each time a presenter is added to UCanAsk, an administrator needs to "edit the user" and elevate his/her permissions. Currently, the administrator has to look for the user in a very long list of all users by slowly advancing each page, one at a time. This is very time consuming and frustrating. This SENG402 project extended UCanAsk to add all of the above functionality and upgrade the technology stack. With this extension, lecturers and administrators will spend less time and energy on administrative overhead and more on enhancing teaching.

FlatMum: All-in-one Flating Utility App

Elliot Lines Smith

Joseph Weaver

Supervisor: Andy Cockburn

FlatMum is a mobile application that caters to the hard-to-organise activities involved in living in a flatting arrangement. A survey carried out on 450 potential users was used to prioritise the most important features for the application. It has been created using Xamarin, a cross platform development environment and works in conjunction with Google's Firebase database service. Using these tools we have built an application that coordinates a cooking roster, IOUs between flatmates and a task scheduler. It also provides a single place to find communication details for flat members. We have incorporated these utilities into a well presented, consistent and reliable UI.

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Ravensdown UAV Crop Metrics

Patrick Nicholls

Supervisor: Richard Green

This project seeks to find a way to estimate the mass of kale and rapeseed crop in a paddock using a UAV with a camera attached to it. The UAV is to record top-down imagery of the crops while flying overhead. From the captured images a 3D representation of the paddock is generated in the form of a point cloud. By analysing the point cloud the points representing the top of the crops can be identified and modeled as a plane, and by knowing the horizontal dimensions of the paddock, the average height of the crops and the density of the crops, the total mass of crop available for harvest can be determined with a few simple calculations after the software has been run.

Pedestrian Detection and Collision Avoidance

Josh Nimmo

Company: Fulton Hogan

Supervisor: Richard Green

Construction sites are dangerous places to work, collisions between moving plant and pedestrians can result in serious injuries or fatalities. Fulton Hogan, a New Zealand based civil construction company wish to deploy an automated pedestrian detection and collision avoidance system to augment existing procedures and technologies. The solution developed throughout the year utilises Intel R200 RGBD cameras which supply a SSD based neural network for pedestrian detection. The system then alerts the plant operator when pedestrians breach the predefined exclusion zone through a graphical user interface.

Developing UI Plugins for Coderunner

Emily Price

Supervisor: Richard Lobb

Coderunner is a system used for assessing student-submitted material, by running said material past a number of automated tests. Coderunner is used heavily by the department of Computer Science and Software Engineering at the University of Canterbury to assess students' understanding of programming and computer science concepts. User interface (UI) plugins have the potential to greatly expand the variety of knowledge that can be assessed with Coderunner. This project focuses primarily on the development of a Finite State Machine UI, for use in the university's COSC261 course.

Inexpensive Vehicle Tracking System

Vincent Reilly

Supervisor: Tom Young

In New Zealand vehicle theft is a significant problem, and unfortunately stolen vehicles have a low rate of recovery. A solution to this problem is placing tracking devices within vehicles, which is generally done in newer high-end cars. However most vehicles are not equipped with this technology, with the average age of New Zealand cars near 14 years. Vehicle owners have the choice of getting a 3rd party tracking device installed – however affordability of these trackers puts them out of reach for students and much of the wider community.

This project addresses this affordability problem by reusing something many people have lying around their home - an old android smartphone. By installing the developed app on an android smartphone and placing it within a vehicle, users can now locate their vehicle at any time. This solution also offers many benefits not offered by other 3rd party devices, including the ability to receive notifications when your vehicle is driven by someone else, collision detection, and monitoring of where your vehicle has been driven.

Improved Teaching of Group Projects with Lens++

Will Richardson

Company: UC CSSE

Supervisors: Moffat Matthews and Tom Young

Running a software engineering course is time consuming and difficult, especially with class sizes growing. Lens++ is a system for managing group projects, designed to be easily used by many courses at the same time, and supports an Agile-based course structure. It is able to manage students, teams, sprints, view project statistics, and gather and distribute feedback from students. Existing tools require technical knowledge to setup and use, creating a barrier which stops most courses from using them.

Lens++ includes a module for generating statistics from a Git repository. Unlike existing tools that are limited to counting the added and removed lines, it finds differences in the syntax tree of the code. This gives more detail and allows tracking moves and updates of code in addition to added and removed code. This can be used by teachers and tutors to better understand the types of contributions of teams members over the lifetime of a project.

Improving Stochastic Petri Nets (SPNP) software package: SPNP Gui

Nicolas Robinson-O'Brien

Supervisor: Dongseong Kim

Computer security analysts are interested in modelling the state of computer systems. One formalism which can be used to model the logical interactions in complex systems is stochastic petri nets (SPN). There are various software packages that simplify the creation, manipulation and analysis of SPNs. One of these is the Stochastic Petri Net Package (SPNP). This 402 project containerizes SPNP and creates a web based user interface which can be used to create, save, edit and analyze SPNs.

Virtual Reality Engineering & Construction Collaboration

Nick Russell

Company: LazyWorm Applications

Supervisor: Rob Lindemann

An Architects ability to realise a client's vision is highly encumbered by the client's ability to interpret the Architects design. For years the client has been forced to visualise architectural designs through mediums which require some form of design background to interpret fully. The objective of this project was to provide a platform which allows Architects to easily import their digital models into a Virtual Reality environment. A medium which will immerse their clients and bring a proper sense of scale and realism to their digital designs.

Interactives in the Computer Science Field Guide

Isabelle Taylor

Supervisor: Tim Bell

The Computer Science Field Guide is an online resource for teaching high school students about Computer Science. It includes many interactive components that allow students to explore a concept and come to their own understanding of it. This project involved the development of three interactive components. These interactives teach students about a variety of topics including face detection using Haar-like features, JPEG compression and the bin packing problem.

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Gathering and Interpreting Data from Sensors to Help with Physical Rehabilitation

Elora Walmisley

Supervisor: Moffat Matthews

Stroke and traumatic brain injury survivors often suffer impaired mobility following the initial injury to the brain. Physical rehabilitation provides stroke survivors with the opportunity to reduce their impaired movement and increase both their ability to live independently and quality of life. The rehabilitation is often drill-based and repetitive, impacting survivors motivation and reducing the dose of rehabilitation below what is required to produce significant improvement. Patients also tend to progress slowly and are unable to view their own progress, further impacting their motivation. This project investigates the possibility of tracking the orientation of limb movement with wearable sensor prototypes and is part of a much larger project involving an intelligent system for tracking the patient's movement, understanding the movement in context, and providing the patient with adequate feedback. This report details the design and construction of both the hardware and software components of these wearable sensor prototypes. It also details the construction of wearable harnesses that allow the prototypes to be worn and the development of a visualization application that allows the orientation of each body sensor to be viewed.

NextGig – Connecting musicians and venues

James Watson

Company: NextGig Limited

Supervisor: Austen Rainer

There is a problem in the hospitality industry when it comes to organising and booking live music: The search costs are too high. Surveyed venues and artists are spending 5 to 20 hours a month just managing his process. NextGig is a cross-platform mobile application that aims to solve this problem. Venues can create listing with smart recommendations for artists that are available to play, and artists can accept these offers. NextGig reduces the time needed for a venue to find an artist to fill a slot from hours, to minutes if not seconds.

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Discrete Mathematics Puzzles for Learning

Tom Wilding

Supervisor: Andy Cockburn

The project attempts to give discrete mathematics students new tools and content in the form of puzzles that minimize the use of language and provide visual representation of problems. The puzzles aim to be incremental, each puzzle builds upon the previous puzzle so as to provide a gradual introduction into complex topics. The primary topic focused on was planarity.

Revolution Youth App

Aaron Wilson

Company: Revolution Youth

Supervisor: Austen Rainer

Revolution Youth (www.revolutionyouth.nz/) is a youth organisation based in New Zealand working with the community to provide a safe place for young people to spend time during the week and invest into their lives. Revolution Youth holds regular weekly events at multiple locations in cities across New Zealand as well as larger events from time to time. They require a way of effectively communicating when and where these events are while not getting lost in social media. The solution to this problem was to create a cross-platform mobile application supported by an administration panel to quickly communicate and distribute up to date information.

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