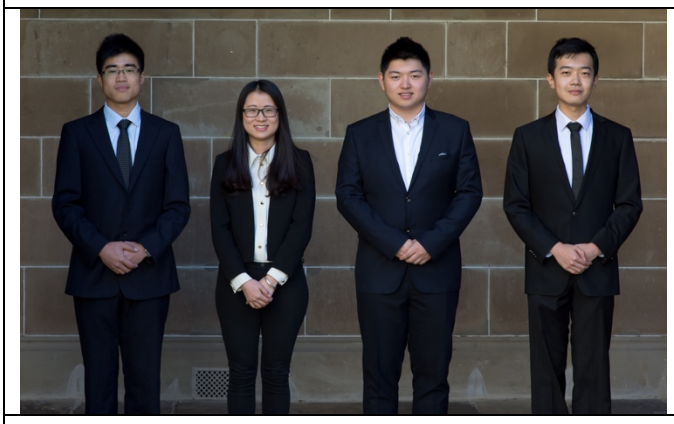
Mechatronics Engineering:

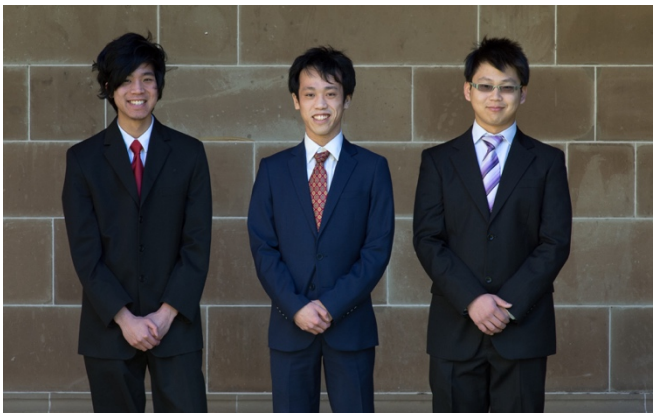
Servo Drive Hardware in the Loop System



Lei Zhang; Yuduo Wei; Wan Li; Dayu Li

In common testing procedures, it can be difficult and expensive to emulate the real system. Hardware in the Loop (HIL) simulation provides an efficient and safe environment to do hazard and critical testing. This project involves replacing the servo motor, power stage and encoder, with the HIL simulation system, which is connected to the control board. This is achieved using a digital signal processor to calculate the currents, velocity and speed of the motor from the pulse width modulation (PWM) signals and send them back to the control board.

Surgical Robotics Development



Zhong Yan Chen; Ya-Yen Tsai; Alvin Ng

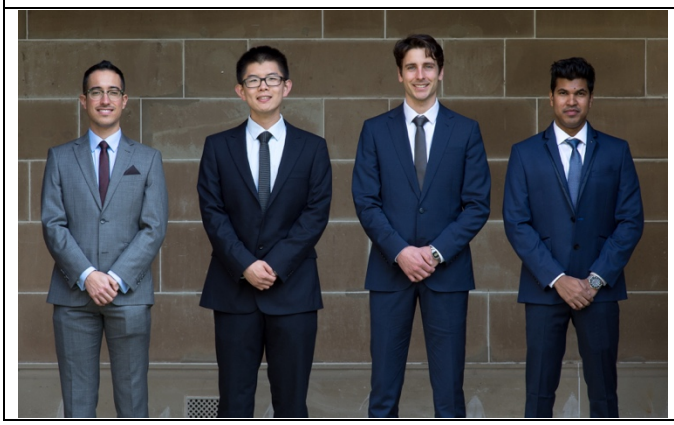
Laparoscopic—or keyhole—surgery has been shown to reduce post-operative trauma, pain and recovery times. However, they are very difficult procedures due to the small incision sizes surgeons must work with. This project will develop a highly dexterous laparoscopic robot. This requires designing a manipulator that utilises Local Magnetic Actuation to transmit driving force over the abdominal wall, without a material connection to the external system. The primary task for the manipulator is lifting the liver to assist in a cholecystectomy procedure. It will be designed to be modular, allowing for a variety of end effectors to be developed.

Hybrid Unmanned Aerial Vehicle (UAV)

Sophie Bainbridge; Nathan Murfey; Bede Wolfenden; Francesco Lanciana

This project extends the work of the 2015 Hybrid UAV Capstone team to address the growing need for UAVs capable of both long-range flight and flexible landing. This project aims to achieve this by developing a fully autonomous drone capable of transitioning between vertical take-off and landing (VTOL) and horizontal (fixed-wing) flight. With on-board computer vision systems capable of detecting a person from 35m away, and the flexibility, speed and range provided by its hybrid flight design, this drone is well-suited to conducting autonomous search-and-rescue missions, delivery or collecting small payloads from otherwise inaccessible locations, and visually identifying environmental hazards.

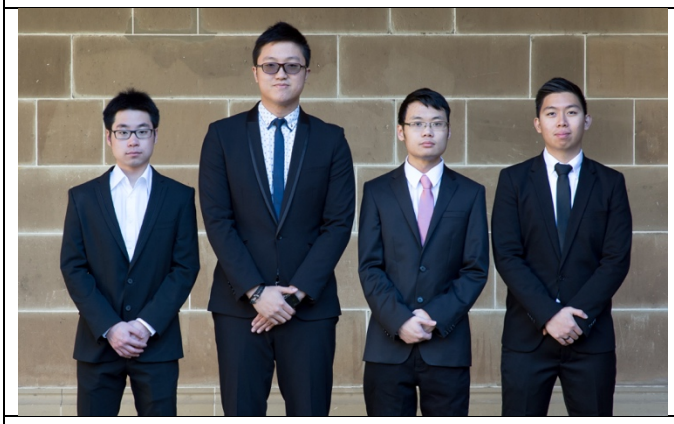
Neuro-prosthetic Hand Development



Jack Hopper; Prakash Mallick; Ricardo Garcia Rosas; Yixuan Sun

There is a vast gap between the abilities of a human hand and those of today's commercially available prosthetic hands. This is due to the lack of touch and sense in prosthetic hands - imagine lifting a cup of coffee without feeling it in your grasp. Furthermore, prosthetic hands do not have the accuracy and dexterity of human hands. This project aims to improve the performance of prosthetic hands in these two key areas. Firstly, by investigating the role of feedback in force control of prosthetic hands, and secondly, by designing a control algorithm for a 16 degree-of-freedom robotic hand.

Autonomous Forklift System



Richard Rizki; Elbert Angdika; Hendry Tan; Joshua Elisa

This project focuses on the area of deceleration profile of forklifts when travelling in a straight line. Forklifts carrying heavy loads are often susceptible to accidents caused by loss of stability when braking too hard, either through forward toppling or the load slipping from the forks. The goal of this project is to implement a software system that is capable of decelerating the forklift in a safe manner to minimise the possibility of forward toppling or load slipping. This software system can simply be added to existing forklifts to assist the forklift operator.

An Eddy Current Braking System for the Hyperloop Competition

Maxwell Carr

In 2013, Elon Musk proposed the Hyperloop: a magnetically levitated pod travelling through a semi-vacuum tube at 1200 km/h. His objective is to revolutionise land-based transport and show the world that there can be a cleaner, faster, and safer alternative to air travel. Elon Musk's company, SpaceX, created the Hyperloop Competition in 2015, challenging student teams around the world to build a ½ scale Hyperloop pod. Frictional braking is not feasible at Hyperloop speeds and Eddy Current Braking (ECB) was chosen as an alternative. This project will design, manufacture and test an ECB System for the WARR Hyperloop pod.