C⊙NTENTS

Acknowledgements

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Faulhaber Singapore Pte Ltd

Intermech Machinery Pte Ltd

Phoenix Solar Pte Ltd

Starlight Tool Precision Engineering

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Deputy Director
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Mr Ronny Tham Quin Fai *(right)*
Co-Chairman,
SP Engineering Show Steering Committee
Deputy Director
School of Mechanical & Aeronautical Engineering

Co-Chairmen's Message

Singapore Polytechnic turns 60 in 2014! In this 60-year journey, Singapore Polytechnic has remained faithful to its calling to provide quality Engineering education to each generation so that our graduates can "Serve with Skill" as stated in SP's motto which is translated from the Malay phrase "Berkhidmat Dengan Keahlian" found on the SP Crest.

Over the years, the Engineering education model has also evolved to keep up with the changing needs, skills and desired attributes required by the engineering workforce in each generation. Besides being competent in technical knowledge, today's engineer must also be a good team player with sound values, having the ability to integrate different domain knowledge into products and having innovative thinking skills to translate needs into solutions. All these key attributes are encompassed in the Conceive-Design-Implement-Operate (CDIO) curriculum model that SP has adopted for its engineering courses since 2008. All the projects displayed in the SP Engineering Show 2014 are testimony of the successful implementation of the CDIO curriculum in Singapore Polytechnic.

As you visit the exhibition booths, you will see how our final year engineering students translate engineering concepts and principles into interesting applications and solutions to meet the needs of different industries and various segments of the society. All the exhibits on display are the result of many months of hard work in fulfilment of final year project requirements. Your invaluable feedback and interaction with the students would certainly help to enhance the students' perspectives of their products and will be of great encouragement to them.

The student projects on display are clustered into five themes - 'I Stay Green, 'I Go Serve', 'I Fly High', 'I Control Robots' and 'I Get Smarter', each identified by a lively colour. There are also some highlighted exhibits on industry collaborations and SP engineering products developed by our staff. Take advantage of the "SP Engineering Show" mobile application from the Apple Apps Store or Google Play Store to pick up detailed project descriptions by scanning the QR codes at the exhibition booths.

We want to thank all sponsors for their contribution towards this publication and to express our heartiest congratulations to all students and staff for making it to the SP Engineering Show 2014. We also wish to express our deepest appreciation to the organising committee and student clubs for making the SP Engineering Show 2014 a memorable experience.

Working Committee

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Working Committee Co-Chairmen

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Co-Chaiman, SP Engineering Show Working Committee	Co-Chairman, SP Engineering Show Working Committee

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Muhammad Haiqal Bin Abu Kassim, Amir Hakim Bin Redwan, Muhd Farid Marican,
Ng Willis, Raiyan Danial Bin Rahmat

Front Row (L to R):

Ng Jie Min Germaine, Chong Yi Ru Verena, Lum Karmun, Ng Shi Hui Esther,
Teo Wei Xuan Bryan, David George, Koko Sia, Toh Yi Jun,
Nur Syafiqah Mohamad Saifudin, Nur Afiqah Nasser

I Stay Green

GO GREEN THINK GREEN. LIVE GREEN

These projects address issues related to **energy** and the environment by leveraging on appropriate **green** technologies to support **sustainable** development.

Solar Water Distillation Device For Use In Water Scarce Developing Countries

Experimental Set Up of Solar Water Distilation.

Clean and potable water is a scarce commodity in developing countries. This lack of clean and potable water leads to sanitation and health problems for the population involved. This project aims to develop a device to harvest solar energy to produce distilled water for drinking purpose in water scarce countries.

Supervisor
Law Ying Tracy

Team Members
Cephas Tan Ser Kit,
Woo Ying Cong,
Teo Swee Fong Caroline

Domestic-Foodwaste-To-Worm System For Organic Garden Solutions

The foodwaste recycling rate in Singapore is low (10%). Homeowners are currently not recycling foodwaste due to a lack of a system that will allow them to conveniently and cleanly do so. Our aim is to design and develop an innovative bfoodwaste to worm to fertilizerb home kit to encourage homeowners to recycle foodwaste. The worm castings, a product of the system, will be studied for its benefits for plant growth. Our vision is for every household in Singapore to contribute to foodwaste recycling, and from this, reap the benefits of organically grown vegetables and fruits.

Supervisor
Chua Yina

Team Members
James Teo, Ameer,
Chan Shu Jun,
Wee Shao Jie,
Lim Siew Teng,
Ang Sin Yi

Domestic worm bin system.

Evaluation Of The Engineering Properties Of Concrete Containing RCAv

Flexural Strength Test.

This project aims to study the engineering properties of concrete containing various replacement levels of recycled concrete aggregate (RCA) fine at specified free water-to-cement (W/C) ratio. The study shall involve laboratory tests to assess the workability as well as the engineering properties of concrete containing RCA fine which include mechanical strength, long-term stability performance and durability properties. The evaluation shall be carried out with respect to a free W/C ratio of 0.45.

Supervisor
Tan Poh Seng

Team Members
James Lui, Caroline Ching, Low Wen Rong

Industry Partner
Samwoh Corporation Pte. Ltd.

Water Disinfection By Ultraviolet Light-emitting Diode

UV light has been used in water disinfection for many applications of water treatment including NEWater. However, conventional UV lamps, like mercury vapour lamp, consume much energy, have a short life span and are considered to be a problem waste after use. The ultraviolet light-emitting diode (UV-LED) is a novel system for water disinfection. The development of UV-LED has rapidly advanced in recent years. UV-LED has a long life and has no mercury requirement. In this project, students will design and setup a UV-LED system and study the effectiveness on water disinfection.
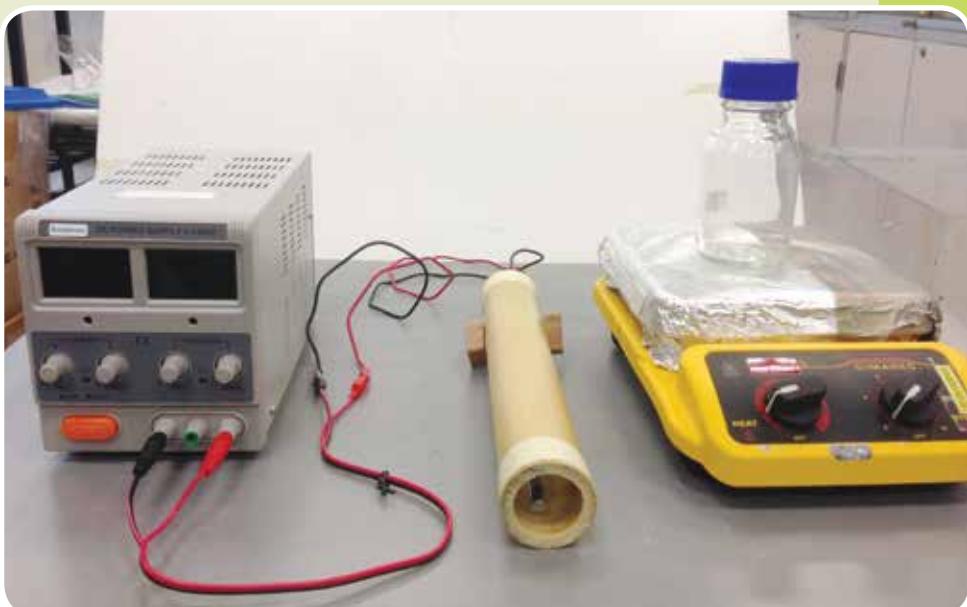
Supervisor
Liu Qishan

Team Members
Wong Weijun,
Tan Wei Liang,
Reuben Chia Yao Hui,
Raymond Sim Zhi Kiong

Industry Partner
AGplus Technologies Pte. Ltd.

Experimental setup to test UV LED water disinfection.

Innovative route to remove Organic Arsenic using Functionalized Polymeric Beads.

Innovative Route To Remove Organic Arsenic Using Functionalized Polymeric Beads

Arsenic contamination in water system is a serious threat to mankind. Industrial disposals with metal ions and chemical by-products directly enter our ecosystem and ultimately contaminate various water bodies. The development of new technology of functionalized polymeric precursors for the adsorption of the common water pollutants is the main challenge for the water filtration industry. In this project, an investigation on the adsorption of dimethylarsenic acid (DMA) using metal functionalized chitosan beads was carried out. Batch adsorption experiment of the beads was carried out by pH effect study, kinetics effect study, isotherm test and effect of coexisting ions.

Supervisor
Handojo Djati Utomo

Team Members
Ainul Mardhiyyah Binte Anwar, Huo Meixi, Kevin Kum Yew Kang, Siow Wei Xuan

Industry Partner
NUS, School of Civil and Environmental Engineering

Desalinated Water To Produce Chlorinated Water

Clean water is the essential for healthy living. Yet many poor villagers who live near seashores do not have access to clean water for sanitation purposes. This could lead lead to water-borne diseases in the area. A low cost electrochemical system to provide sanitised water from seawater was investigated. The product could meet the demand of non-potable water usage near seashores.
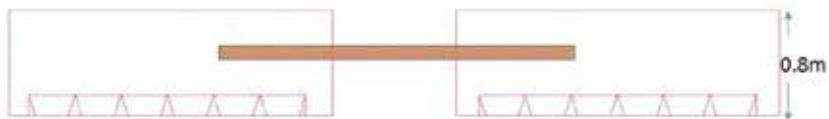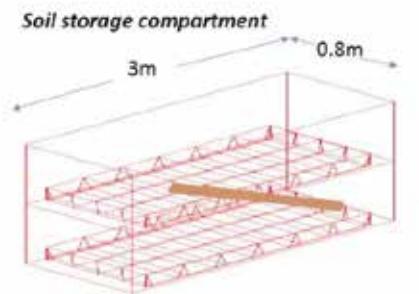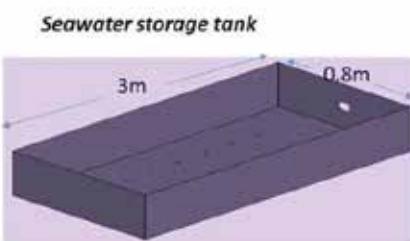
Supervisor
Handojo Djati Utomo

**Team Members**
Chew Junling,
Lim Jit Xin, Kwan Shu Yi
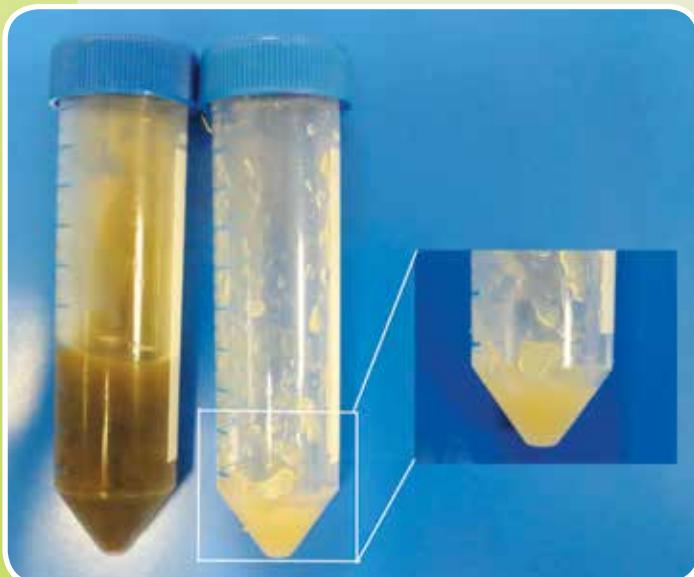
Simple Model of Electrochlorination System.

Extraction And Characterisation Of Protein From Seaweed

Protein-based ingredients have wide application in food, pharmaceutical and cosmetics industries. Attempts have been made by scientists worldwide to isolate valuable protein ingredients from various plants and animal sources. But there is little research on seaweed-derived protein. In this study, a crude protein was isolated from kelp through isoelectric point precipitation. Kelp protein was found to precipitate around pH1. The amount of protein precipitate formed was more than 50 B5g/ml. Study to further identify the kelp protein composition is currently on-going.

Supervisor
Tan Sze Sze

Team Members
Tang Minjie, Theodosius Mah Yong Jian, Heng Chin Wee

Crude protein(insert) isolated from kelp (green suspension).

Stable Fluid Emulsions for Asia Markets

The project aims to develop stable fluid emulsions which are targeted at Japanese and Chinese markets. Ingredients are selected and varied to achieve successful sensory profiles such as the ease of picking up and the spread of product on skin. The emulsions have to be moisturising yet non-greasy, have a smooth skin feel as well as be free from use of banned preservatives and ingredients of animal origin. The stabilities of the formulations are evaluated to establish their shelf life. Surveys are also conducted to determine how these formulations fare over different age and gender groups.

Supervisor
Lam Kok Seng

Team Members
Sanggari S M Thirunavakkarsu,
Danielle Ong Kai Li,
Christina Chua Wei Xian

Students formulate and test the quality of emulsions for desirable product attributes.

Refining And Testing Of An Integrated Rainwater- harvesting And Grey-water-recycling System

Front view of the integrated rainwater harvesting and grey water recycling system located at Hilltop Library.

The Solar Living Lab (SLL) is an existing SP-wide multidisciplinary project to design and build a fully functional house that uses solar power as its main source of energy. This current project will make the SLL also green in terms of water usage. Rainwater is collected and treated to an adequate standard for non-potable use. Grey water is treated by phytoremediation so that it may be recycled for non-potable use.

Supervisor
Kwok Chen Ko

Team Member
Patsy Low, Dela Cruz Ma Monica Carlos, Tan Hui Lin Elayne, Tan Xin En Ethelynne, Ong Chun Jia, Teo Chee Chong

Biotreatment Of Pharmaceutical Wastewater Using Selected Bacillus Cultures
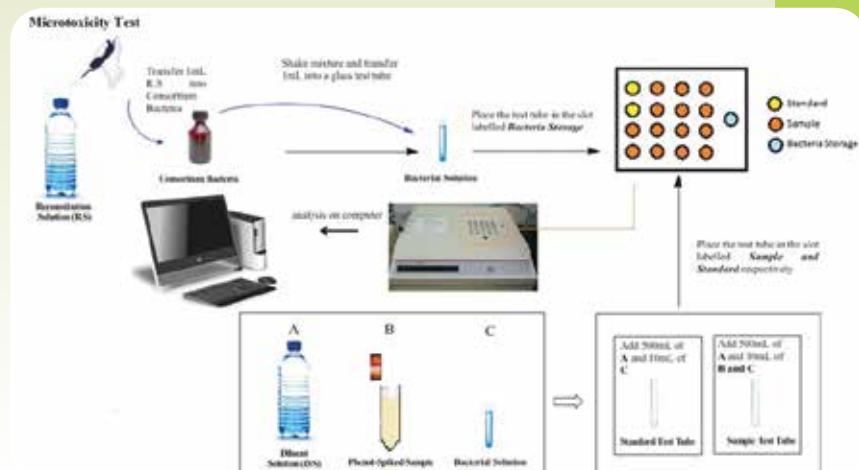
The pharmaceutical industry is rapidly expanding in Singapore placing an increased demand on our scarce water resources. This has led to interest in improving the effectiveness of biotreatment processes, such as bioaugmentation, to reduce the impact on the environment. Bioaugmentation is the application of microorganisms as part a biotreatment process to degrade toxic substances into less toxic or even harmless substrates. The more traditional technologies include physical, chemical and thermal methods such as filtration, activated carbon and even incineration. However, these methods are often costly and generate additional wastes that require further treatment or landfilling.

Supervisor
Gregory Poi

Team Members
Chua Xin Yi Joesis,
Douglas Teo Xi Ze, Mok Zhen Xuan

The pharmaceutical wastewater samples are tested for toxicity using the USEPA approved method called MicrotoxB. before and after biotreatment.

Design And Development Of Natural Fibre Product From Plant Waste For Productisation

The aim of this project is to convert natural fibres from plant waste into usable products using an environmentally friendly process. The CDIO (Conceive-Design-Implement-Operate) framework was adopted in producing binderless boards from sugarcane bagasse. These binderless boards could substitute fibreboards made from wood and thereby reduce the demand of wood thus reducing deforestation. Products such as shoe racks, storage boxes, cabinets and stationery can be fabricated using the binderless boards.

Supervisor
Phua Siew Teng

Team Members
Choo Jia Yi,
Sakinah Binte Lokman,
Kuah Li Ping

From Sugarcane Bagasse to Evergreen Fibreboard to Productdesirable product attributes.

Youth CAN recycle
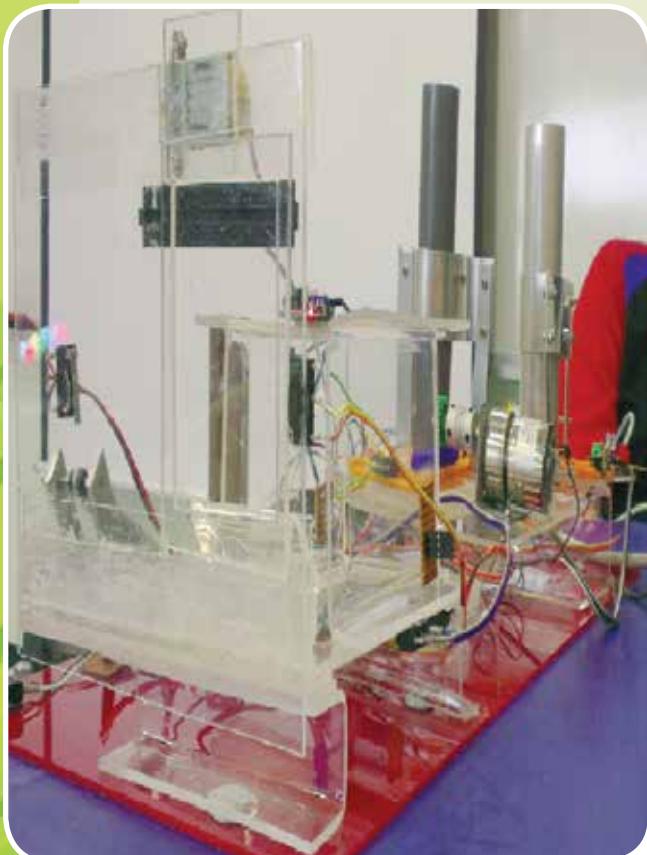
The aim of this project is to design and develop a prototype that is able to recycle and compress empty cans. The prototype will reward the user for each recycling effort as a form of motivation. The prototype can also be used to create awareness of recycling among the public.

Supervisor
Leck Hwang Keng

Team Member
Wee Zhi Yuan, Ang Boon Kiat, Loh Zhi Kai Glenn

Overall without can-crushing module.

MDP - Solar Car Project - SunSPEC3

SunSPEC3, a solar car designed and built by a team of students and staff from the Schools of EEE and MAE, participated in the 2013 World Solar Challenge from 6th to 13 Oct 2013. The World Solar Challenge is a 3000 km race from Darwin to Adelaide along the Stuart Highway. Competition cars, powered only by the sun, navigate under regular traffic conditions. Teams have 6 days to reach Adelaide, traveling from 8am to 5pm each day. At the end of each race day, they make camp wherever they stop, very often in the Australian Outback.

The prospective view of Solar Car SunSPEC3.

Supervisors
Leong Fai Choy, Than Keng Hwa, Steven Chew Lai Keat, Lam Yee Ki, Lawrence Ng Kiam Yam, Tune Chien Jung

Team Members
Dustin Yeo Boon Keong,
Aung Khant Zaw, Ho Hoe Han, Zhang Yun, Stanley Hosea, Chay Wai Peng Benjamin, Pisigan Carlo Adrian Rectra, Chua Yong Siang, Gwee Jia Han, Seetoh Cheng En, Chua Pei Yuan, Lin Weiqiang, Eric Tan Jia Qing, Benjamin Chia Jack Leng, Law Jian Hwee Sherman, Augustus Lee Jian Li, Ho Jun De, Ng Choi Siene, Sylvia Wong Jun Yi, Chong Galon, Muhammad Shahir Bin Abdol Rahman, Yu Binbang, Phyo Thu Ya Thet Min, Lewis Ang Cheng Wee, Ong Kee Kiat Javier, Chong Yuen Xuan, Abdul Rahim Bin Zainal Abidin, Chua Hongcai Godfrey, Nur Iskandar Bin Abdul Samad, Seah Sze Leong, Adam Akbar Mohamed Ammar, Teng Wei Cheng, Jack Lim Jie Zhi, Suzanayanti, Ei Phyu Phyu Phway, Ang Bo Jia, Avinash Kumar S/o Vijaya Kumar, Low Zhongwei, Ang Wee Kiang, Eng Yi Xiong, How Qi En, Reynold Fan Zhen Yu

Electromagnetic Driven Propulsion

Electromagnetic propulsion is considered unfeasible, when compared to a conventional propeller, due to the latter's lack of speed generation to propel a ship. The aim of this project is to improve on the propulsion speed of a model ship by applying the principle of electromagnetic force to its fullest form and to create a 'propeller free' operated ship.

Supervisor
Wong Yoon Quee
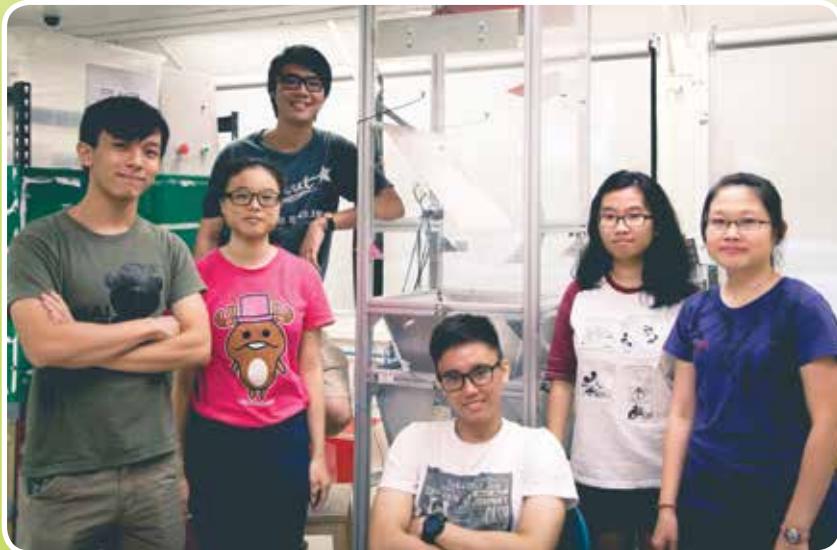
Team Members
Alois Hoo Ziming, Ho Wei Ming, Ang Chin How, Melvin Tan Wei Jie, Liew Jun Yong

Electromagnetism, Lorentz Force is the force on a point charge due to electromagnetic fields. $F = J \times B \times V$

Green Avatar - Recyclable Waste-sorting At Residential Buildings

Students with their prototype recycling structure.
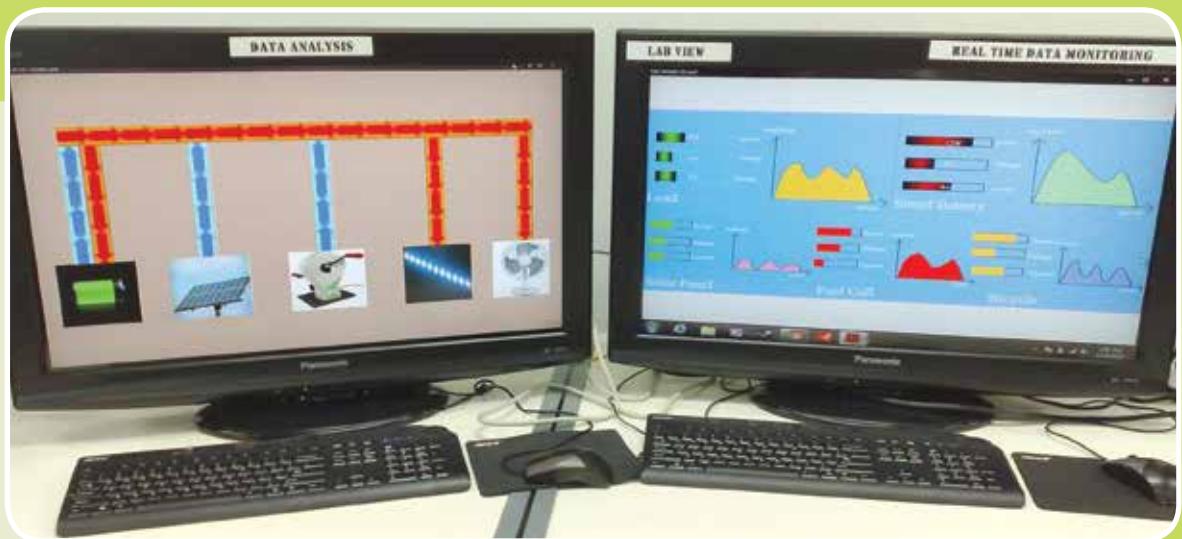
The aim of this project is to allow Singaporeans to have a simpler, quicker and more convenient way to recycle, thereby encouraging Singaporeans to make an effort to save the environment to make Singapore a better home. The target audiences are the younger generation and HDB residents, mainly the housewives, who are often at home and who take care of the household chores.

Supervisor
Yang Zhizong

Team Members
Chen Ho Tung, Diong Kah Kien, Lew Wai Sing, Shermaine Tan, Tan Jue Ping, Ng Hui En

Display of the main controller.

DC Microgrid Demo System

This project aims to develop a modularly-designed DC microgrid demo system which can easily integrate various energy sources into one power supply system. It promotes high energy efficiency, has a smart battery module for energy storage, uses a wireless communication network. When connected to an exercise machine, it allows for the use of human power generation to promote a green lifestyle in a fun gaming way.

Supervisors
Wang Huaqian, Jiang Hao

Team Members
Ong Jun Xiong Putra, Tan Qi Feng, Tan Jing Jie Cliff, Low Jon Hon, Ivan Tan Zhi Xuan, Sua Heng Hang, Lee Jun Wei, Koh Jia Yuan Benjamin

Industry Partner
ST Kinetics Ltd

# Compressed Air Vehicle: Development Of Differential Gear Mechanism
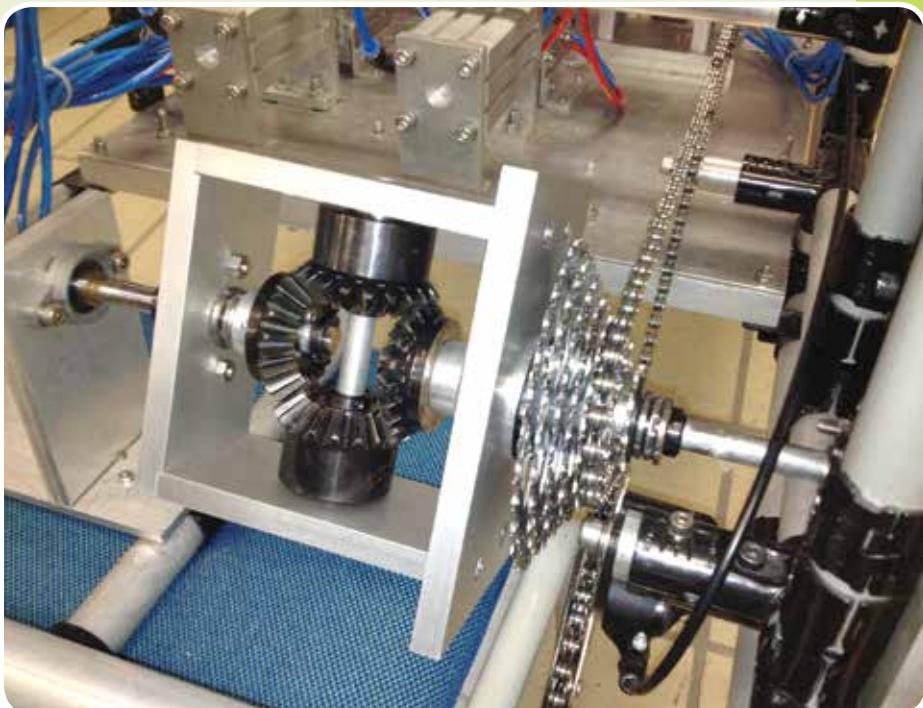
The focus of the project is to install a Differential Gear system into the present Compressed Air Vehicle Chain Drive system to enable a vehicle to achieve a different wheel rotational speed while negotiating corners. The project shall consider improving the present Speed Change system and the re-construction of the vehicle chassis.

Supervisor
Foo Fang Siong

Team Member
Mathivadanan S/o Arumugam,
Schuyler S Kyi Win Swe,
Soon Seng Yong,
Chowdhurie Nicholas Alexander,
Aminuddin Bin Mohd Ali Hanafiah

Differential Gear.

Portable Rechargeable LED-based Lighting For Ships Confined Spaces

The aim of this project is to develop an LED-based portable light for confined spaces on board vessels docking in shipyards for repairs. The use of LEDs permit reduction in consumption of energy powered by a conventional power grid that relies on fossil fuel. At the same time, the portability improves the shipyard's mobilisation time. This translates into cost savings while being environmentally friendly.

Supervisor
David Tay
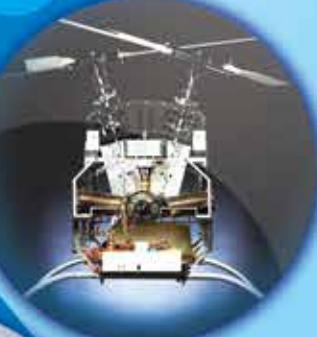
Team Members
Ding Chen, Low Wei Zhi Daniel, Goh Jian Feng, Cheong Tong,
Lee Quan De

Prototype design ideas.

I Fly High

These projects are built by students to realize their own **aviation ambitions.** The projects give them a chance to gain **hands-on experience** and practice with aircraft **design, construction** and **flight dynamics.**

Go MAD.

Go M-A-D

Go M-A-D (Mini Aerial Devices) comes from an imagination of seeing a swarm of next-gen M.A.D that mimic insects or birds doing a collaborative flying mission or each of them flies independently from one point to another specific point under GPS guidance. The project team has attempted to build a prototype of M-A-D.

Supervisors
Chaganti D V Subrahmanyam,
Mike Ong Chin Siang, Toh Ser Khoon

Team Members
Damian Cheng, Zan Teo Wei Jie,
Chua Jin Guang, Eng Sin Loong,
Chang Chee Hong, Li Yanbing

Autonomous Flying Machines

This project has seen the creation of various types of autonomous quadcopters that can be controlled by gestures using Kinect sensor, that can perform position-hold with optical flow sensor, can perform altitude hold with ultrasonic sensor, perform auto-takeoff, auto-landing, mapping and that can navigate to avoid obstacles with laser sensors and make precise landings with StarGazer sensors and be able to fly and follow a target.

Supervisor
Danny Lee

Team Members
Jasper Tio, Goh Ji Yu, Tinesh Jayaraman,
Lim Bing Hong Jasper, Tan Choon Liang, Alison Loh Wai Syn,
Chew Guo Jie, Muhammad Farhan Bin Abdul Malik Angullia,
Darren Chia Kok Seng, Ng Wing Wai

Autonomous quadcopters that can track target, land precisely on target, perform mapping with navigation and be controlled by gestures.

Development of Unmanned Tilt-rotor Aerial Vehicle

The aim of this project is to develop an aerial vehicle that is capable of achieving both vertical and forward flight modes, without sacrificing their merits. No runway is needed for such an aircraft to land as it is capable of taking-off and landing vertically on any spot. The primary unique feature is the variable-angle tilting of the propeller nacelles, which is required for achieving such a feat.

Unmanned Tilt-Rotor Aerial Vehicle.

Supervisors
Teo Ye Wei, Leon Chu Sin Yu

Team Members
Marcus Chee Kar Lok,
Benedict Tan Zhong Han, Ji Weisong,
Leong Wei Kang Nathaniel,
Leong Jia Ming, Chen Zhikuang,
Gwee Teck Wah, Vidya Ahredass,
Siu Kian Wing, Tan Wee Sim

Development of the Iconic UAV System Phase 2

The epitome of engineering that we garnered towards the desire to defy gravity and go beyond the laws of nature.

This project development is to enhance, upgrade and test an existing iconic UAV system with improved aerodynamics functions, a lighter Hybrid metal/carbon Fibre Semi-monocoque structure integrated with a lighter High Precision Transmission Gearbox System for the intermeshing rotors and integrating fully autonomous flight control systems equipped with a more robust electronic modular system such as video D-Link and Obstacles avoidance system using Laser sensors for a longer range and precision.

Supervisors
Liew Hui Sing, Mike Ong Chin Siang

Supervisors
Divesh Singaraju, Nicholas Ho Ge Liang,
Liang Yubin, Law Weijie Andy,
Lim Dao Wei Eric, Koh Yu Wei,
Dashen Dhanabal, Lim Wei Qing,
Jonathan Lee Shi Hong, Siow Yong Ren,
Shawn Teo Jia Hong, Chen Wei Jing,
T Sugunthan, Darren Yeo Wen Jie

Cyclops

The aim of this project is to design, build and test a downscaled unconventional mode of transportation that can transit between mediums. The cyclops is an unconventional battery-powered platform that is capable of transiting between mediums. For this project, the team attempted to combine the ground and air modes as a test bed.

Supervisor
Duncan Sih Wei Cheong

Team Members
Musa Bin Ahmad Dahlan,
Qamaruz Zaman Bin Ali,
Lim Jia Xiang,
Deon Chia Mun Hin,
Veingada Mani Kanda Vel

Cyclops - front view.

Switch-blade

The aim of this project is to design, build and test a flying platform capable of in-flight transformation. SwitchBlade is a flying platform capable of in-flight transition from fixed-wing (of variable sweepback) to multi-rotor flight. At a small scale it can be used for area surveillance, aerial videography and photography and even recreation purposes.

Supervisor
Duncan Sih Wei Cheong

Supervisors
Jonas Hii Ding Sing, Liew Rong Wei,
Tang Zhi-shen Eugene,
Daryl Tang Jun Wen, Tan Wee Kiat Jareb

SwtichBlade - Front view.

Front view of Flying Car.

Flying Car Competition

The objective of this project is to build a flying car that is less than 20 kg and is able to lift a payload of 2kg for the purposes of entering the SAFMC competition. The Flying Car must be able to function on the road as well as fly from one point to another. It also comes with a autopilot board which enables it to be autonomous. This is to be controlled via a single Radio Control Transmitter.

Supervisors
Liao Choon Way, Mike Ong Chin Siang, Faizal Sain

Team Members
Jerin Wesley R, Aung Kyaing Myint, Sim Qing Qing,
Loh Cai Jun, Peng Chongtian, Yap Jun Hong,
Ng Jiaqi Eugene, Leong Junjie Benedict,
Pang Qi Jian, Nicholas Koh En Jian,
Low Wei Yi Nitro, Lim Wei Liang, Pek Teck Song

Biofuel For Aircraft Engines

The aim of this project is to design and fabricate a processing plant to convert used cooking oil into biofuel for aircraft engine use. This will include running a jet fuel piston engine and a turbojet engine using the processed biofuel. Its performance will be compared with that of a jet fuel. Glycerine, another by-product from the waste oil, is processed to be a cleaning compound.

Supervisor
Cheong Choon Kee

Team Members
Ong Chun Kiat Benjamin, Wong Weisong,
Goh Jian Han, Han Yi Chou, Abdurrahman Bin Zaidi

Stages of processing biofuel from used vegetable oil.

I Control Robots

Building and controlling robots to achieve missions give students a fun challenge and rewarding experience. They **innovate, develop** and **control** for ground, air and underwater robotic systems. It takes **perseverance** and **patience** to see the projects through to completion.

Team RoboErectus@Work.

Robots At Work

The objective of this project is to enable the use of innovative mobile robots equipped with advanced manipulators for current and future industrial applications. The robots will then cooperate with human workers for complex tasks ranging from manufacturing, automation, and parts handling up to general logistics. This project focuses on navigation and manipulation. Navigation allows the robot to move around in its environment in a goal-oriented, autonomous, robust, and safe way. Manipulation allows the robot to demonstrate its capabilities in handling an object, for example picking, grasping, turning, sorting or placing the object.

Supervisors

Shen Jiayao, Yue Pik Kong, Wang Yiyan

Team Members

Liu Zhemin, Teo Chee Siang, Goh Chun Siang, Fariz Cheang Bin Mohd Khairi, Ren Anqi, Lim Jun Xian

Table Soccer - Man vs. Machine

This project allows a human to play the popular game of Table Soccer (a.k.a. Foosball) against a machine. The machine consists mainly of a camera, a few stepper motors, a few servo motors and two Arduino microcontroller boards. The camera allows the position of the ball to be determined, while the steppers and servos allow for sliding and kicking actions, respectively. The "brain" of the machine is an Arduino Mega board, programmed with artificial intelligence to play a smart game. An Arduino UNO board helps to control the steppers and servos, so that the Mega is not overburdened.

Supervisors

Chong Siew Ping, Sim Boon Quang

Team Members

Weng Wen Jie Jonathan, Namra Bano Abul Barakat, Lin Yongjin Justin, Lau Cheak Min, Chua Teng Kiat, Leon Tay Wei Sheng

Table Soccer - Man vs. Machine.

We are the pioneers in this area of robotics. So exciting!!!

Android Robot

This project aims to develop an android robot that looks and behaves like a human. The key reason for building androids is to help humans with daily mundane tasks. Currently the team has developed two versions of the robot. One uses a mobile platform to allow the robot to move around. The second is equipped with a pair of legs. Both robots have six degrees-of-freedom in each arm, three degrees-of-freedom in the neck, three degrees-of-freedom in the torso and hands with five independent fingers. The robot is about the size of a small lady.

Supervisors
Carlos Acosta, Asadollah Norouzi, Rubaina Khan, Ng Buck Sin, Tan Tuan Kiat, Choy Fook Seng

Team Members
Koh Boon Hock, Khairul Anwar Bin Zulkifli, Reghuraj Naidu S/o Rajendran, Benjamin Hum Ping Zhi, Koh Shien Kai, Brahmawan Riyadi, Low Kun Long Elton, Kwok Chin Hoe Marcus, Claudia Cheok Yee Ting, Tan Hao Kang, Andy Lee Yung Siong, Yeo Wei Le, Edrick Tong Yuen San, Ong Bo Lin, Chua Hao Yu, Louis Ang Wen Jie, Neo Chun Ann Andi Safuan Bin Azmi N, Sim Yu Zhi Caleb, Avison Low Chor Wen, Chou Po-yang, Koh Shu Shun, Ah Kar Pyi Phyoe, Khant Zwe Hein, Tan Yong Kun, Alex Mowe, Muhammad Amzari Bin Hamzah

Receptionist Robot

The project aims to develop a receptionist robot that greets visitors and provides information. This robot is able to interact via gestures and perform basic tasks like grasping objects and shaking hands. Japan, Korea and other countries have started to incorporate robots as receptionists, not to replace humans, but in an effort to improve productivity. We expect Singapore to do the same and we hope that our efforts will help industries be productive and relevant.

Supervisor
Carlos Acosta

Team Members
Adrian Carlo Estira,
Muhammad Ridhuan Bin Mohamed Hairi,
Sathiasingham Rethinasingam

The difference between ordinary and extraordinary is that little extra.b b Jimmy Johnson.

Autonomous Underwater Robot
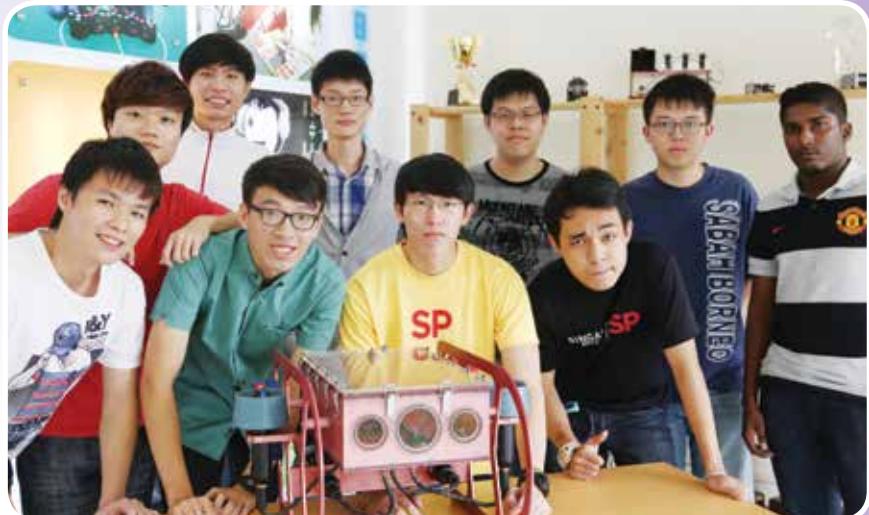
Autonomous Underwater Robots can be used to perform underwater missions such as sensing the environment, detecting and mapping submerged wrecks and obstructions that are a hazard to navigation for ships. The robot conducts its mission without operator intervention. When a mission is complete, the underwater robot will return to a pre-programmed location. The robots can be equipped with a wide variety of sensors to measure water parameters and depth of the water body and cameras to take pictures of wildlife and aid in navigation by avoiding obstacles. Data collected are useful for scientists monitoring the quality of water bodies.

Supervisors
Rubaina Khan, M Fikret Ercan, Chong Woon Shin

Team Members
Por Yong Boon, Tan Yi Jie Andy, Aw Han Shen, Brian Seah Yee Chuen, Sherman Lim Shou Rong, Zheng Wentao, Lam Wei Khang, Tan Wee Liang, Alex Tan Wei Liang, Kaviraj Anbalagan, Yong Chong Nen Justin

The Autonomous Underwater Robot with her builders!

Air Jelly

The aim of this project is to design and develop a Jellyfish-like robot that can fly and manoeuvre in the air. The purpose is to replicate the results achieved by Festo, a leading world-wide supplier of automation technology in their Air Jelly project. The Air Jelly can be used to promote Engineering to students at school events.

Supervisor
Zhou Wei
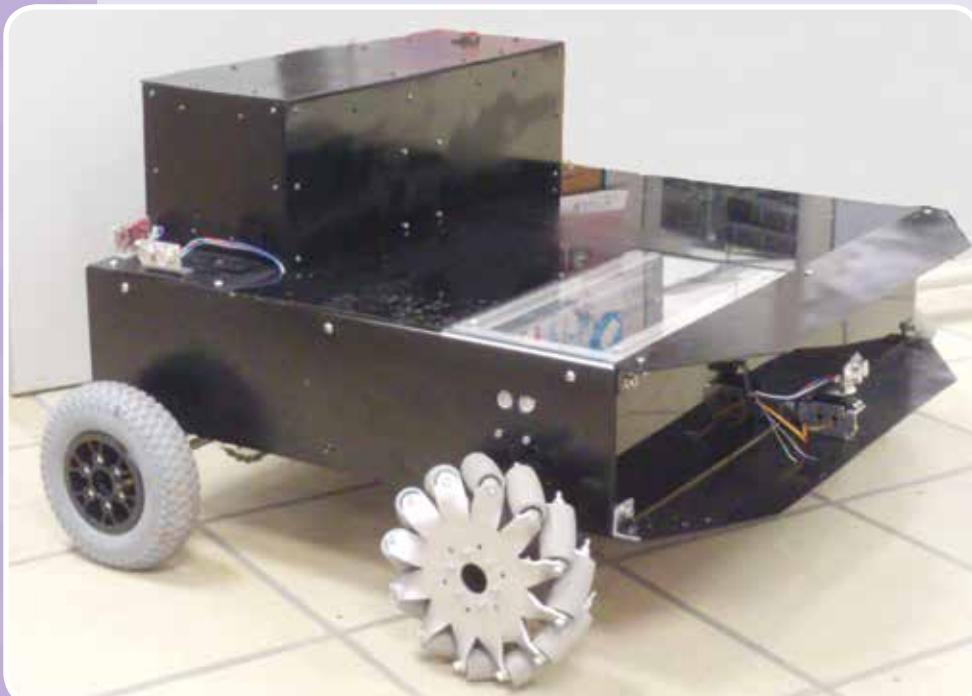
Team Members
Muhammad Ridhwan Bin Maznin, Sint Thida Bo, Jaime Lee Pabilona, Vasanth A/l Elangovan, Ananthakumar A/l P Ramachandran

Air Jelly.

# Four-wheeled Based Mobile Platform

This project aims to design a four-wheeled based platform vehicle to test any navigation system for AGVs (automated guided vehicle). This mobile platform, which is power by Lithium battery, has a strong but light weight structure. The platform has a high payload that can be used for both indoors and outdoors operations.

Four-wheel based mobile platform.

Supervisor
Zhou Wei

Team Members
Tjoa Nicholas,
Tang Jing Guang,
Phone Su Maung,
Tan Wei Liang,
Chay Chin Peng

WHS2V - Amphibious Vehicle
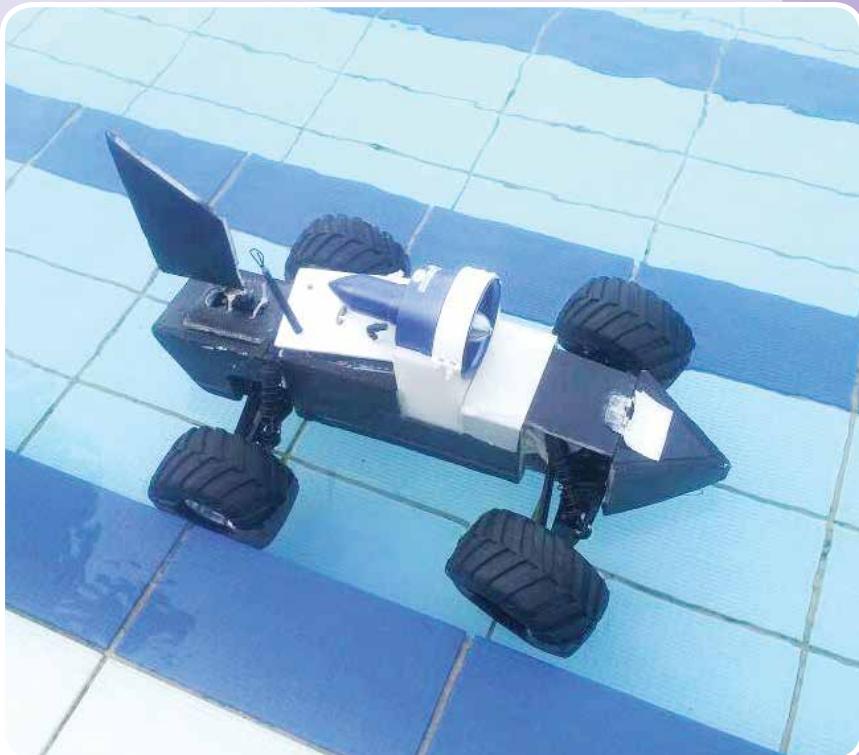
The aim of this project is to develop an all-terrain vehicle that has the capability of manoeuvring both on land and sea. Another aim is for the vehicle to be a highly cost effective and amphibious one which uses non-polluting resources, thus making it an eco-friendly option.

Supervisor
Chua Chin Teck

Team Members
Shahul Jahangir Bin Mohammed Abu Bakar, Viknesh Porcheliyan, Muhammad Hazim Bin Alias, Ong Mu En Wayne, Syukri Bin Hassan

The vehicle is the first of its kind, developed on the idea of thrust propulsion.

Project team and vehicle.

FAT-V

Unmanned drones have proven to be an effective tool in many ways for the military. They aid in diverse situations such as aerial or ground support in times of armed conflict, search and rescue operations in potentially hazardous situations. The product allows for fast ground mobility coupled with the agility of an aerial drone making it a valuable asset to ground units. Targeted support capabilities would include short to long range ground or air reconnaissance missions, payload drop off, search and rescue operations and the provision of surveillance for units in the field.

Supervisor
Tan Tuan Kiat
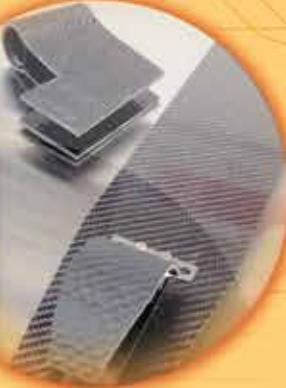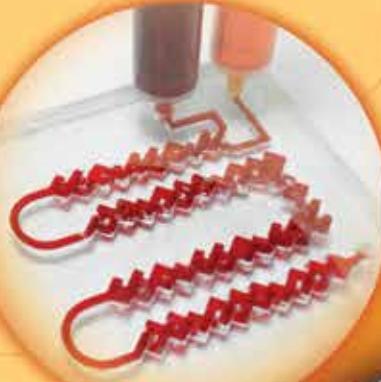
Team Members
Tay Zi Tong Christopher, Ryan Lau Yu Xuan, Ling Jun Xian Benny, Jonathan Ling Jia Wei, Aubrey Quek Ting

I Get Smarter

Students find ways to make work easier and life more pleasant through the use of **internet-enabled smart devices, intelligent communication** and **software for automation.** These can pave the way for the development of integrated computing environments.

Smart Home System

This project is designed based on the KNX and Arduino technology platform to achieve smart home automation equipped with energy management. The system would also redefine security control via Near Field Communication (NFC) technology and protect the home against fire hazards through a programmed automatic sprinkler system. The system would also alert users and the relevant authority through telecommunication. The project aims to bring comfort, safety and sustainable living through technology.

Supervisor
Lim Bock Teck

Team Members
Ahamad Fareed Bin Noorul Ameen,
Thee Wai Ken, Goh Kae Yan,
Hee Zhi Sheng

Integration of Energy Managment, Fire Protection and Security features using KNX interfacing with Arduino system.

Telehealth - Alarm Management and Finger Muscle Monitoring System

This project provides a Telehealth integrated solution. It aims to help with alarm management and finger muscle monitoring in a nursing home. All information generated in both systems are reported to the server and is sent to the mobile phones for the care givers' immediate attention and for user information.

Supervisors
Chung Ock Jin, Zhu Bochun

Team Members
Chuah Wei Qiang Alexander,
Chua Jia Ying, Lim Fang Yi Cherie,
Koo Jia Wei, Lim Ee Teck Ryan,
Ong Lu Wen Reuben,
Jeremy Toh Hong Yao,
Gloria Ng Yun Yi, Tan Teck Wee,
Wong Ying Teng,
Sebastian Chan Zhi Hui

Alarm Management System.

Driver Shield

Driver Shield is able to retrieve real-time vehicle information through a hardware device, providing video recording thus tagging of real-time vehicle info through the video captured. This serves as a car blackbox data to help drivers and organisations like the Police Force and insurance companies, etc. further investigate an event like an accident. Driver Shield also helps drivers map out the safest route to their destination by marking out accident areas based on online LTA traffic data. Driver Shield's voice guide promptly assists users in driving correctly along a planned route.

Routing with real time LTA accident info displayed.

Supervisor	Team Members
Zhu Bochun	Goh Xian Liang Alvin, Wan Tai Fong, Shanice Yong Jie Hui

IoT for Smarter Living

Internet-of-Things-enabled Home for smarter living.

This combined project shows how the Internet of Things (IoT) technologies can be used to enable smarter living in the home. This is done by allowing everyday home devices to be connected to smart phones, the Internet and user's social media accounts like Facebook and Twitter. The project also shows how intuitive natural user interfaces can be used to interact and control these devices. This project demonstrates an exciting future where a smart home provides users with the unique experiences of controlling and interacting with their home.

Supervisors

Lim Joo Ghee, Melvyn U Myint Oo, Seow Boon Chor, Ho Hooi Chee, Rodney Dorville

Team Members

Tan You, Jonas Lim, Lai Qing Hui, Melvin Ng Jia Le, Muhammad Ar Rasyad Bin Abdul Razak, Trixia Tan Rui Xia, Muhammad Farwin Bin Jeffrin, Yong Zhung, Li Baoyan, Lim Yong Ann Ben, Seow Jia Jun, Teo Siew Hwi, Akila Kumar, Ngo Young Kit, Lim Kian Koon, Moh Moh Aung, Jacob Koh Jun Hao, Chan Ching Kang, Tay Cheng Jiang Darren, Cho Wai Hlaing, Lai Chun Kuen, Seah Song Qian Alvin

Interactive Sharing

The Interactive Sharing system will allow potential students to learn more about the Diploma in Computer Engineering through the use of Byte Tags. Byte Tags allow users to interact with a high-end graphical display, such as a table, for easy access to information. This system can also be used for sharing information during lessons.
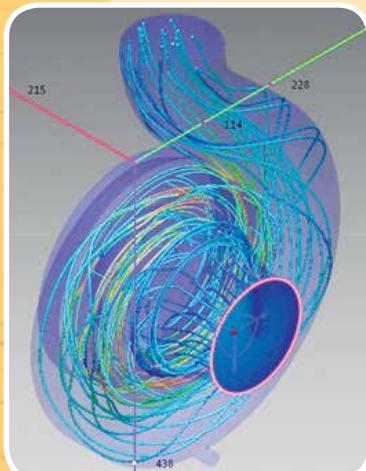
Supervisor
Kwa Teck Poey

Team Members
Muhammad Ridhwan Bin Mohamed Hussain, Vignesh Kumar Rajasegaran, Muhammad Iqbal Bin Mohammad

Exhibition Mode.

Computational Fluid Dynamic Analysis Of Centrifugal Pump

Streamlines Plot in CFD software.

A Computational Fluid Dynamic (CFD) modelling and analysis are done on a physical centrifugal pump from a local SME to understand how the blade design would affect the fluid flow of a centrifugal pump. The results are validated against the performance curve done on the pump, and found to be close to actual tests. In this study, the CFD capabilities for rotating machineries developed from working on the pump would help the company to shorten the development time with fewer costly prototypes during the design process and improve on pump performance in subsequent design iterations.

Supervisor
Lee Kim Kheng

Team Members
Tan Hui Huan, Hanuraj Sivasegaran, Lim Yang Han Quenten, Marc Chan E-yung, Hogan Gregory Edward

Development Of Composite Structure
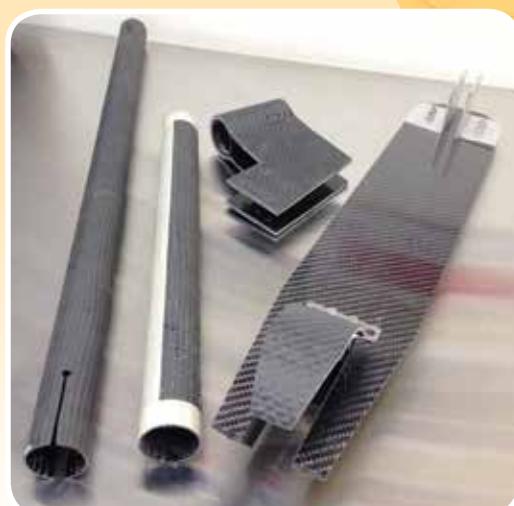
This project aims to utilise the capabilities of composite in a kick scooter, an everyday vehicle. This involves the design and creation of composite structures ranging from simple geometry, such as the scooter deck, to more complex ones, such as the T-shaped cylindrical bar. Methods of joining composite components with each other or to metallic components will also be tested to assemble a scooter with a standard of quality.

Supervisor
Liu Hui Yin

Team Members
Christopher Aguirre Tan, Muhammad Arshad Bin Haris, Chew Jun Jie, Yeo Junkai, Isaac Kwong Yi Jie

Carbon Fibre Composite kick scooter parts.

Mobile Composite Work-bench

Mobile Composition Infusion bench.

In today's modern environment, there is an increase in usage of composite in modern structures as developers and designers aim for weight reductions while increasing strength. This can primarily be seen in the aviation and automobile industries where there is an increasing trend of higher percentage of composite usage in structures. The mobile composite workbench is a more organized, convenient and apt method of designing and fabricating composites that will peak the relevance and interest of composite materials technology.

Supervisor
Kelly Koh

Team Members
Hong Lionel, Quek Hong Wei,
Joshua Sia Hong Jun,
Chan Hua Woon,
Lau Zhen Yuan Shaun

# Application Of Laser For Surface Structuring
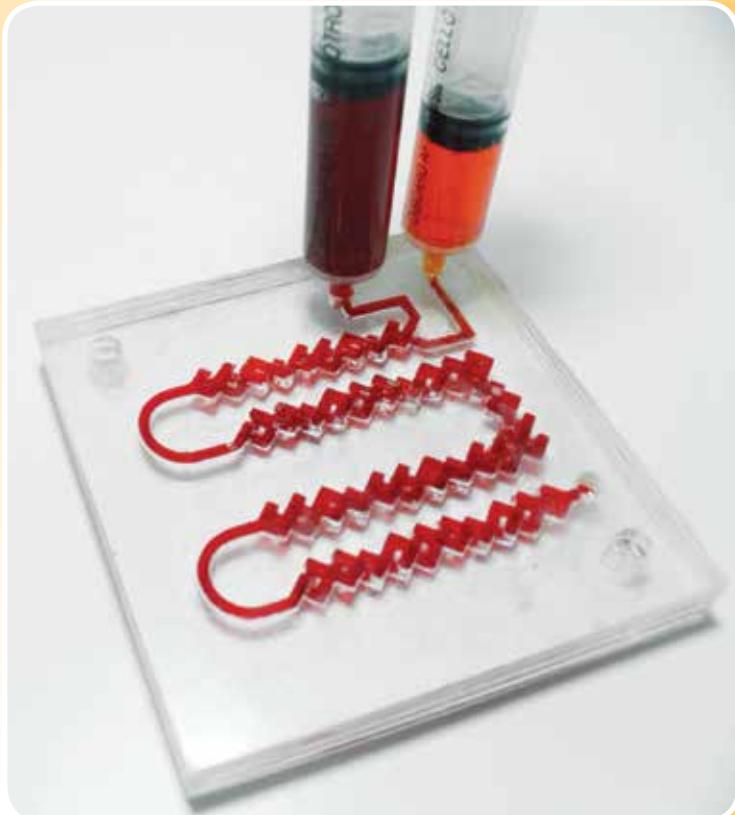
The laser has been widely used as a fabrication tool. This project explores the use of laser technology, which is fast and flexible, to fabricate a micro-mixer, capable of mixing two different fluids. Each different fluid enters the micro-mixer through the inlet. Fluids flow along separate channels and are mixed at the collision point. This collision point is where both separate channels intersect. The mixed fluid exits through the outlet. The entire mixing process occurs in micro scale and in a chaotic way.
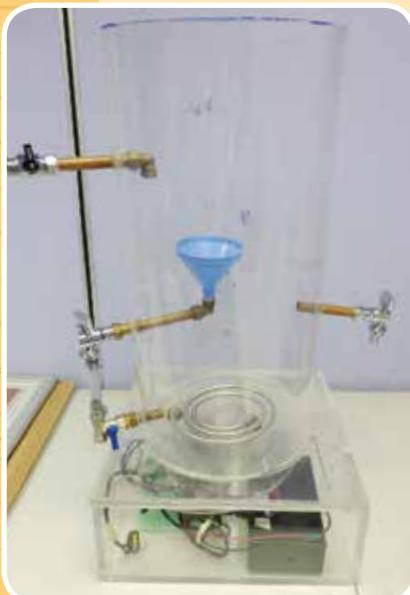
Supervisor
Daniel Lim Jye Suenn

Team Members
Lim Hong Zheng,
Khoo Lay Meng Daniel, Cassidy Lee

Mixing of 2 fluids using an assembled
micro-mixer fabricated by laser cutting.

To Create A Teaching Aid For Existing Boiler Control Systems

Layout of our model.

The objective of our Final Year Project (FYP) is to provide a teaching aid for future student so that they are further able to understand the working principle of the boiler. An actual boiler is enclosed, meaning that students are not able to see the operation within the boiler. To allow them to have a better understanding of the boiler's operation, this project gives them insight into the fire-tube boiler.

Supervisor
S Premanathan

Team Members
Muhammad Ridzwan Bin Katerman, Sukieyang Kheng, Glenn Nigel Jaishanker, Choy Honn Fong, Alby Supangat, Chia Jia Ting Samuel

Ship Damage Stability And The Air Bag System

The aim of this project is to create a working prototype and to carry out a feasibility study of a ship's airbag system which provides additional buoyancy in case of ship damage. The calculation and study will back up the theory on ship damage stability to provide floating aid for vessels when in need.

Supervisor
Kim Youngkook

Team Members
Lee Jian Wei, Alvin Wong Kui Lung, Chue Wen Xiang, Narendran Viknasvaran


The prototype of the airbag system.
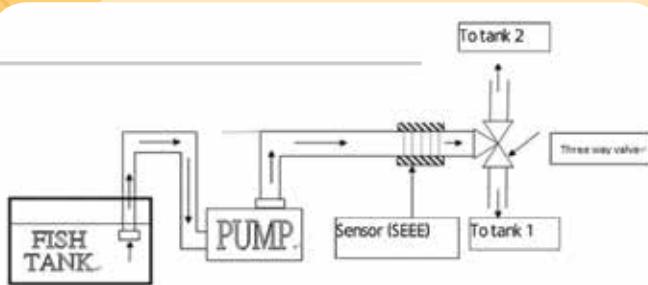
Outline piping system for the fish sorter.

Fish Sorting System

The aim of this project is to design and build an automatic sorting system for the aqua culture industry to improve productivity and reduce the mortality rate of fish experienced using a manual method. This is a joint project with the School of Electrical and Electronic Engineering (EEE). Students from the Diploma in Marine Engineering (DMR) will be designing the fish handling system and students from EEE will be designing the measuring devices.

Supervisors
Foo Nan Cho, Chung Ock Jin

Team Members
Chua Yi Wei, Kee Wen Jie, Hee Kai Siang, Karine Lim, Nicea Ng Jia Ying, Wira Alfian Bin Omar, Ling Hsih Zheng, Siti Syafiqah Binte Salleh, Huang Chung Kuan, Muhammad Nazarudin Bin Rozali, Hairi Bin Noor Azman, Syawatul Asyraf Bin Mohamed Karim

These projects are built with the intention of cultivating a spirit of **social innovation to serve people and society.** This will help students by engaging them to develop appropriate technologies in a sustainable manner to **make a difference** in people lives.

Students working together with villagers to install water filters.

Sustainable Water Filter For BOP

This project is aimed at developing a low cost, reliable and sustainable water filter for Bottom of Pyramid communities. The main idea for the project was generated during the inaugural Friendship Express in 2012. Students have manufactured and assembled the filter system at a village in Thailand. Excellent performance was achieved.

Supervisor
Liu Kao Xue

Team Members
Wong Weiyu, Jason Ang, Poh Tian Han

Development Of Healthy Eating Educational Materials For Bukit Batok Residents

This project aims to determine and evaluate the nutritional values of the commonly prepared and consumed dishes of Bukit Batok residents. The findings are translated into the development of a nutrition video and a leaflet to increase the residents' knowledge about healthy eating. A nutrition education programme including a healthy cooking demonstration has been conducted to help the residents incorporate healthier cooking methods at home. The project is done in collaboration with the Bukit Batok Community Club.

Supervisor   **Team Members**
Toh Hui Kheng   Teo Jie Ting, Lim Hui Won

Nutrition education programme for Bukit Batok residents held jointly with the Bukit Batok Community Club.
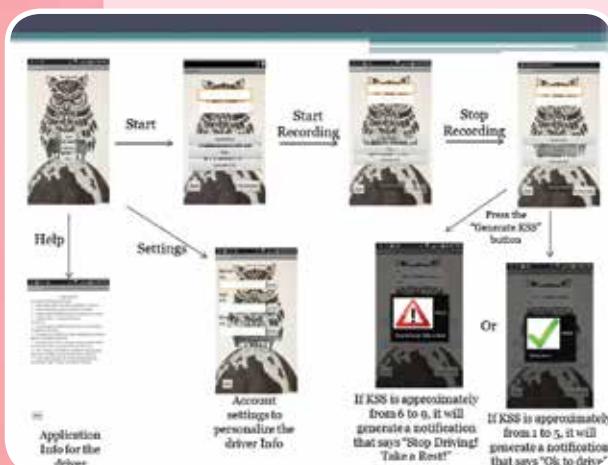
Healthy cooking demonstration

Leaflet on healthy eating

Bukit Batok residents listening to a nutrition talk

Sleepiness State Detection and Alert System

Mobile apps "HourOwl" on Sleepiness State Detection and Alert System.

Statistics has shown that there is an increasing amount of accidents occurring due to drivers being sleepy. Based on the Support Vector Machines (SVMs) algorithm, this project develops a mobile application that can automatically determine the driver's sleepiness state and alert him/her accordingly. Accident rates could thus be reduced as drivers will do the necessary to ensure that they are good to drive.

Supervisor
Cai Zhi Qiang

Team Members
Ezra Ramasamy, Mohamad Humairan Bin Mohamed Gazali, P M Ponnazhagan Manimuthu, Teo Boon Chiat Terence, Gavin Tan Ying Zhi, Ong Rongxing John

# Acquired Colour Vision Impairment In Diabetes Mellitus
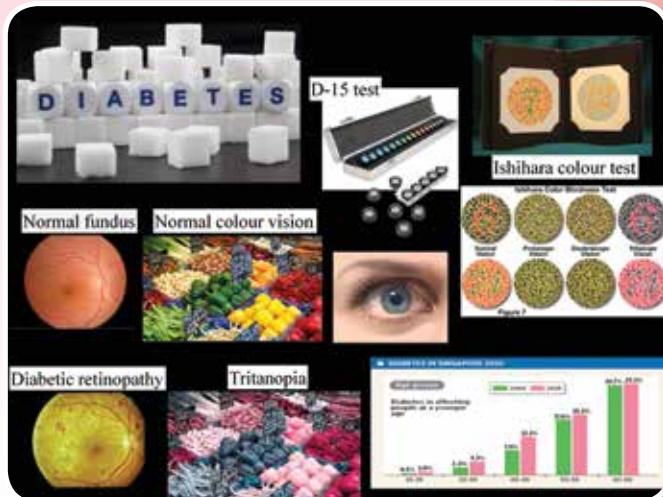
Diabetes is prevalent in Singapore and is the leading cause of blindness related to diabetic retinopathy (DR). Diabetic patients' colour vision can also be impaired by the disease, known as Acquired Colour Vision Impairment (ACVI). The study aims to assess the prevalence of ACVI amongst the multi-ethnic Asian DM patients managed in a typical polyclinic in Singapore using the D-15 test. Detection of ACVI presents an opportunity for education and interventions to optimise diabetic control to reduce further complications.

Supervisor

Kallakuri Sumasri

Team Members

Tan Chuan Kiat Benny, Liew Xiao Wei, Peh Jia Ning, Ho Jin Wei Clarine

Acquired colour vision impairment in Diabetes Mellitus.

Biochip For Water Analysis And Flexible Electronic

Prototype for water analysis.

Flexible Electronics has been projected to be the technology to watch in the next decade. Material deposition using inkjet systems and roll-to-roll printing will lead to a whole new generation of device fabrication technology at a cheaper cost. The project explores inkjet printing technology for flexible applications. Current water testing kits are developed based on specific contaminants with some requiring days to obtain satisfactory results. Colorimetric analysis has received much attention due to its simple and fast detection method. The project aims at developing a rapid and in-situ environmental diagnostic kit for water analysis using colorimetric dyes.

Supervisors

Low Lee Ngo, Leck Hwang Keng, Ken Lee

Team Members

Muhammad Nur Hafiz Bin Mohd Ramli, Ng Kian Wei Steven, Chua Yun Da, Toh Yang Jian, Nixon Aw Han Wei, Mou Chen

Brain Computer Interface-based System for Handicap

The aim of this project is to design and develop a brain computer interface (BCI) based system to assist the handicap in their daily needs and entertainment. The system is being incorporated with an emotive headset. By further processing the user's brain wave, the system is able to reflect the user's needs or entertain him/her with various activities.

Supervisor

Lu Hongli

Team Members

Goh Yee Tat, Jerald Han Zhe Ding, Nurul Hidayah Bte Abdul Manan, Alvin Tan Chong Wei, Cherlyn Ng Hui Ting, Chua Ru Hui

Brain Computer Interface-based System setup.

Elderly Care System In A Smart Flat/ Motivational Companion MoCo for Elderly

The aim of this project is to develop a system with an intelligent sensor in a smart flat to help the elderly to have a quality life. The elderly will be motivated by a Companion MoCo, a robotic pet companion that will assist them. This puts the elderly's kin at ease.
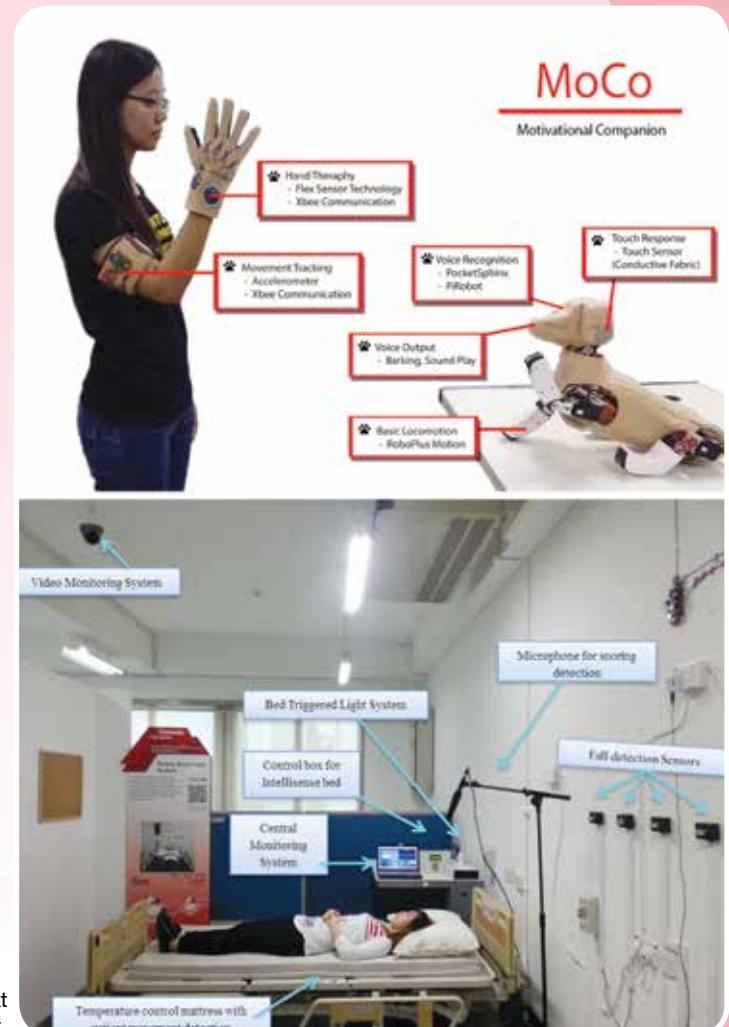
Supervisors
Jaichandar K S, Yang Liping,
Rosa Tan-wong Ah Hoon, Ong Hock San,
Benjamin Koh Yee Foo

Team Members
Alvin Koh Kai Kiat, Park So Yeon, Pang Shang Hao,
Addy Zhang Junshun, Soh Qi Shan,
Elieen Koh Huay Ching, Htet Aung Shine,
Pyae Phyo Aung, Aye Chan, Le Shwe Yee Win,
Myat Kyu Kyu Zaw, Swe Zin Hsu Kyi,
Naw Thablay Thaw Ray, Kwa Yi Wei,
Kyar Nyo Thin, Koh Jianqin, Chan Kian Ann,
Jordy Soewanto, Mok Bo Chuan, Aung Ko Ko

Elderly Care System In A Smart Flat
with Motivational Companion (MoCo) Pet Robot.

Silver Suit

"Silver Suit" is a multidisciplinary project harnessing domain knowledge from Human factor, Electronic, Electrical and Mechanical Engineering. The objective is to design and develop a user-friendly wearable equipment for researchers to study the needs of the elderly and to empathise with the challenges faced by old folks. The mechanical hardware will be developed to force degrading bodily effects in terms of movement and posture. Electronic sensors will be incorporated to convert physical stimuli into useful data for data collection.

Supervisors
Soh Kim Fai, Arun Kumar

Team Members
Kenneth Ng Chun Hua,
Muhammad Syafwan Bin Abdul Wahid,
Chen Wai Yip Kenneth, Myat Sandi Thwin,
Teo Zhi Ting, Nguyen Gia Bao, Tan Yi Hong

"Silver Suit" forcing an aging posture on a youth.

Tapioca-crumbs-squeezing Machine

Many women in the villages of Kradenan and Polengan (Yogyakarta, Indonesia) are involved in the production of Tapioca crackers for side income. One of the pressing issues in the cassava crackers production process is the strenuous effort in squeezing out water from Tapioca crumbs. The project aims to design and develop a user friendly, effective, efficient and sustainable crumb-squeezing machine for the stakeholders.

Supervisor
Soh Kim Fai

Team Members
Lin Junhong,
May Chit Ngon,
Soh Tze Wei,
Koh Wei Qiang

One man operation of Cassava squeezer.

Customized Medical Chair

The chairs currently used in the Tan Tock Seng Hospital's Eye Clinic pose a tripping hazard and lack practicality for elderly and handicapped pateints. This newly designed chair features a rotatable arm-rest for easy access for wheelchair-bound patients, a slide-able seat with backrest to support patients during eye examinations and a base which is designed with a foothold, thus eliminating tripping.

Supervisor
Chua Chin Teck

Team Members
Seah Shang Yan, Chan Jia Yong, Jeffrey Lim, Kelvin Tay Jing Yen

Industry Partner
Tan Tock Seng Hospital

We care and we serve

Speech Therapy Device V2 (ttsh)

The aim of this project is to design and develop a speech therapy device that can assist rehabilitation patients. With the use of minimal buttons, a patient can communicate with text and speech to caregivers. Based on the latest discussion and feedback from TTSH, a new speech therapy device will be developed with improved features.

Supervisor
Foo Fang Siong

Team Members
Chia Yee Hon, Geng Kim Ling,
Sam Seow Woon Long,
Lim Jia Jun

Industry Partner
Tan Tock Seng Hospital

Augmentative and Alternative
Communication (AAC) Device.

The final product for Adam.

Armless Bicycle

The aim of this project is to provide a training trike (3 wheeled bicycle) for a competitive-disabled athlete for the Ironman Challenge. The idea was inspired by the team's desire to help, Adam, an SP alumni from SMA, who met with a traumatic accident which saw him losing the use of both his arms. He went through a trying period before he came back fighting through competitive sports. This development is to assist him to train for the future.

Supervisor
Frederick James Francis
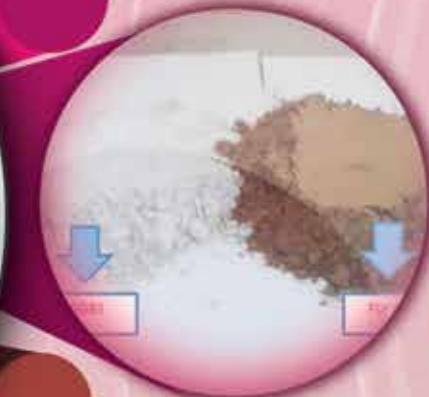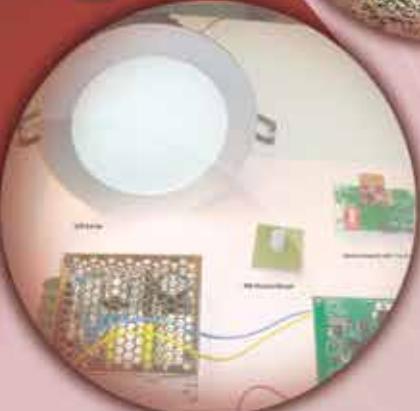
Team Members
Muhd. Riyaz,
Muhd Syamil Bin Mohd Sahair,
K R Muhammad Ahriff,
Muhammad Ariff Bin Nordin,
Kaung Zan Win

Industry Collaboration

SP Engineering Product

Singapore Polytechnic treasures the close **industry collaborations** that provide learning opportunities for our students through good **industry projects.** Our students use **Design Thinking** to derive viable solutions to solve authentic industry problems.

Staff's **R&D** innovations are not simply designs and experiments within an academic setting; some of the technology has evolved into **products** of good industrial and **commercial value.** The exhibits in the **SP Engineering Products** section are testimonies of these excellent **innovations.**

Green Concrete Using Ground Granulated Blast-furnace Slag And Tuas Power Fly Ash Powder

In this project, Ground Granulated Blast-furnace Slag (GGBS), a material that is value-adding, cost effective and eco-friendly in terms of preserving natural limestone resources that are otherwise depleted due to the manufacture of ordinary Portland cement (OPC), and the Tuas Power fly ash powder, a material generated in the Tuas Power Plant with very different chemical composition, physical properties and strength performance compared to the conventional fly ash (pulverized coal ash) due to the unconventional burning technology and coal-biomass cogeneration method adopted by Tuas Power plant, are used to develop green concrete.

Green concrete material GGBS (left) and Fly Ash (right).

Supervisor
Tao Nengfu

Team Members
Chhim Piseth, Alexandra Larissa, Agus Tioman, Hing Wee Sheng, Mariah Binte Abdul Ghani, Lee Mei Shuang

Industry Partner
EnGro Corporation Limited

Team members from EnGro and SP.

"This collaboration has been fruitful as many different types of blended cement have been tested for ready mix concrete application. GGBS & Fly ash-blended cement is now at the initial testing stage and preliminary results look promising. We see the potential to further develop these products for wider applications. The research will further enhance EnGro and Top-Mix Concrete's position as market leaders in this new product category and promote the green movement to reduce the carbon footprint of the industry. "

Mr Eugene Ho
General Manager, EnGro Corporation Limited.

Hybrid VOC Bio-filtration System

The use of Bio-cultures for bio-filtration is not new. The treatment of hazardous chemical such as phenol using SP's patented consortium coupled with this innovation in a dry process methodology will help reduce the reliance on post processing or treatment of the filtration media. The VOC will be channelled to a series of packed media already inoculated with the bio-cultures. These cultures will breakdown the VOC into harmless carbon dioxide and water.

Supervisors
Leong Mun Kin, Gregory Poi

Team Members
Ng Shu Lynn Anita, Natalie Tan Yee Ning,
Daniel Chew Zi En, Wang Ji, Cheng Shubo,
Xavier Hoong Wei Jie, Donavan King Jia Ying, Tan Wei Hao

Industry Partner
Vopak Terminals Singapore Pte. Ltd.

Main hybrid reactor.

Ultra-filtration System

The aim of this project is to develop a compact mobile water system for purifying ground/storm water into potable drinking water. The project is contained within a 10 foot container measuring 8 x 9 x 8 feet. The system comprises solar panels, a battery system, a water purification unit and a potable water storage unit. This system was designed and built to assist disaster relief situations through the provision of potable water and electricity.

Solar-powered water generator (ultra-filtration).

Supervisor
Leong Mun Kin

Team Members
Yan Haiwen, Poh Cheng Xiang Irving,
Yap Beng Chin, Lee Jun Yi

Industry Partner
SciMed (Asia) Pte Ltd

"SciMed (Asia) Pte. Ltd. is an established provider of Life Science laboratory and research equipment. This mobile solar powered ambient water generator unit is a joint development with Singapore Polytechnic for disaster relief. This 500 litre water unit is capable of treating storm run-off water into drinking water that complies with WHO standards. In addition, electricity could be tapped for emergency use as it has 48 banks of battery to convert and supply 230V AC voltages."

Mr Keith Low
CEO of SciMed Pte Ltd

Mr Keith Low (centre), CEO of SciMed, and consultant
Mr Kean Chong (right) looking pleased with the final
outcome of the prototype unit.

Aircraft Battery-monitoring And Refilling System

Battery-monitoring system.

NiCad batteries are the backup power supply for an aircraft when the main engine driven generators and standby/auxiliary generators fail. Batteries that fail a pre-flight check or are due for service are sent to a workshop for servicing. The servicing of these batteries is labour intensive, involving 16 to 24 hours per battery. This project aims to create a system which is fully able to perform the maintenance process of these batteries with the click of a button on a designated computer.
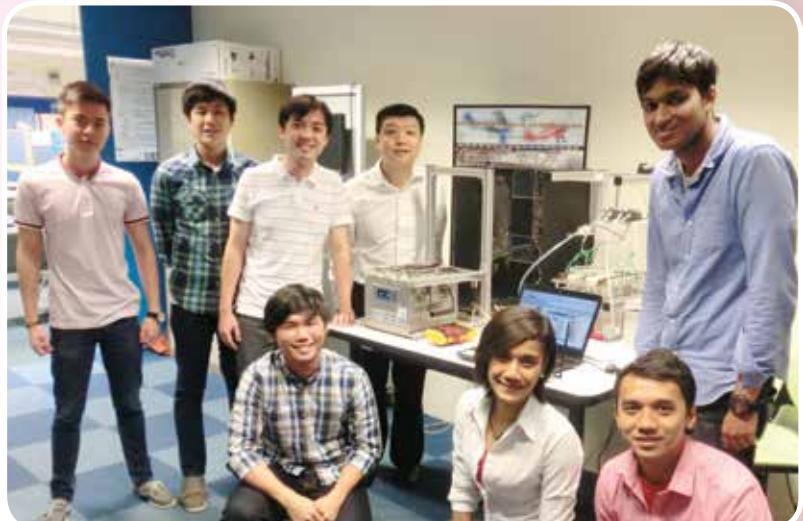
Supervisor
Tan Tiong Kwee
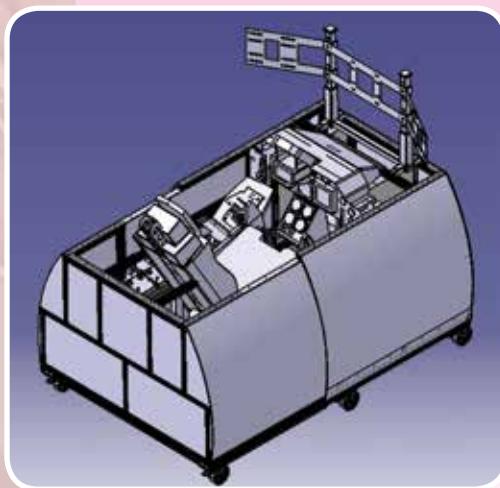
Team Members
Kitson Lim Jian En, Yap Brian Jay Padilla,
Royston Koh Xuanwei,
Nurul Hasyiqa Binte Osman,
Shiju Saseedaran,
Muhammad Fadhil Bin Yusoff

Industry Partner
Pacific Air Supplies & Services (S) Pte Ltd

Project adviser Mr Loh Sze Yin Darren (third from left) of Pacific Air Supplies & Services (S) Pte Ltd and team from SP.

RSAF Basic Flight Simulator System

Full assembly view of simulator.

The objective of this project is to build two transportable flight simulator systems which can do terrain flying, perform dogfights and aerial refuelling and have networked multiplayer functions. The project aims to provide a representative experience of being inside a fighter jet cockpit and allows the user to learn the basics of flying. The simulator has a special feature - the rear half of the cockpit can be mechanically split open to provide accessibility to those who find it difficult to climb over the sides.

Supervisor
Liao Choon Way, Mike Ong Chin Siang, Teo Ye Wei

Team Members
Jonathan Yong De Yuan, Terrence Cheo Chee Ming, Gui Zhi Peng Keith, Looi Jie Sin, Zachary Adam Proft,
Chia Teck Sheng, Engku Idris Bin Engku Osman, Toh Kin Hun,
Lim Yexing, Thomas Yong Khiam Soon, Loke Cheng An,
Chen Jun Yong, Edwin Lim Li Rong

Industry Partner
Republic of Singapore Air Force

Upper Extremity Rehabilitation For Upper Limb-impaired Patients

A gravity-elimination exoskeleton with four degrees of freedom (DOFs) for upper limb rehabilitation is designed and fabricated for upper-limb impaired patients for faster mobility recovery. This active device accommodates a wide range of users who suffer from upper limb impairment. Its ingenious design allows the user to switch from one arm to another within minutes. This device is digitally ready to support upcoming development in virtual reality games and analytic capabilities for patients, therapists and researchers.

Exoskeleton with human model.

Supervisors
Lee Kim Kheng, Sampath Kumar

Team Members
Wong Jing Lun, Law Jia Li,
Siti Nur Aisyah Binte Mawardi,
Jackie Chu Woei Bin,
Syahrul Hakim Bin Mohsin,
Khairuzzaman Bin Abdul Malik,
Nanthakumar Ananthan,
Terenjit Singh Makhan Singh,
Png Wee Kai, Amos Wong Wen Jet,
Suzie Susanti Binte Adigunarwan

Industry Partner
St Andrew's Community Hospital
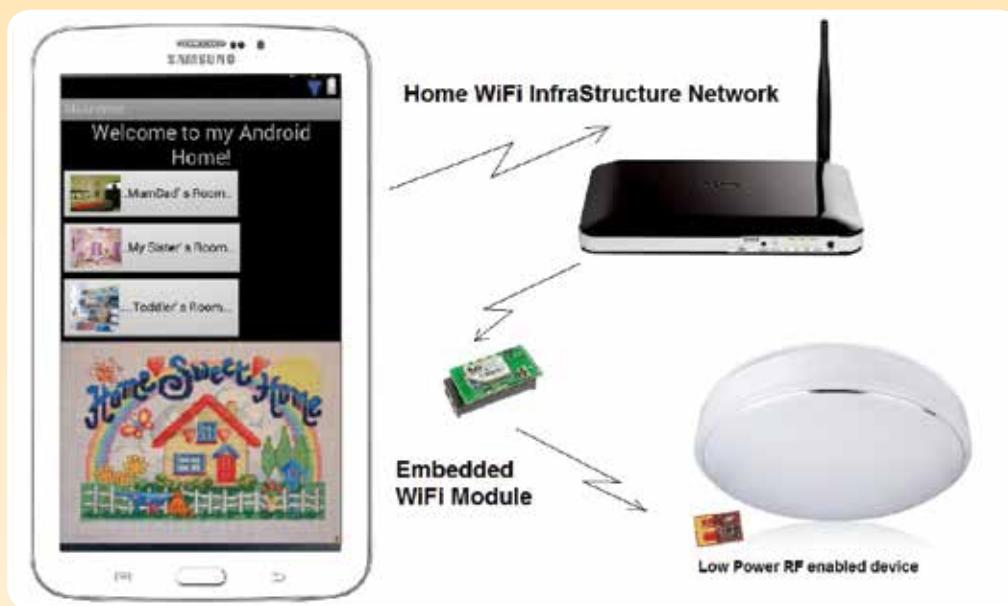
Team members from St Andrew's Community Hospital and SP.

"This collaboration between Singapore Polytechnic and Saint Andrew's Community Hospital aims to improve the rehabilitation process of stroke patients. Occupational therapists currently manually move the patient's limb through a range of motions.

Using technology, the team came up with a device that helps prevent joint contractures and maintain joint flexibility for the paralysed limbs of stroke patients. This device enables therapists to focus on other aspects of a patient's recovery or even to treat multiple patients at a time."

Ms Anna Lee Suan Cheow
Principal Occupational Therapist & Manager of Inpatient Therapy Services,
Saint Andrew's Community Hospital

Android-based Control System

Android@Home.

There are a good number of Android-based home automation systems in the market. Quite often, these are sold at component level for simple on-off operation of a light or an appliance using a handheld remote or a smartphone. Elaborate systems come with control schemes that may be too complex for a typical person to program, operate and maintain non-withstanding the high cost of ownership. This system allows low cost components to be built for the control and monitoring of lighting and electrical appliances in a home.

Supervisor
Hui Wing Hong
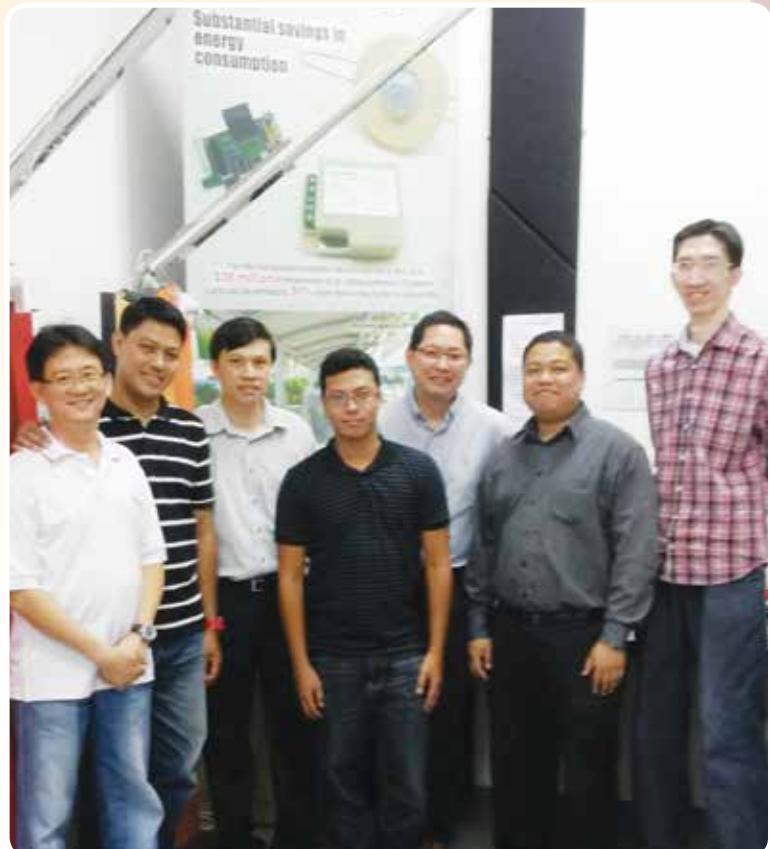
Team Members
Goh Yu-cherng Benny, Tan Yong Jie Cleman, Ko Ko Swe

Industry Partner
Surbana Technologies Pte. Ltd
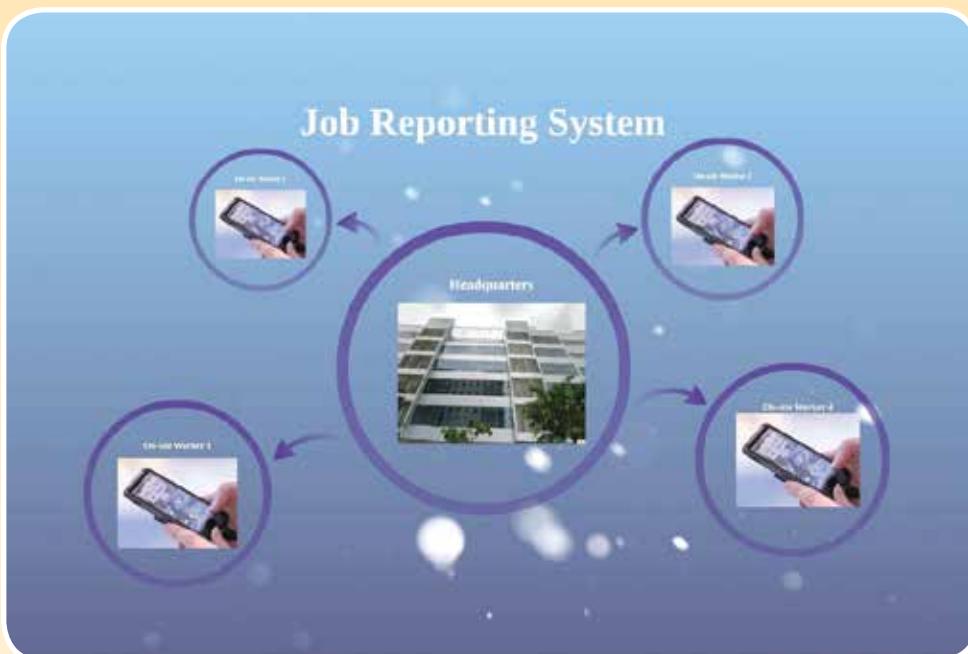
This project clearly demonstrates the use of various technologies to achieve the basic functions of controlling and monitoring of devices in a home. It has enabled us to design the specifications required for application on a large scale. A good example would be how the solutions can help achieve better energy efficiency in a commercial building.

From left : Mr Chong Wee Tat (SP TSO),
Mr Abdul Rahim (Surbana Project Manager),
Mr Hui Wing Hong (SP Senior Lecturer),
Mr Rohaizad (Surbana Assistant Project Manager),
Mr Alan Lee (Surbana Assistant Vice President),
Mr Azhar (Surbana Senior ICT Specialist),
Mr Tan YuGin (SP Research Engineer)

IoT for Smarter Workplace - Job Reporting System

IoT for Smarter Workplace - Job Reporting System.

The aim of this project is to develop an Android mobile application that utilises camera features to support the compilation of work progress of on-site jobs. The captured images are uploaded to the System administrator's server in the Headquarters. This will reduce the turnaround reporting time for both the supervisor in the main office and the mobile team working at the site. Other features such as job scheduling and report generation are also incorporated.

Supervisor
Rosa Tan-wong Ah Hoon

Team Members
Kor Ren Cai, Koon Wan Jie, Jarren Ling Jieren

Industry Partner
Ramky Cleantech Services Pte. Ltd.

"The experience gained from this collaboration between Ramky and Singapore Polytechnic's internship programme was invaluable. Ramky sought the skillset to enable them to improve their cleaning workflow through the use of technology, Wan Jie's team demonstrated and was proven to have this required skillset. We are proud to have sponsored this programme to groom technologist for Singapore's future. The cleaning industry would benefit from process automation using technology e.g. smart-phones, which ultimately will improve productivity and contribute to a company's bottom-line."

Mr Milton Ng
Director, Ramky Cleantech Services Pte Ltd

Acoustic Modeling And Analysis Of Speaker

The miniature speaker used in cellular phones is studied here using multi-physics FEA software to determine the sound pressure level (SPL) against the frequency range. As part of validation requirements, it is first done at a component level, followed by running the analysis at a system level to assess the software capability. It is found to be reasonably accurate when compared against the experimental results. The methodology developed from the study can be applicable to sound-related applications.
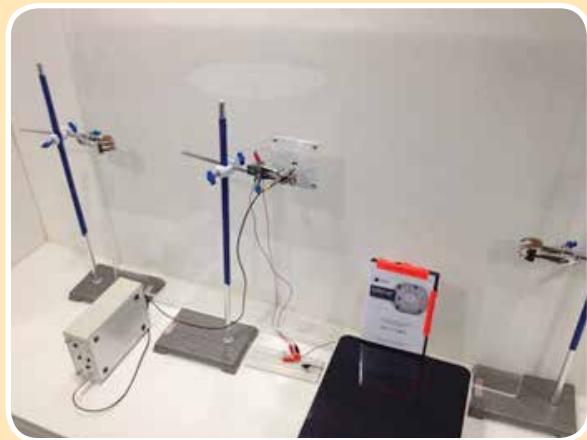
Supervisor
Lee Kim Kheng

Team Members
He Jie, Yeo Ray En, Brandon Koh Rong Xing, Seah Helin, Stephenie Malar Alakesan

Industry Partner
Hi-P Electronics Pte Ltd

Experimental setup used to capture the speaker performance.

Industry collaborator (Hi-P Electronics Pte Ltd) and FYP team (SP).

"This collaboration with SP has benefitted Hi-P by providing us with a methodology to conduct acoustic simulation at speaker and phone level. This ability to predict the frequency response of the speaker during actual phone usage has provided Hi-P with a competitive advantage in the design process of Hi-P electronic wireless products to produce a product that can meet the electro-acoustic recommended specification for mobile phones before the design is released for manufacturing. This will further enhance the advantage of Hi-P in the highly competitive contract manufacturing marketplace."

Mr Howard Hong
Hi-P Electronics Pte Ltd

Multi-layered Processing Machine

The Multi-layered Processing Machine is a standalone machine that can be implemented for scaled-up production of multi-layered cakes such as kueh lapis, kueh talam and other types of nyonya kueh. This standalone unit automates the highly skilled and labour intensive process of traditional layered cake making. Significant benefits through the adoption of this concept include reducing the reliance on manual labour, eliminating the need for repetitive tasks as well as removing the operator from harsh working conditions. This can be further translated into consistent product quality and cost savings for the user.

Supervisors Steven Tan Yih Min, Wan Mohamed Firdaus, Lim Hup Boon, Terry Tan, Alex Tan
Centre/School Name Food Innovation & Resource Centre
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Contact Number 67721469
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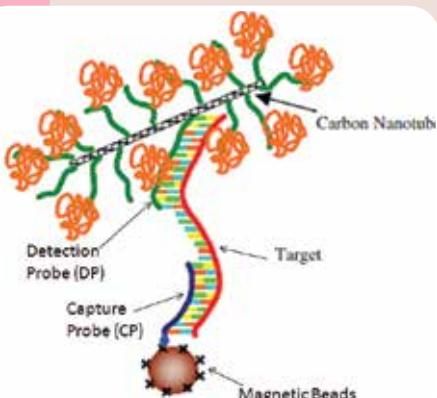
Overall view of the Multi-layered Processing Machine (MLP-100).

Rapid Diagnosis Of Dengue Infections

Methodology of the carbon nanotube label assay.

Dengue infections are one of the most common infectious diseases in the tropical areas in the world, resulting in many fatalities over the last few decades. To date, there are no effective antiviral drugs or vaccines available, and all the treatments are symptomatic-based. Thus, there is an urgent need for rapid diagnosis of dengue infections for better clinical management. This is an assay that utilizes the simple principle of carbon nanotubes aggregation to detect the presence of 4 serotypes of dengue viruses in just 15 minutes, with a single-step process.

Supervisors Tan Eng Lee, Adrian Yeo Chao Chuang, Annabel Ang
Centre/School Name Centre for Biomedical & Life Sciences
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Solar Heat-absorbing Paint
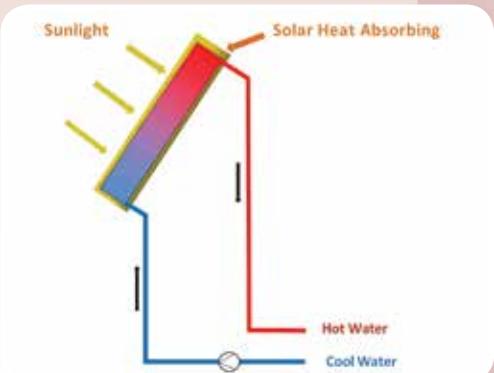
The aim of the project is to apply solar-absorbing coating to utilize solar heat for energy saving. This invention has higher solar heat absorbance and better thermal conductivity than normal decorative coatings. Fluid can be heated to $50^{0}C$ or above when the installation coat uses such paint. The generated hot fluids can be provided for domestic and industrial users. The use of such paint can cool buildings and reduces usage of electric energy to reduce electricity bills.

Supervisors Li Ping, Yin Xi Jiang, Low Aik Seng
Centre/School Name Advanced Materials Technology Centre
Contact Person Li Ping   **Contact Number** 67721172
Email liping@sp.edu.sg

Solar Heat-absorbing Paint application.

Object Tracking In Wide Outdoor Areas

Human detection in complex environment.

Object tracking in outdoor areas is very challenging due to the changes of lighting, colour and size of objects, as well as the distances between the object and the sensors. Sitting on a surveillance system of CCTV cameras and digital video recorders, this project sees the development of a system that can detect, track, trace and alert an operator by means of visual, text, and audible modes if interesting objects are detected.

Supervisor Cai Zhi Qiang
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Contact Person Cai Zhi Qiang
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Intelligent Controller System For LED Lighting

LED lighting is a good choice when it comes to implementing Eco-friendly and Intelligent-Lighting Management Systems. The lighting system can be used in public areas such as corridors, link ways, stairwells and lobbies with considerable energy saving potential. Each light fitting is a self-contained, plug and play, dimmable LED light source powered from the 230V/50Hz mains. It also includes a PIR motion sensor, an RF communication radio and control.

Supervisor Lim Yuen Siong
Centre/School Name
School of Electrical & Electronic Engineering
Contact Person Lim Yuen Siong
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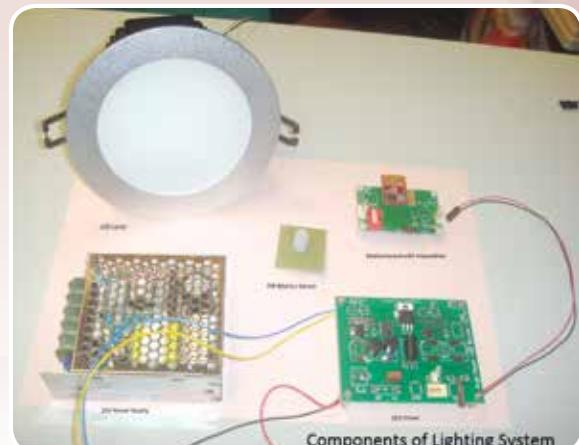
Each light fitting consists of an LED lamp, an RF Control Module, a PIR Motion Sensor and dimmable driver.

Gap-clearing Wheelchair

The wheelchair is one of the most important transportation equipment, providing mobility to the physically impaired. However, current wheelchair designs still face the problem of crossing gaps, such as uncovered gaps and drains. To assist the wheelchair user in their travels, an integrated gap-clearing mechanism is being researched and developed to enable the user to overcome these obstacles.

Supervisors
Soon Yew Boon, David Liu Dao Xian, Hendra, Foo Fang Siong
Centre/School Name
School of Mechanical & Aeronautical Engineering
Contact Person Soon Yew Boon
Contact Number 67721556
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Wheelchair with gap-clearing mechanism.

EEE Projects

I Stay Green

- Assessment of Energy Saving Potential for Cabin of Singapore Flyer
- Automated Solar Energy Saving Lightings (ASESL)
- Carbon saltwater battery
- Decorative LED lightings for gardens
- Design power management circuit for low voltage applications
- Development of a Grid-connected Solar Micro Inverter
- Dual Axis Solar Tracker
- Eco Garden
- Educational bike generator
- Educational Model on Use of Clean Energy
- Efficient Battery Charger for a Service Robot
- Energy conservation on street lights.
- Energy Evaluation for Solar Thin Film
- Energy recovery scheme for home
- Energy saver for home lighting
- eSave
- Floating solar panels at the lake
- Green Avator Waste water recycling at residential buildings
- Green Hump
- H2O Saver
- Illuminati
- Intelligent Energy Saving Street Lighting System
- More Than Just A Vending Machine
- Mozzie Control
- Multi-color Night Lanterns
- New Generation Outlet
- Notebook Power Supply in Solar Living Lab
- Novel surface structures and their influence on screen printed solar cell
- Portable solar powered handphone and camera charging kiosk
- Power distribution system planning software
- Power Integrator of Multiple Energy Sources
- Silicon nanowire-based photonic crystal as back surface reflectors for ultrathin wafer solar cell
- Smart Garden
- Solar Bicycle
- Solar Powered Automatic Fish Food Dispensing System
- Solar Powered Buggy
- Solar powered carrier
- Solar powered clock
- Solar Powered Garden
- Solar powered laundry area control system
- Solar Powered Portable Charger
- Solar Powered Segway
- Solar Shelter
- Solar ThermaL System
- Solar Traffic Light
- Solar Trash Bin
- Solar-powered electric bike
- SPAWS (Solar Powered Automated Watering System)
- Stagnant Water Monitoring
- Walk n Charge

I Fly High

- Aerospace Educational Kit
- Aircraft Blackbox Search Software
- Aircraft Ground Proximity Warning System Trainer
- Aircraft Radio Communication Trainer
- Aircraft Stall Warning System Training Model
- Analysis of videos transmitted by remote control aircraft
- Autonomous Flying Machine with Camera System
- Autonomous Flying Machine with Obstacle Avoidance
- Control Modelling of Quadrotor Flying Machine
- Development of Camera System on the Intermeshing Flying Machine (Iconic Project)
- Flapping Wing Flying Robotic Swarm-2
- Interactive Aerospace Learning Experience
- UAV with Pre-planned Flight Path
- UAV with Search Capability
- Unmanned Aerial Vehicle (UAV) Combat Quadcopter
- Unmanned Aircraft Tow Tractor 1
- Unmanned Aircraft Tow Tractor 2

I Control Robots

- AGV for Hospital
- Android Robot - Social Robot 3 (MDP)
- Automated Pet Feeder
- Control Programming Finger Muscle Movement
- Edu-tainment Robot
- Educational Robots
- Envo-Robot
- MIROSOT 1
- Mobile-based Edutainment CoSpace robot
- Multi-modal Human Robot Interaction
- RoboClean
- Robot Eye
- Robotic Arm Object Identification and Grasping System
- Sure-position RF measurement platform A (NTU collaboration)
- Surveillance ITA
- Touch panel control on pressure and valve testing system

I Get Smarter

- Acoustic Event Detection, Localization and Classification
- An Auto F&B ordering system using Web or Apps
- Android APP for Motor Control
- Audio Analytics for Environment Monitoring
- Authentic Combat Tag Game
- barcode reader system
- Bluetooth Sensor Power Switch
- Cloud Based Network Security Lab Environment
- Cloud-based database service
- CNT mask for anti-reflection application
- Comparing Cloud Platforms,To Or NOT to Cloud?
- Creative Advertising Show - System Integration
- Crowd Monitoring for Indoor Stadium
- Data backup for Android Phones
- Data Center Infrastructure Management Using openDCIM
- Design a switched capacitor filter IC
- Development of an iBook and an energy measurement system for the Microgrid
- Digits (iphone game)
- eBook on Computer Networking topics Engineering Design Systems
- Expenses Monitoring System for Primary School
- Flexible Electronics-Energy Harvester
- Fun Maths Learner for Lower Primary
- Global Positioning Building System (GPBS)
- Go Easy Bag
- Handphone Guide
- HiBuddy
- iBook for first year students
- iBook for selected topics on Electrical Engineering Principles
- IMU based Navigation System
- Indoor Navigation Using Google Map
- Intelligent Alarm
- Intelligent Electronic Safe
- Intelligent Home
- IOIO Based Smart Home Control System
- iPhone Tasklist App
- Kiosk Mode Presentation System using the Cloud
- Leap Assessment
- Logistic Mobile Platform for Material Handling
- LPG Detection System
- Medduler
- Mobile application on messaging & location tracking
- Mobile Apps Development
- Mobile Online Information Sites for LTA HR
- Monitoring cloud-based applications through active monitoring
- Monitoring System for SPELL
- Motion Sensor Application
- MPPT using CMOS PWM with feedback control I
- Multipurpose Alarm System
- MyImager - A Photo Depository for mobile devices
- Online Fast Food Order
- Open Source Based Private Cloud Implementation
- Overseer
- Preconcentrator for chemical sensing
- Pregnancy 101
- Remote Monitor and Control System
- Seat Availability Locator-Android Phone Apps
- Self Sustain Outdoor System
- Sense & Alert System
- Ship Engine Room Monitoring
- Smart Bathroom
- Smart Tools Box
- SP Food Guide
- SP HnS(Health and Studies)
- SP Show Path
- SP Spot Finder II
- SPeak
- SPeek (App)
- To develop a mobile app for collating reviews
- Transforming Physics Education
- Travel Mate
- User Behavior Analytics on Social Media
- Vehicle classification and counting
- Web page design & mobile application for online shopping
- Web-based Wireless Sensor Monitoring System

I Go Serve

- A pose detection system using in-depth camera
- Automated System for children or elderly
- Automating the measurement of person's hand grip using wireless means.
- Automation for elderly or the physically-challenged
- Balance training device for sprained ankle
- Biochip for the detection of viral RNA
- Blind Spot Alert
- BODY FAT MEASUREMENT
- CARdiac Safeguard
- Cycling Safety/Security
- Design and Developemnt Sensor interface and Instrumentation for Hand, Wrist and Shoulder therapy
- Design and Development of Game application for Upperlimb Rehabilitaion
- EasySave
- Elderly Care System in a Smart Flat – Event triggered vision-based monitoring system
- Elederly Care in a Smart Flat - Lifellogging
- Enhanced Carpal Tunnel Ligament Device
- Fall alert & Internet-enabled surveillance system
- Fucntional Electrical Stimualtor integrated with EMG activation for Upper Extremity Rehabilitation System
- Health Monitor Sytstem for Senior Citizen
- Intelligent Baby Care
- Intelligent Pill Dispenser (IPD) 1
- Intelligent remote physiotherapy monitoring using WBAN
- Medi-Minder App
- Medic-Kit
- Medicine Time
- Patient Treatment Time Monitoring System (RFID)
- Pill Reminder 1
- Quad Rotor Contoller using Body Motions
- Reminder Clock
- Rescue Helper
- Smart Exerciser for limbs (Gp 1)
- Smart Gait for Sport, Hospital & Motion Control
- Smart Motion Control for Walker
- TeleDoc
- Telehealth - Arm Muscle Movement Control
- Telehealth - Simulation of falling leg
- Telehealth- Device Interface & Patient Data
- Walk Through BMI System 2
- Wireless Monitoring System for personal healthcare
- Wireless Service Call System

MAE Projects

I Stay Green

- Cold and Hot Food Cart
- Compost / Fertiliser Processing Unit
- Concentrated Solar Steam Generation Kit
- De-humidifier System for Solar Living lab
- Development of a Compact Compressed Air Engine
- Earth Battery for Small Garden Lightings
- Eco Lifter
- Heat Load Analysis for Solar Living Lab
- High Rise Hydro Energy Harvester (Phase II)
- Human Powered Water Filtration and Supply System.
- River Powered Generator
- Vacuum Grass Trimmer
- Ventilation analysis for Solar Living Lab
- Wave Energy Harvester
- Zephyr

I Fly High

- Ace Engineering Project
- Active Aero-elastic Composite Wing
- Afterburner & Thrust Vectoring Gas Turbine Engine
- Aircraft Stall Warning System (Training Aid Model)
- Boeing Interior Design and Fabrication
- Development of Composite Structure for Aircraft Vibration Control / Isolation
- Development of V/STOL Aerial Vehicle
- Eagle Service Asia - Kit Cart Project
- Hover-Glider™
- Hybrid Fuel-electric Quadcopter
- Lear Jet Cockpit Simulator
- Motor-powered Cargo Lifter UAV
- P&W HR Shared Services - Policies and Procedures Standardization
- P&W: Seletar Component Repair (SCR)
- Pegasus
- Project management of MRO processes of PW 100 Series Turboprop Engines
- Surveillance Sphere
- Tail-less, Delta Wing, Propeller-powered Plane Development
- The Aerophibius Robot
- The Unmanned Underwater Vehicle
- Transformer Flying Car
- TRY2C Short Field Vehicle
- Valveless Pulse Jet Engine

I Control Robots

- Aquarius Truck
- Elevating System for Cleaning Robot
- Unmanned Fire Fighting Vehicle

I Get Smarter

- Catapult War
- Design & development of Hopper Dispenser using Interchangeable Auger
- Design and Development of Patty Forming Unit
- Design and Development of Volumetric Dispenser using Barrel Drum
- Design Enhancements for Flight Simulator
- Development Vari Process for Composite Products
- Jig for Maintenance Practices
- Mechanical Augmentation Armour Upgrade
- Micro-milling of Titanium Alloy
- Microfluidics Car Air Freshener
- Movable Lightweight Whiteboard
- Nano Coating UV Tester
- Silent Eye (SEE)
- SnerGise MarkII
- Structural Analysis of Conveyor Components
- Value Stream Mapping of all Products

I Go Serve

- Automated 'Stowable' Ophthalmic Chair
- Design and Development of a Bilateral Manipulator
- Design and Development of an Exoskeleton for Upper-limb REhabilitation
- Device for Visual Detection of IV Cannulation Site (KKH)
- Hand and Wrist Rehabilitation
- Hand/Palm Rest and Finger Holder for Hand Rehabilitation Device
- Instrumenting the Starting Block for Sprint Start in Athletics II
- Interactive Therapeutic Pet Robot
- ipad Based Picture to Speech and Text to Speech
- Lappy Wheel
- Laptop Stand for Wheelchair User
- Man-Guided Wheelchairs' Transporter
- Portable Hoist
- Portable Leg Extension and Flexion Exerciser
- Shower Wheelchair
- STS System
- Tech-chair

Exhibition Layout

SP ENGINEERING SHOW 2014

Service Road

T11C
Fabrication Lab

FLYING DEMO

I FLY HIGH

I STAY GREEN

eleven²

I CONTROL ROBOTS

I GET SMARTER

SP ENGINEERING PRODUCT

INDUSTRY COLLABORATION

I GO SERVE

C1

C2

T11A

Car Park

8th Jan 2014
2pm to 6pm

9th, 10th & 11th Jan 2014
10am to 6pm

C1: Visitor's reception and Information

C2: End Point

✚ : First Aid Counter