# I CAN ENGINEER SOLUTIONS FOR

CLEANTECH & BUILT ENVIRONMENT

SP TECH TO MARKET

Transport & Mobility

SP ENGINEERING SHOW 2016

Healthcare & Wellness

Industrial & Automation

Infocomm & Media

SINGAPORE POLYTECHNIC | SP

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# EXHIBITION LOCATION MAP



**SP ENGINEERING SHOW I 2016**

# CO-CHAIRMAN'S MESSAGE



**From Left to right:**

**Dr Sepulveda Jose**
**Co-Chairman,**
SP Engineering Show Steering Committee
**Centre Director,**
TIE-Applied Research & Tech for Infocomm Centre

**Mr Sng Hong Lian**
**Co-Chairman,**
SP Engineering Show Steering Committee
**Deputy Director,**
School of Electrical & Electronic Engineering

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

# Welcome
## to the SP Engineering Show 2016

This annual exhibition provides our final year engineering students with the opportunity to showcase their cornerstone projects to fellow students, staff, industry visitors and the public. It is also a chance for them to demonstrate their "tech-readiness" in an era where technological innovation is competitive and valued. Through this exhibition, our future engineers will also be able to engage with industry partners on the practical applications of their projects.

We would, therefore, like to invite you to tour the exhibition and interact with our students. As you are introduced and entertained by the range of technology and engineering innovations created by our staff and students in collaboration with the industry, our students will receive the opportunity to broaden their soft skills through the sharing of their expertise. This experience will go a long way in helping our students to be work-ready, life-ready and world-ready, on top of being tech-ready.

The exhibition will feature a fascinating display of technology in CleanTech & Built Environment,

Healthcare and Wellness, Infocomm & Media, Industrial & Automation and Transport & Mobility.

You should also visit our SP Tech to Market section which showcases industry-ready ideas developed by staff from our five schools – School of Architecture and the Built Environment, School of Chemical and Life Sciences, School of Electrical and Electronic Engineering, School of Mechanical and Aeronautical Engineering and the Singapore Maritime Academy – as well as our Department of Technology, Innovation and Enterprise.

The projects on display today demonstrate the capability of our students to learn and apply the knowledge acquired in our CDIO (Conceive, Design, Implement & Operate) and Design Thinking curriculum, skills, which we are confident, will serve them well in future.

We would like to express our heartiest congratulations to the organising committee, student clubs and helpers, staff, industry partners and visitors for making the SP Engineering Show 2016 a memorable event.

# SP ENGINEERING SHOW WORKING COMMITTE



**Front Row
(Left to Right)**:
Tan Hai Su, Lynn Chhia, Seow Boon Chor, Beh Hang Meng, Sepulveda Jose,
Ronny Tham, Sng Hong Lian, Cheung Kim Kwong, Gillian Lam, Lee Mei Lai, Esther Kang

**Back
Left (Top to Bottom)**:
Chua Poi Hui, Lui Siew Kwok, Wan Kok How, Tay Kheng Siong, Victor Choo, Tan Toh Seng

**Right (Top to Bottom)**:
Goh Kim Seng, Teo Kian Hun, David Chai, Handojo Djati Utomo, Fazlur Rahman, Chan Chin Loong

**Not in Picture**:
Chiam Tow Ming, Francis Hong, Frank Chua, Gabriel Soon, Gareth Lai, Jonathan Ng, Lee Choon Sun, Lee Yoke Ling,
Leong Mun Kin, Lew Woon Cheun, Matthew Choong, Moon Sunghan, Tan Cher Hwee, Tan Liong Kiat, Wong Kwee Yin

# SP ENGINEERING SHOW STUDENT COMMITTEE



**Back Row
(Left to Right)**:
Hans Bin Elias, Koh Zhi Yuan, Narin Kumar, Tan Kee Wei Nigel, Jason Chia Wei Kiat, Ang Zhong Wei, Lin Che Wei Weber,
Yohannes Ignatius Kartika, Wong Zheng Zhou Nicholas, Lim Ye Xun

**Middle Row
(Left to Right)**:
Esther Choon Jing yi, Lee Ying Theresa, Chiang Hua Chen, Lai Zhau Yan, Goh Qian Ning, Tsen Ya Pei, Peck Jia Ying Claudia,
Raden Irdynna Binte Rahamat, Chua Yu Lin, Denise Ng Rui QI

**Front Row
(Left to Right)**:
Lee Wei Zheng Benedict, Thomas Wong Jin Her, Muhammad Haziq Bin Rozaini, Muhammad Ady Muharawi Bin Irwan,
Muhammad Sufian Bin Abdul Razak, Poon Yong Kit Alvin, Neo Zhuang Lin, Matthew Paul A. Manalang,
See Rui Hong Alastair, Willy Teo Way Yang

# CLEANTECH & BUILT ENVIRONMENT

These projects use technology which is environmentally friendly, is economically competitive and generates less waste. Students work on increased performance, productivity and efficiency by minimizing the negative effects on the environment.

**CLEANTECH & BUILT ENVIRONMENT**

# Green Initiatives For The Built Environment

The team studied several innovative Green initiatives with the intention of creating a sustainable built environment for the future. These would be implemented in a built environment and would include creating and designing a Greener office. The team first investigated how to reduce heat gained on RC walls and glass windows so that indoor temperature can be reduced. Secondly, the team looked at how office space can be improved by implementing different features and configurations to complement the 3Rs - REDUCE, REUSE & RECYCLE. Thirdly, the team aimed to encourage and raise awareness, among the public, for a better and greener environment.



Innovative initiatives for a greener and better Built Environment.

**Supervisor**
Chua Yina

**Team Members**
Chong Pei En, Sim Jie Yi Eileen, Stephanie Lim Wei Ling, Chen Yu Ting, Bernice Lee, Chok Man Ming

**Industry Partner**
Ascendas Pte Ltd

# Impact Resistance Of Sand Against Projectile Penetration

The use of sandbags as a ballistic impact resistance barrier is conventionally used for military field fortifications. Compacted granular material, like sand, has a tendency to dilate under shear loading. A suite of impact tests will be conducted with the smooth bore gas gun to determine the ballistic performance of sand over a wide range of variables such as sand type, relative compaction of sand, impact velocity, mass and shape of projectile.



A suite of impact tests conducted with the smooth bore gas gun to determine the ballistic performance of sand.

**Supervisor**
Teo Kian Hun

**Team Members**
Tan Xin Wei, Aw Ming En, S Vinodan, Michelle Ng Suan Giok

**Industry Partner**
National University of Singapore

# Use Of Pulverized Fly Ash (PFA) In Concrete

The project aims to study the engineering properties of concrete containing various replacement levels of PFA with respect to a free W/C ratio of 0.45. The study shall involve laboratory tests to assess the workability as well as mechanical strength and durability properties.

**Supervisor**
Tan Poh Seng

**Team Members**
Ng Sherwyn, Ng Kang Yong, Hairi Bin Anuar, Keh Zi Ao

**Industry Partner**
Samwoh Corporation Pte Ltd


Aggregate quartering.

# Use Of Recycled And Natural Materials In Bituminous Paving Mixtures


ABE Group during Greenwave Competition 2015.

This project aims to evaluate the properties of bituminous paving mixtures containing crumb rubber tyres and natural rubber latex. Results of the mixtures with and without recycled materials will be compared and analysed during the mix design procedure. The bituminous mixtures with optimal binder content will be analysed and concluded.

**Supervisors**
Handojo Djati Utomo, Tan Poh Seng

**Team Members**
Tang Kak Yong, Charto In Sutra, Xu Xinwei, Tan Jun Jie Brandon, Han Yin, Shane Tok

**Industry Partner**
Samwoh Corporation Pte Ltd

# Produce High-purity Poly Aluminum Chloride Solution & Recover Pure Copper Metal From Spent PCB Waste



Revolutionizing the world one step at a time.

Spent cupric chloride waste solutions produced from printed circuit board (PCB) processes are currently treated by pH neutralisation. This method produces a precipitate which is recovered and an effluent of salt and water mixture that is disposed of. The aim of this project is to apply a new method by using a displacement process to treat the spent cupric chloride waste solution with zero waste discharge. The primary target is to produce stable high purity 23-24% poly aluminium chloride (PAC) solution, while the secondary target is to obtain pure copper sponge.

**Supervisor**
Audrey Chen

**Team Members**
Leong Chi Munwilsven, Chua Zhong Hang, Ang Wei Zhang

**Industry Partner**
Pride-Chem Industries Pte Ltd

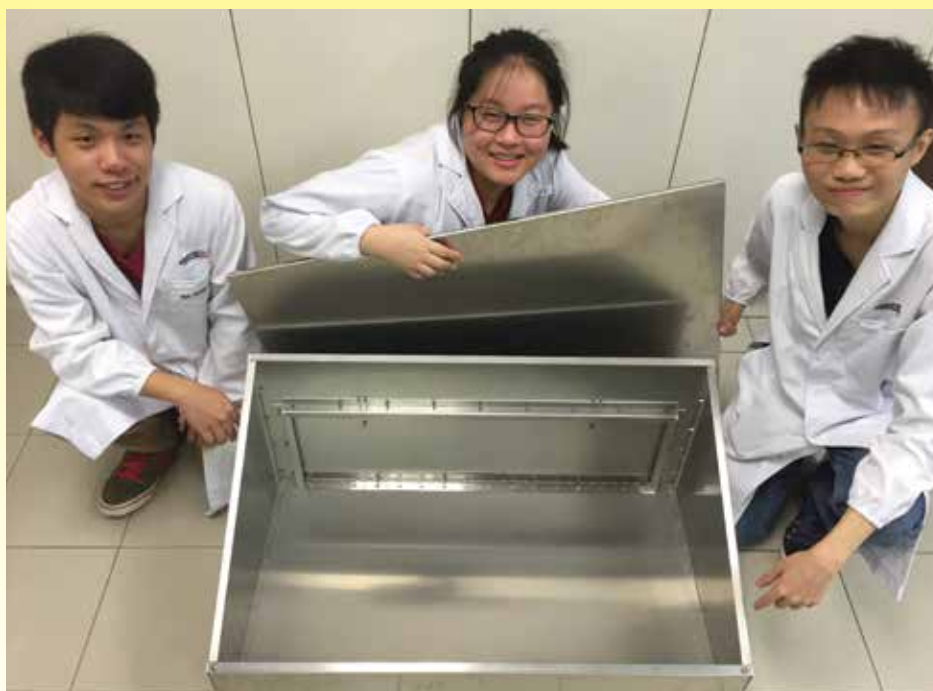# Surface Modification For Drying Application In Rural Areas

In this project, students will modify the surface of a material to achieve balanced hydrophobic and hydrophilic areas on the surface(s) of a solar dryer. The surface modification is intended to enhance the rate of drying of an innovative solar dryer that was previously conceived in a Learning Express trip.

**Supervisor**
Noel Kristian

**Team Members**
Sia Hong Yew, Lee Kai Xiang Luke, Madely Iolana



Low cost dryer for rural areas.

# Evaluation Study On Converting Solid Wastes Into Usable & Valuable Products For Developing Countries

In some developing countries, such as the Philippines, poor families live on the dumpsites at the outskirts of urban areas. The dumpsites are full of solid waste, such as plastics, food waste, wood, etc. In this project, students were required to conduct an evaluation study on the conversion of solid wastes into usable and valuable products, using an engineering approach. The aim is to help poor families in the Philippines to earn a living through sustainable means.

**Supervisor**
Jessy Yau

**Team Members**
Hairul Amri Bin Jefree,
R Sai Sidharth,
Sufyan Amirul Syafiq Bin Gazali



Blending and moulding of solid wastes.

# Solar Car (MDP)



The aim of this project is to design and build an advanced 2-seater carbon fiber solar electric vehicle (solar EV). The completed vehicle participated in the 2015 World Solar Challenge. This is a 3000 km race across the Australian Outback, stretching from Darwin to Adelaide that lasted over 6 days.

Media Event to send off Solar Car Team at SP Sports Complex on 29 Sep 2015.

### Supervisors
Steven Chew Lai Keat, Than Keng Hwa,
Leong Fai Choy, Lam Yee Ki, Foo Fang Siong

### Team Members
Lee Zhen Yuan Bryan, Lee Sunho, Lim Wei Siong, Pyae Ko Ko, Bryan Chu Wei Xuan, Melvin Ng Cheng Li,
Kim Hyun Jee, Lai En Han, Chua Zhi Xin, Siti Nur Sharifah Binte Zainol, Muhammad Taufik Bin Johari,
John Ying Jie Ming, Gladly Gedelyn Estrella Laurente, Darryl Ng Zhi Wei, Daniel Quick Ruiwen, Teo Yi Qian,
Malcolm John Samuel, Eddie Bin Jamil, Yong Le Yun, Royce Teo, Clovis Lim Jing Jie,
Siti Zulaiha Binte Mohd Hanifah, Poh Ngiam Teck, Dzulaikha Binte Ramle, Mohamed Al Thanwir Mohamed Rafeek,
Lim Tian Fu, Leow Wei Lin, Chen Jingwen, Lim Jian Hao, Muhammad Hazim Bin Mohd Rashid,
Syamsul 'arifin Bin Mohmad Razak, Devakumar Sinnathambi Moorthy, Muhamed Irshath Liakath Ali,
Cheong Yong Quan, Chong Yung Hoe, Poh Hoc Chuan, Kee Yanhong, Ling Wei Xiong, Tay Xue Qi Elean

# Client-Server Applications For Automation

This project focuses on the development of a Client-Server application on a WiFi network. The client-server applications comprise both Windows-based applications (Windows Form and Windows Store) as well as Android-based applications. The applications support multiple clients (users) to a server application thereby allowing close control and monitoring of the devices by the server application. Devices that can be controlled and monitored include LED/fluorescent lighting, temperature, humidity and occupancy.

**Supervisors**
Hui Wing Hong, Lim Yuen Siong

**Team Members**
Lee Ting Jue Darren, Lim Yu Sheng Joevi, Teo Chok Yong, Cao Chen, Ratna, Lim Wen Pow, Ngui Jia Hui, Ho Zhi Zhong Lester, Tai Jie Qin



Client-Server Application for lighting control.

# Mouse Trap

This project aims to design and develop a Sensor Circuit Board for a mouse trap, so that a trapped mouse can be removed before it starts to rot and give off an unpleasant smell. The human supervisor is informed of the trapped mouse via SMS sent from a Base Station. Individual traps communicate with the Base Station via RF signal. A Repeater may be necessary to extend the RF range.
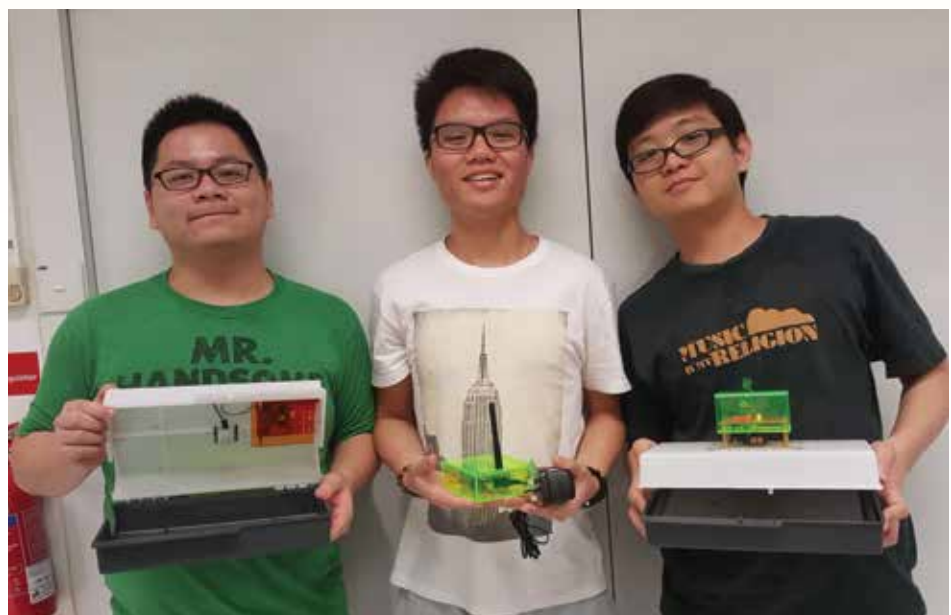
**Supervisor**
Chong Siew Ping

**Team Members**
Chng Yong Quan Edmund, Melvin Wong Yi Yang, Tan Po Lin

**Industry Partner**
Rentokil Initial



Adding a sensor board to a mouse trap so that a trapped mouse can be reported.

# Nitroaromatic Compounds Removal By Nanosilver Ceramic Membrane

Nitroaromatic compounds are among the largest and most important groups of industrial chemicals in use today. These compounds are organic molecules that consist of at least one nitro group (-NO2) attached to an aromatic ring. Nitro-aromatic compounds are stable, persistent and toxic. Most of these compounds are considered poisonous if ingested and exhibit human mutagenic and carcinogenic potential. Current methods to remove nitroaromatic compounds in water include photo-oxidation, incineration, absorption, etc. However, no effective and economically feasible method exists. In this study, a new way, using nanosilver ceramic membrane, was investigated.


Students doing the experiment.

**Supervisor**
Liu Qishan

**Team Members**
Ong Ching Kang, Na Shi Ching, Xie Tingting, Sun Yiwen

**Industry Partner**
AGplus Technologies Pte Ltd

# Electric Vehicle

The objective of the project is to construct a 4 wheel vehicle which can be operated with at least one man with a laden load of approximately 200kg min to 300kg max. The vehicle will be designed based on a green energy concept and will fulfil the basic requirements of a vehicle system i.e. the system shall have a drive unit, a suspension system, a directional change capability and an ability to brake. The system shall be designed and comply with regulations provided to the designer(s).

**Supervisor**
Foo Fang Siong

**Team Members**
Seow Mei Qi, Muhamad Amirul'adli Bin Syed Ahamad Shah, Low Dai Jun, Nur Adli Bin Abd Azis, Leong Yan Cheong Wilson


EV side view.

# Improving And Increasing The Number Of Solar Tiles Prototype For Walkways

The project's objective is to design and fabricate lighted tiles capable of using solar energy to charge batteries for conventional applications which include outdoor use within SP facilities. The tiles must be able to light up the path of the users for at least a 10 second duration using a simple electrical circuit.

**Supervisor**
Norazhar Bin Mohamed Sepet

**Team Members**
Muhammad Khidhir Bin Mohamed Razuwan, Tashfique Haider,
Hariz Budiman Bin Mohamad Rashid,
Olaguir John Enric Paredes



Activated Solar Powered Tiles.

# Hydro-hybrid Power Plant

The 20th century's main issue is the environment as a sustainable environment will determine the survival of the human race. Providing clean energy resources will reduce the use of fossil fuel, thus saving the environment from air pollution resulting in a greener earth. The aim of this project is to generate electricity using underwater currents as well as solar energy. The prototype is designed to generate electricity with sufficient power to provide lighting to the public.

**Supervisor**
Wong Yoon Quee

**Team Members**
Peng Xiu, Chang Ren Ooi, Pisigan Charles Abraham Rectra, Yee Yong Qi, Ng Chern Khai



Integral part of the Hydro-hybrid Power Plant.

# Blue Wave Generator

The aim of this Blue Wave Generator project is to show how to harness sea-wave energy to generate electricity. The demonstrable aspect of this project is the Blue-Wave Energy Converter which uses the rack and pinion mechanism to convert the linear motion [wave movement] to rotary motion [rotating generator].

**Supervisor**
Lim Jit Cheng

**Team Members**
Jeffrey Yeoh Sing Bok, Joey Leow Wei Hong, Foo Yi Ling, Ambrose Huan Yee Yang



Construction in progress of the Blue Wave Generator.

# Harvesting Energy From Wastewater And Sludge Using Microbial Fuel Cells

Progress and development in the 21st century has resulted in many global environmental issues that revolve around the two key problems of energy consumption and solid waste management. The objective of this project is to study electricity generation from a simple microbial fuel cell (MFCs) that contains sewage sludge, a solution that would address both problems.

**Supervisor**
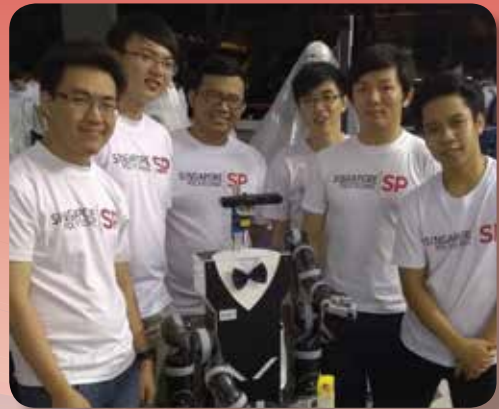Handojo Djati Utomo

**Team Members**
Ong Ching Kang, Li Siyu, Jeannie Aw Yeong Jun Yi, Eu Jun Nan

**Industry Partner**
Nanyang Technological University



First Runner-up Award presented by Minister Heng Swee Keat during National Energy Day.

# Healthcare & Wellness

These projects help maintain an optimal level of wellness which is crucial for living a high quality life. Students will develop tailor-made integrated solutions to make a difference in people's lives.

# Healthcare & Wellness

## Rapid Detection Of Carbapenem-resistant Enterobacteriaceae By Real-time PCR

The great increase in Carbapenem-resistant Enterobacteriaceae (CRE) has become a public-health priority. The use of carbapenems as drugs of last resort for severe infections caused by these bacteria has resulted in the emergence of carbapenem-hydrolysing N2-lactamases and carbapenemases producing Enterobacteriaceae, contributing to the growing threat of nosocomial infections. The current culturing diagnostic method is too long and is time consuming. With no treatment currently available, rapid diagnosis of the infections has become a crucial factor for better clinical management. This project aims to develop a rapid diagnostics assay for rapid screening of CRE using real-time PCR.
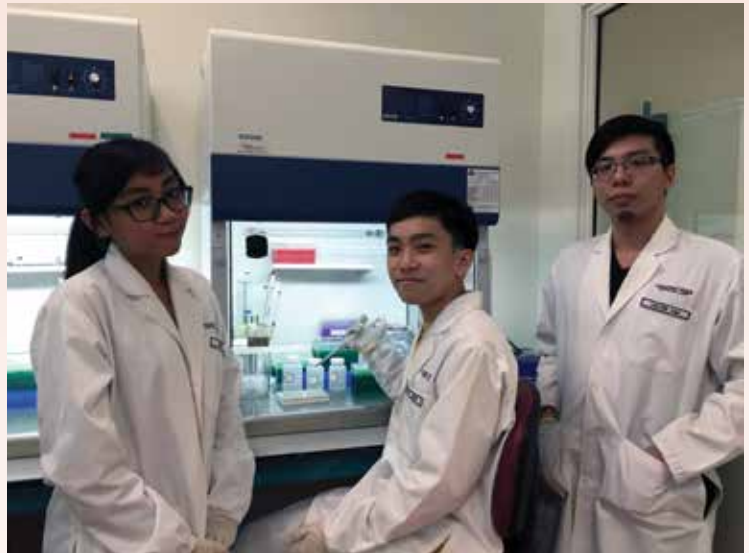

Students working on the project.

**Supervisors**
Ng Min-chuan Desmond, Tan Eng Lee

**Team Members**
Derrick Wee Zan Liang, Lester Lim Kok Wei, Nurin Ubaidah Binte Hamzah
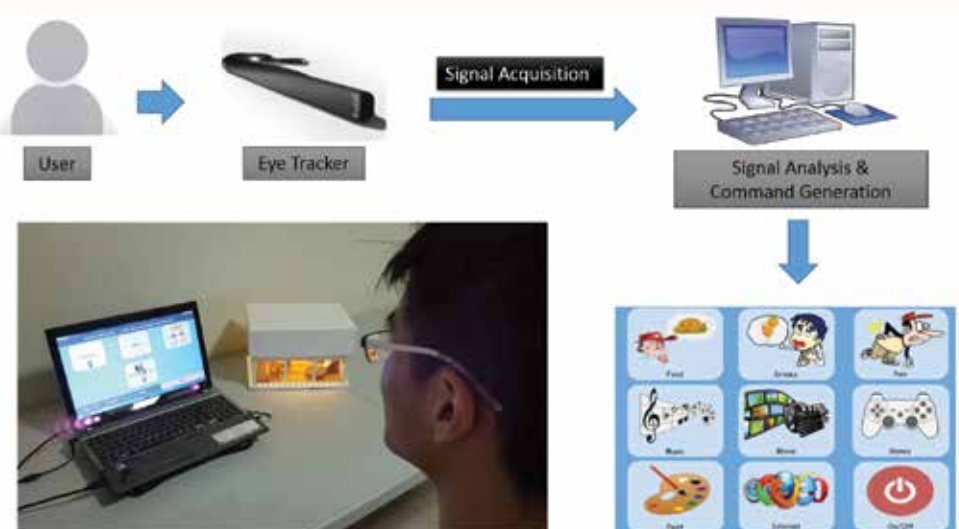
**Industry Partner**
Tan Tock Seng Hospital

## Communication And Home Device Control System For Disabled Using Eye Tracker

This project aims to develop a computer-interface-based communication and home device control system for the disabled using the Eye Tracker. With this system, a disabled individual is able to express their daily needs with caregivers and communicate with others on a variety of social networking platforms, such as Facebook, Twitter and their blog. They can also control various home devices wirelessly.


Communication system and home device control for disabled using Eye Tracker.

**Supervisor**
Lu Hongli

**Team Members**
Min Pyae Moe, Mohamed Ifthar Bin Mohamed Fazlulkareem, Lim Guang Liang, Cassandra Ng Chi En, Joey Ng, Lim Yong Peng Aloysius
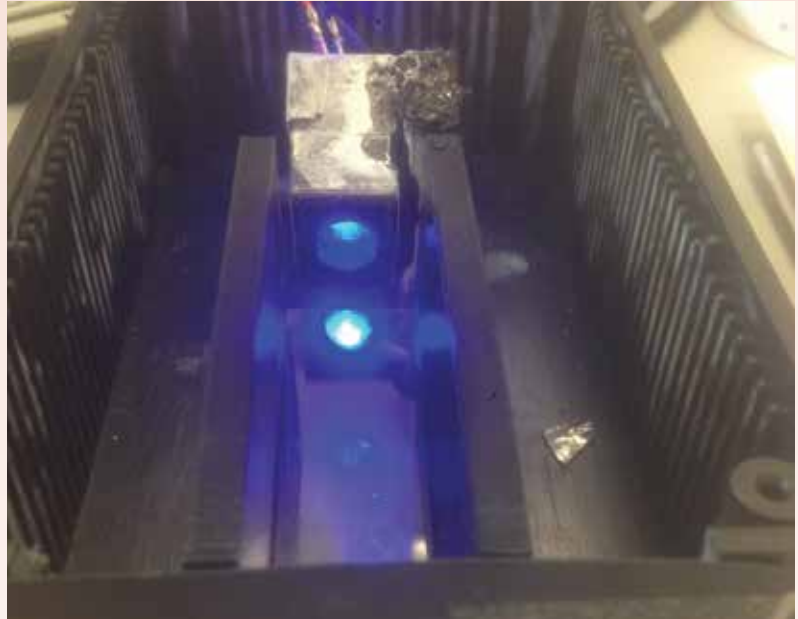
# Biosensor

Early detection of highly infectious diseases is crucial in preventing the onset of an epidemic. Current detection methods are time-consuming, expensive and require trained personnel to carry out the tests. There is, therefore, a need to develop a rapid and efficient diagnostic kit for detection. In this research, students focus on developing a portable device for detecting viral RNA using a fluorescent tagged probe.

**Supervisor**
Low Lee Ngo

**Team Members**
Hu Jiawei, Tan Chee King



Bio Device to detect viral RNA.

# Smart Assistive Technologies For Visually Impaired And Physically Disabled



Poster - Smart Assistive Technologies for Visually Impaired and Physically Disabled.

Assistive technology promotes greater independence by enabling people to perform tasks that they were formerly unable to accomplish. The team aims to help the physically disabled, especially the visually impaired, to be more independent and self-reliant. It will also prevent them from becoming a burden to their family members. Smart Assistive Technologies can also provide timely emergency responses for medical, fire and lift rescue on SP's Campus.

**Supervisors**
Phyoe Kyaw Kyaw,
Lo Cheong Wah Frank,
Voon Ching Choo

**Team Members**
Kelvin Raj Stephen Louisesamy, Armando C Rico Ii,
R Sivadass Rajendran, Brian Chua Woon Keat,
Png Xiang Hua, Jong Sze Kuan Melvin,
Ting Yong Hao Ericsson, Yang Zhaoding, Hui Wei En,
Siti 'atikah Binte Mohd Raba'i, Nurridzuan B Supardi,
Lai Yue Shan

**Industry Partner**
Institute for Infocomm Research (I²R)

# Therapeutic Pet Robot For Motivational Companionship And Early Alert System For Elderly

The purpose of this project is to design and produce a pet robot that acts as a therapeutic companion for both the elderly and autistic children. It reduces the workload of the caregivers as well as the possibility of physical and emotional setbacks of the elderly. It also allows autistic children to socialize better with their peers. To promote aging in place, the system can be combined with EASE (Early Alert System For Elderly), a vision-based system that provides early warning to caregivers during an emergency based on real-life scenarios faced by the elderly who live alone.



Pet Robots with EASE system.

**Supervisors**
Jaichandar K S,
Chew Boon Seng,
Carlos Acosta,
Benjamin Koh Yee Foo

**Team Members**
Ryan Aidil Azalee Bin Azmi, Wee Liang Zheng Ervin,
Chen Pei Yi, Wong Chen Li, Ng Jun Jie,
Vikram Visvanathan, Tee Wen Jie,
Shahabaz Anwar Husen Khan, Akshay Anthony Viji,
Shoban Ashwin Kumar, Tan Jun Hao,
A Abdul Hakeem, Goh Kok Hong, Ho Nguyen,
Lee Dong Ruen, Ivan Chia Da Feng, Tan Yi Ji

**Industry Partners**
Institute for Infocomm Research (I²R),
A*Star,
Ling Kwang Home for Senior Citizens,
Nanyang Technological University

# Social Robot

Social robots are robots that are able to assist humans in daily activities in places like homes, offices and restaurants. The SP Social Robot is equipped with a 3D camera, speakers, two arms, and a mobile base. During the SP Engineering Show, the robot can take drink orders and deliver the order to the customer. This simple task for humans is not so simple for robots. Advances in technology will make these robots a reality in the near future. The benefits these robot will deliver to society are mainly as a tool to support and increase comfort in life.



The team of students proudly showing their social robots.

**Supervisors**
Carlos Acosta,
Asadollah Norouzi,
He Yingjie, Tan Tuan Kiat

**Team Members**
Yap Zu Qing, Lim Han Chiang John Michael, Nabil Ilham Bin Abdul Jalil, Julius Justin Francis,
Muhammad Irfan Bin Azman, Lee Jia Ming, Tan Yan Kiat Jireh, Lim Enjie, Adam Seth Tan Zhenyuan,
Farah Umairah Binte Muhammad Redwan, Tan Yeu Mein Brenda, Teo Yong Jie Darius,
Tan Li Lin Melanie, Liang Jia Jun, Nadiah Binte Zainudin, Ong Shi Wei, Muhammad Irfan Bin Razni

# Pro-step

This project focuses on the design and fabrication of a lightweight, high performance prosthetic foot that is made of carbon fibre composite materials. The aim is to improve versatility by integrating a 2-piece design secured by a locking mechanism which allows the user to easily change their sole plate when necessary. Additionally, with the contours of the sole-plate mimicking that of a human foot, this design also aims to provide the user with a more natural stride and therefore ensures comfort every step of the way.


Pro-Step group.

**Supervisor**
Kelly Koh

**Team Members**
Irfan Dhamiry Bin Mohamed, Sidhesh Sunil Pillai, Hairris Susandi Bin Supaat, Koko Sia, Muhammad Syafiq Bin Juraimi

# Wheelchair Elevator For HDB Door Steps

The project aims to design and build a compact device for physically challenged HDB residents whose wheelchairs have to overcome the 3 steps at their doors. It uses a linkage mechanism to form the lift system with minimal obstruction to the corridor. It is robust, easy to operate and to setup.


CAD model of lifting device.

**Supervisor**
Soh Kim Fai

**Team Members**
Lim Lu Xin, Tan Jia Jing Roy, Tan Jun Ren, Dylan Kevin Conceicao, Theng Wen Jun Clarence

# Design And Fabricate A Modifiable Geriatric Chair

Geriatric chairs are commonly used in hospitals for rehabilitation. The users are often the elderly or patients who suffer from stroke. It is used primarily to allow patients who have difficulty moving to sit instead of lie down, allowing the blood to circulate. Patients, however, tend to feel uncomfortable after some time and some are known to slump or even fall from their chairs. The Geri Add-Ons are small and mobile devices attached to a regular geriatric chair and are ergonomically designed to help improve patient's comfort while supporting their posture.

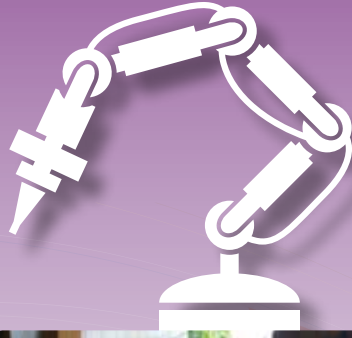**Supervisor**
Cheung Kim Kwong

**Team Members**
Luo Yulin,
Akshay Raj Singh Rajesh Singh,
Elfy Hafiyan Bin Suhaimi,
Jordon Poh Jun Hui,
Sim Woei Sheng
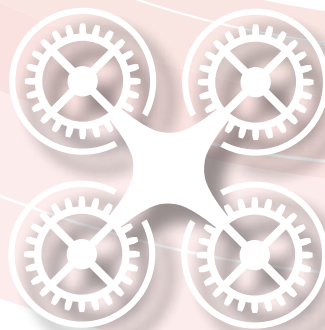
**Industry Partner**
Changi General Hospital



Geriatric chair engaged, comfort delivered!

# Industrial & Automation

These projects provide control systems with processes that need to interact in real-time with other applications with significantly superior performance in terms of precision and speed.

# Industrial
# & Automation

## WIP Tracking System

Work in progress (WIP) refers to all materials and partly finished products that are at various stages of the production process. These are materials that have entered the production process but are not yet finished products. This project aims to design, develop and deploy the WIP tracking system using active RFID technology at Sanmina-SCI factory in Singapore.

**Supervisor**
Lee Kuoh Lih

**Team Members**
Tan Ying Rui Sebestian, Fong Whye Hin, Quek Jun Wen Edward

**Industry Partner**
Sanmina-SCI Systems Singapore Pte Ltd



WIP Tracking System with Active RFID equipment.
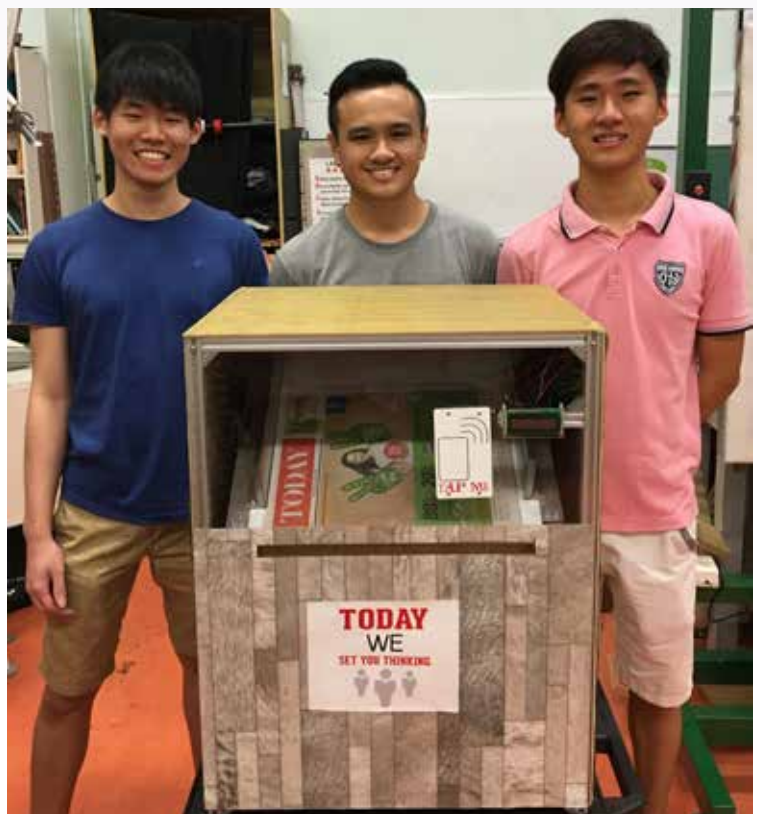
## Smart Free Newspaper Dispenser

In this project, a smart newspaper dispenser has been built for use on SP campus. Students and staff will use an issued RFID card to retrieve the free newspaper, at their convenience, from the newspaper dispenser. The dispenser will prevent the same person from taking multiple copies of the newspaper so that more people will be able to get hold of a copy of the free newspaper. The machine will also generate daily statistics to show the number of copies of newspaper that have been collected, so that the newspaper collection point can be appropriately stocked.

**Supervisor**
Goh Say Seng

**Team Members**
Ng Tze Wei, Lok Weng Kiat, Ng Kai Xuan



The Smart Free Newspaper Dispenser, together with the project team.

# SP Air Hockey

The aim of SP Air Hockey is to create a game that would interest students and showcase engineering in an exciting and fun way. The game allows students to have fun challenging one another while discovering the engineering ideas behind its creation. This project was done in collaboration with industry partner Weidmuller Pte Ltd.

**Supervisors**
Chia Soo Ping,
Roger Chiun Koon Yong

**Team Members**
Ang Zhi Yu Andre,
Justin Goh Jun Hao,
Noor Nashriyah Binte Jalil,
Umar Amirudin Bin Osman,
Chia Yuan Tzeng,
Muhammad Syafiq Bin Hamzah,
Lio Chin Hwe, Yeo Hui Ling,
Loh Shu Ting

**Industry Partner**
Weidmuller Pte Ltd


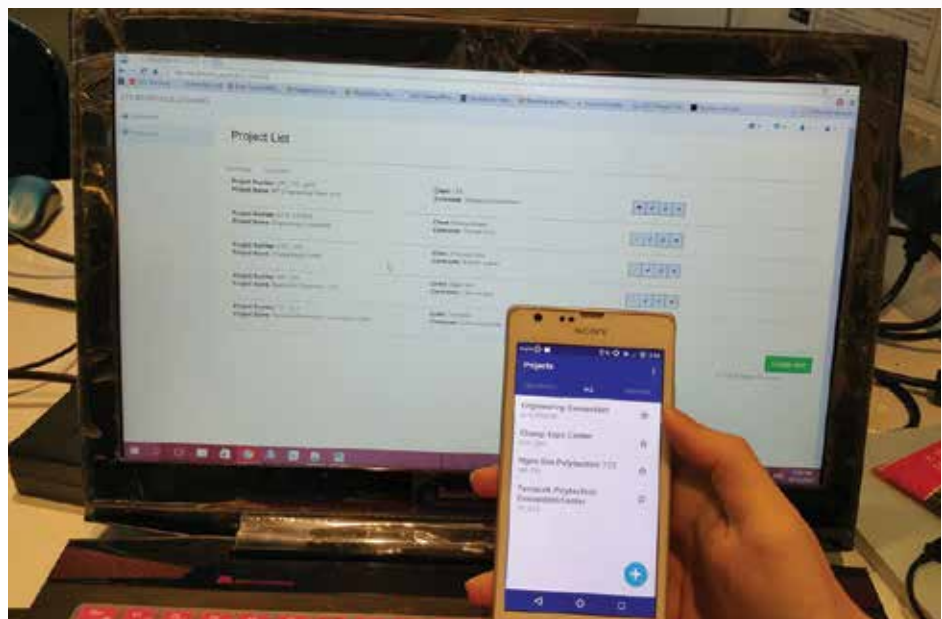SP Air Hockey: Engineering is Fun.

# Smart Solutions For Companies

These industry-based projects use mobile devices to provide smart solutions for companies. The projects consist of a soil condition logging system for the Land Transport Authority, a nurse scheduler and medication administration systems for ECON Healthcare, a mousetrap alert system for PestBusters and a customer retail experience analytic system for SingTel.


Soil Condition Logging System For LTA.

**Supervisors**
Sing Mong Nguang,
Wong Chee Yong,
Tan Kwee Teck,
Zhu Bochun

**Team Members**
Kok Wai Gie, Lim Ting Wei, Leow Kian Ann, Ong Jia Chen, Er Jun Liang, Teo Siang Chuan Daniel, Yong Wen Hao, Ng Mai Feng Gary, Lim Bo Zhi, See Yu Xiang, Tay Kai Keng, Hu Qingyao, Ray Cheng Chern Xi, Leong Jia Long, Alex Neo Jing Hui, Hassan Bin Mohd Dohlan

**Industry Partners**
ECON Healthcare Group,
Land Transport Authority (LTA),
Singtel

# Video Analytics For Monitoring And Assessing Customers

CCTV cameras are a common feature in commercial public places like restaurants. New developments in video analytics can help better utilize these cameras to provide the operators with useful customer information like the number of potential customers who spend time looking at posters, menus or banners outside a restaurant and the duration of their viewing, or the recognition of new and regular customers that will enable restaurant owners to enhance interactivity. This project investigates such video analytics development to provide monitoring and assessment info to the operators. This project utilizes cameras innovatively to enhance customer service.



Analysis on the attractiveness of a promotional banner and the number of viewers at a selected time frame.

**Supervisor**
Yang Zhizong

**Team Members**
Evon Tan Shi Yun, Seah Mun Ting, Lee Li Ling

# Soft Robotics

Soft Robotics use soft and flexible materials to replicate the movements of biological systems. This allows the robots to move in very limited spaces, change gaits easily and makes them safe to be used around humans. The aim of this project is to build a prosthetic hand using soft robotics actuators as fingers for rehabilitation or assistive technology. A muscle sensor and fluidic control board are used to control the silicon actuators.

**Supervisor**
Tan Yan Xin

**Team Members**
Calvin Febianto Liem, Zhang Ziyue, Reamonn Chan Yao Quan, Lua Jia Zheng, Goh Chong Jin



Prosthetic hand made of silicone fingers demonstrating the use of soft robotics in Assistive Technology.

# Composite RC Racing Boat

This project focuses on using mainly carbon fiber composite to develop and build a durable, light weight and cost effective hobby boat yet retaining its racing ability such as high manoeuvrability and good speed. Eighty percent of the boat is made of carbon fiber composite, contributing to the superior strength-to-weight ratio and the beautiful black glossy appearance. It also has the provision for configuration in which a second function can be installed according to consumer's interest. In this project, a camera function is added to the RC boat to allow a wider aspect of the hobby boat.



Composite RC Racing Boat in action.

**Supervisor**
Liu Hui Yin

**Team Members**
Fu Yongjun, Tay Yi Li, Tan Yao Hui, Thian Hui Ning, Tan Jia Wei

# Analysis Of Jacking Up Method For Tank Erection

The aim of this project is to help PEC explore the feasibility of a newer method of tank erection. This new "Top-Down" method increases cost efficiency while reducing both time spent erecting the tank and working at heights. The group has analysed the feasibility of "Top-Down" by using a Finite Element Analysis software named ANSYS.

**Supervisor**
Lee Kim Kheng

**Team Members**
Tan Wilton, Toh Yi Rui,
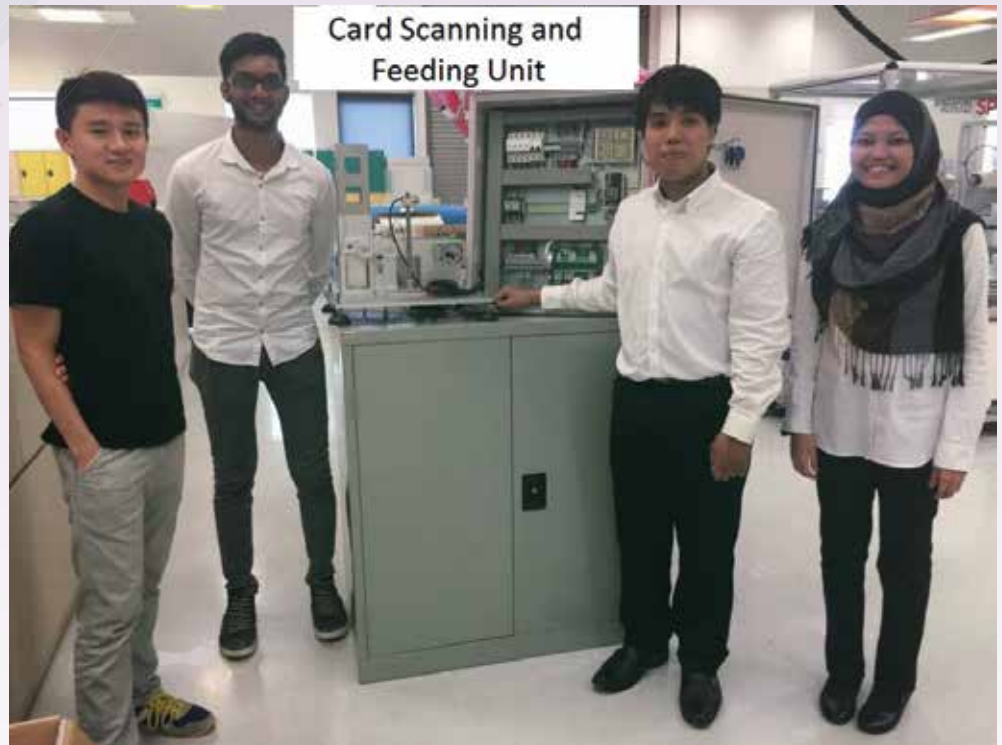Toh Zhe Han, Ng Bo Yan



3D CAD model of Tank.

# Card Scanning And Feeding Unit

Manual scanning of work passes by workers is tedious, mundane and unproductive. Automating the scanning process will improve productivity and allow personnel to be redeployed to work on higher value work. Before proceeding with the full development of the fully automated system, it is proposed to prove the concept on the critical operation which is the automatic scanning and data collection. The project has shown its viability and is ready to be further developed into a fully automated system.

**Supervisor**
Steven Tan Yih Min


Card Scanning and Feeding Unit.

**Team Members**
Dong Xiao, Siti Hajjar Binte Zainal Abidin, Danial Syafiq Bin Muhamad Daud, Vigneswaran Balachandran

# Elevator

Elevators are common forms of vertical transportation systems that are applied in residential, commercial and industrial buildings. The entire system is made up of mechanical structures, mechanisms, sensors, motors and a control system, making it a useful training resource for engineering systems. A 1:5 scale elevator is designed, fabricated, assembled and integrated comprising miniature mechanisms and components that can be used to demonstrate engineering fundamentals and concepts in an indoor learning space.

**Supervisor**
Tan Tuan Kiat

**Team Members**
Wong Wai Kit Zachary,
Neo Thiam Woon,
Sean Lee Jun Xian,
Tang Keng Fai Billy,
Lam Jia Yi Reynold


Elevator left view.

# Robotic Gripper

Robotics in industrial automation are generally used for object manipulation in a wide variety of applications which include material handling, manufacturing and assembly. Such applications require the robot to handle different objects at the end effector. Whenever there is a process change, the end effector would need to be changed to handle a different object. The aim of this project is to design and develop a robotic gripper that can handle objects of different shapes. Developing such a generic gripper at the end effector can significantly reduce the setup time for handling different tools and materials.

**Supervisor**
Tan Tuan Kiat

**Team Members**
Cheong Wing Foong Boaz, Reon Chua Cheng Han, Dominique Tan Ming Xun, Poh Kok Hong Kean


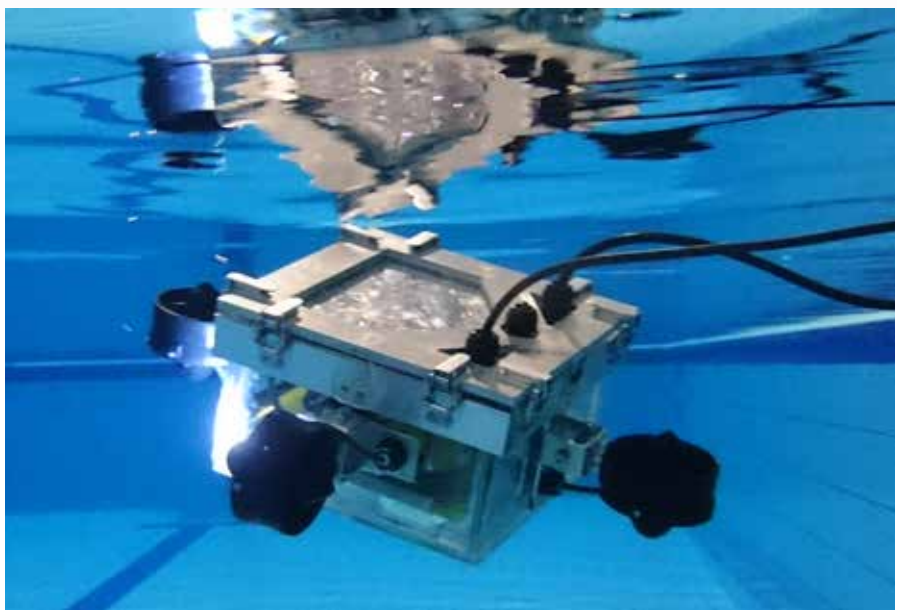
Robotic Gripper prototype.

# Underwater Robot

The aim of this project is to design and develop an Underwater Robot with a prototype manipulator attached to it. The robot has a quick access panel to allow access into its internal circuits. It also carries an on-board camera to allow the user to see streamed real-time video so as to use the manipulator. These types of robots are seen in various industries around the world and are extremely useful on a regular basis. The long term aim for this project is to meet such a demand.

**Supervisor**
Thevaraja Ramu

**Team Members**
Mohamed Farhan B Mohamed Anwar,
Muhammad B Rahmat,
Muhammad Hafiz B Adnan,
Hilmi Bin Amir Hassan,
Muhammad Syafiq B Sani



Side view of the Underwater Robot manoeuvring through water.

# INFOCOMM & MEDIA

These projects deal with a digital technology base with new era of infocomm-enabled applications and digital media. These projects handle interactive applications involving infocomm technologies.

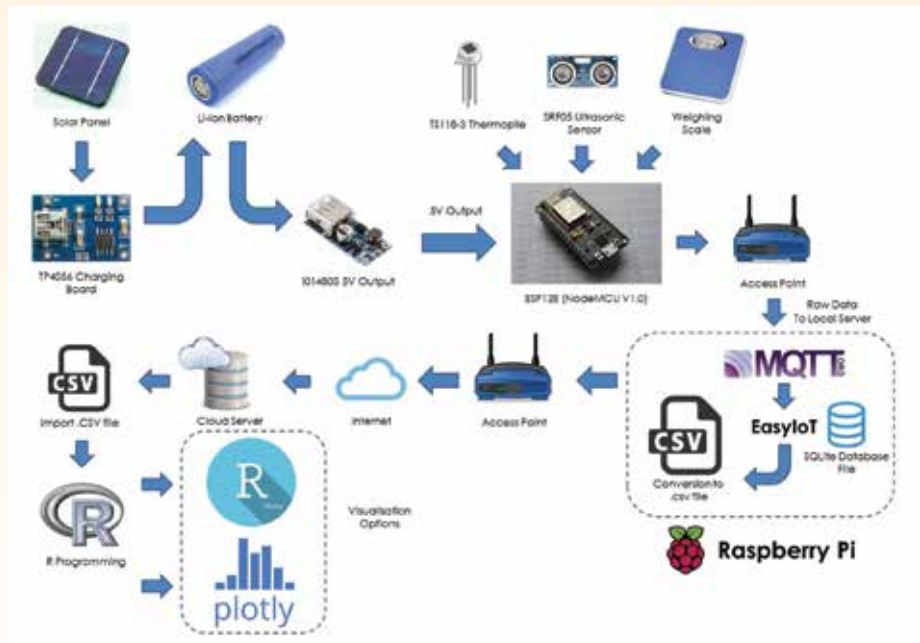# Ubiquitous Computing Framework To Collect, Process And Visualize Public's Interest.

The purpose of our project is to visualize and perform analytics on healthcare data of public interest after collecting it via relevant sensors. As an instance of this goal, the team will investigate if the prevalence of fast food in SP is contributing to student obesity. The team has created the necessary infrastructure (sensors, computing framework, and analytics software) to test this hypothesis.

**Supervisor**
Teo Shin Jen

**Team Members**
Tan Jing Yu William, Ang Tian Hao, Ng Yu Jie



System Diagram.

# Smoker Detection And Mobile App Development For Dehaze

With video and image processing, the team developed applications for smoker detection and dehaze. The smoker detection system can be applied in mass surveillance to detect smokers and also to alert relevant authorities accordingly. Haze is an atmospheric phenomenon where dust, smoke and other dry particles obscure the clarity of the sky. Dehaze can significantly increase the visibility of outdoor scenes when haze is heavy. The developed Haze-Off mobile apps can remove or reduce the effects of haze from hazy images instantly.

**Supervisor**
Cai Zhi Qiang

**Team Members**
Daniel Tan Jun Xian, Adriel Goh Wei Liang, Law Jun Hong, Feng Hanxin, Teo Jun Wei

**Industry Partner**
Institute for Infocomm Research (I2R)



Smoker Detection and Development of Mobile Apps on Dehaze.

# EasyLock - An IoT Locker System For A Smart Campus

The aim of this project is to develop an IoT (Internet of Things) smart locker system that is easy to use and manage. Users are able to rent and access a locker using the one thing that is always found on a modern individual - a smart phone. The smart phone is used to scan for any available locker and rent it for a specified period of time. The phone can also lock and unlock the locker, thereby doing away with the need for a physical key.

**Supervisor**
Lim Joo Ghee

**Team Members**
Saw Tian Hwee,
Keshav Prasath Asaithambi,
Parmar Varun Samir



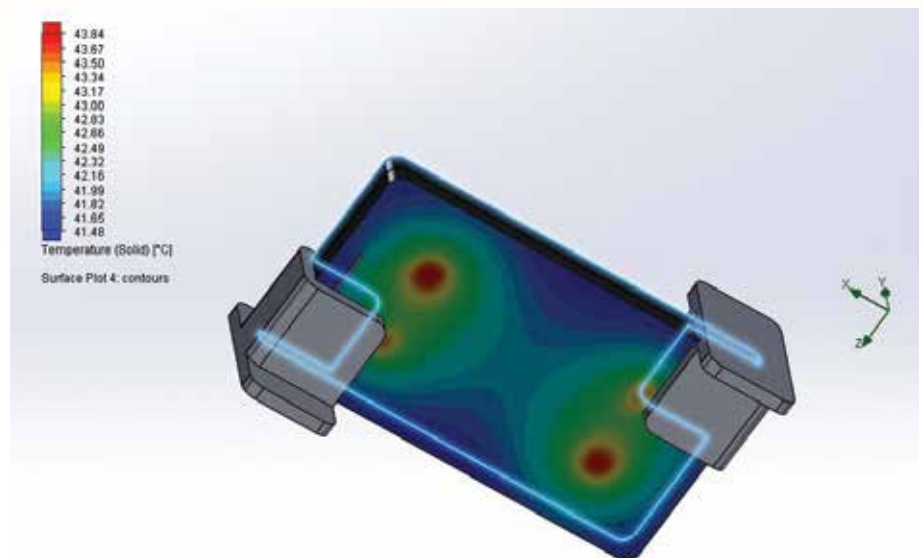The EasyLock System Block Diagram.

# Thermal Analysis Of Mobile Phone

This project employs the use of CFD software to study and run thermal analysis on Intel's SOC package and correlate the experimental results with numerical simulations. With the use of a validated phone model prototype, a controlled heater is used as a proxy to simulate a phone heating up during operation and comparing the results from the CFD software to prove its accuracy. The use of this software allows the prediction of hotspots and surface temperature on the Intel IC chips during operation and provides an insight on heat dissipation in the mobile device.
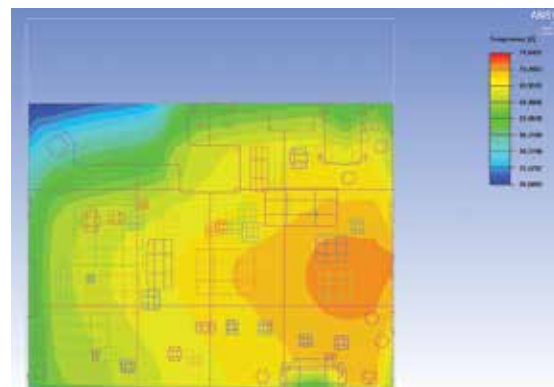
**Supervisor**
Lee Kim Kheng

**Team Members**
Lewis Ng Yew Kuan,
Kevin Ong Xin Zhi,
Tan Kay Fei Benedict,
Leo Ming Zhe Jeryl,
Joel Pua Wen Jie



Temperature Contour Plot for Validated Model.



Temperature Contour Plot for PCB Model.

# Transport
# & Mobility

These projects contribute to the creation of integrated transport systems that are resource efficient and which tie in with substantial improvements in the mobility of people and freight.

# Transport & Mobility

## A Pest Controller's Assistant

The aim of this project is to build a field deployable flying machine for bee-hive destruction and roof top inspection. Currently, pest controllers have to don heavy gear and get close to a bee hive before they can spray special chemicals to destroy the hive. In addition, they sometimes have to scale great heights to do a visual inspection of the roof top. Both types of work present great risks. With this tool, the pest controller can simply choose a comfortable location and remotely pilot the flying machine to carry out the otherwise hazardous tasks.



The machine spraying chemicals at the beehive.

**Supervisor**
Tan Hwee Siang

**Team Members**
Yan Junfeng, Yeo Ling Zhi Kenny, Andrew Teng Kai Hong

## WITS II - Wireless Instruction Transmission System II

The wireless instruction transmission system (WITS) is conceived, designed and implemented to enhance the safety and overall experience of aurally-challenged paragliders. The WITS is a collaboration project between the School of Electrical & Electronic Engineering's Aerospace Electronics Technology Group and the Paragliders Association (Singapore). The project aims to enhance the safety and overall experience of aurally-challenged paragliders by leveraging on the modern microcontroller and wireless electronics technologies, to develop a system through which a ground-based instructor can effectively communicate with an airborne aurally-challenged paraglider to carry out a successful flight.



**Supervisors**
Tan Hwee Siang, Shanker Maniam

**Team Members**
Sherman Lau Swee Yang, Wong Zhi Hao, Anderson Lin Wai Kit, Tan Wei Qi, Tan Yong Siang

The WITS field prototype II.

# Autonomous Battery-Swapping System For Multicopter And Aerial 2D/3D Mapping Applications

1) This project aims to enable multicopters to fly forever by automatically swapping the depleted battery with a charged one. The multicopter will land precisely and the actuating mechanisms will position it for battery swapping. The ground station is fully automated and able to charge batteries.

2) This project aims to develop aerial 2D/3D mapping services for the industries. Data are gathered from the camera on the flying drone and then processed using a software which will convert the data into point clouds. These point clouds will then form together to represent a scaled 3D model of the data.



Ground battery swapping station with four battery holders and the rocker arm on the rotatable carousel.

**Supervisor**
Danny Lee

**Team Members**
Yeo Yak Hang, Celetaria Charles Edison Alimboyoguen, Chew Yi Zhe Gabrice, Sim Jia Yi, Chen Yan, Qian Jie, Yap Shu Min Natalie, Yeo Wei Sheng

# Reducing MRT Door Re-openings During Peak Hours

The aim of this project is to reduce the frequency of MRT doors re-opening during peak hours. Under the current system, ALL doors re-open when one door is blocked. The solution is to have individually controlled doors, so that only the blocked door will re-open. A voice message will also be played at the blocked door to request passengers to stay clear of the closing door.

**Supervisor**
Chong Siew Ping

**Team Members**
Chua Wei Jie,
Lau Jian Hao Keith,
Lim Jian Wei



Reducing MRT door reopening, by having individually controlled doors with voice reminder to stay clear.

# Bazedboarders

The popularity of short distance personal transportation (SDPT) such as electric scooters and bicycles is gaining momentum in Singapore as Singaporeans look for transport modes that are cost effective yet efficient. Through research, the team answers this demand by making an electric longboard. The Bazedboard delivers convenience, speed and portability seamlessly at a cost effective price compared to similar products in the market, presenting what could be the future of SDPTs.

## Supervisor
Cho Lai Teck

## Team Members
Yong Xun Jie, Lee Boon Yao, Toh Wei Ren Enver, Ho Zheng Yi, Derrance Wong Guan Yu


The Bazedboard in action! Electrically powered with high trucks and wheels for better control and comfort.

# New Iconic Hybrid Swarm UAV Systems

The aim of this project is to design and build 4 Hybrid UAV Systems utilizing a combination of technologies from different platform configurations, using hybrid material and aerodynamics to achieve optimum operating parameters with SWARM Capability to provide cooperative behaviour to complete complex missions and to eliminate redundancy in the system. The Respective Hybrid UAV Systems are also designed with a modular configuration which allows standard components to be interchangeable for different missions. Each Hybrid UAV System can also fly autonomously in a pre-plan flight path using GPS Way-Point Systems.


Hybrid Modular Swarm UAV Systems.

## Supervisors
Liew Hui Sing, Mike Ong Chin Siang, Chua Ming Sing, Reagan Chionh

## Team Members
Wang Wei Xiang Sylvester, Tay Wen Hui Gabriel, Ong Lok Sim Iris, Mohammad Haiqal Amirul Bin Mohammad Yazid, Muhummed Farid Marican Bin Abdullah, Ahmad Ariffin Bin Ahmad Affenddie, Dhanie Ardiyan Bin Suyanto, Peh Jun Hui, Lim Weiyu Arnold, Tan Tze Yuan Timothy, Muhammad Syahril Bin Rosli, Lim Jun Liang Kenneth, Nicholas Lim Ding Feng, Benedict Yam Jin Keng, Joel Mauriths Kambey, Lim Dao Wei, Chia Hou-an, Samuel Joo Jian Wen, R Bharath Ram, Wang Sichen, Lai Yan Ting, Wong Chee Wei Joel, Joshua Lay Hui Jie, Sebastian Wong Chee Qian, Wan Jun Jie James, Yang Zhaoyi, Vishnu Loganathan, Wei Huan, Huang Shuaihan, Kurt Kee Yue Zhen, Siau Shang Le

# Fabrication And Flight Testing Of The ST Aerospace Hybrid Aerocopter

This multi-disciplinary project aims to fabricate and flight test the ST Aerospace patented concept of a novel hybrid UAV (Unmanned Aerial Vehicle) capable of high speed airplane mode flight and low speed vertical and/or hovering flight. Students from both DARE (Diploma of Aeronautical Engineering) and DASE (Diploma of Aerospace Systems) are involved in the fabrication, assembly and flight test of the UAV with the former responsible for all mechanical and the latter for the electrical and avionics aspects of the project. At this phase, the project culminates with a demonstration of the take-off and hover flight.



Rendition of the Hybrid Flight Vehicle.

**Supervisors**
Leon Chu Sin Yu,
Mike Ong Chin Siang

**Team Members**
Ng Kar Ming Brian, Zhu Yifan, Melvin Chua Han Wei,
Harrison Ng Rui Fu, Tan Aik Lim Philip, Lim Zhen Yang,
Lim Wee Liam, Gafkinshah Gaffar

**Industry Partner**
ST Aerospace

# Boeing 737 Cockpit Simulator Module (Phase 2)

The aim of this project is to design and build, adding additional features to, the existing Boeing 737 Interchangeable Flight Simulator System with Flight Control Upgrades. The Cockpit also takes reference from realistic Glass Cockpit Systems to accomplish a rigid mechanical design and precise flight controls in the cockpit. The Cockpit simulator is also designed to be an interchangeable modular unit which can be retrofitted into the existing SP Full Motion Simulator Dome.

**Supervisors**
Liew Hui Sing, Tan Tiong Kwee

**Team Members**
Mardave Paredes Manuel,
Kaeselitz Ted, He Junnan, Loh Kay On,
Loa Mun Sheng, Tan Yan Jie Sean,
Hay Yao Hui, Thomas Tan Jing-ren



Boeing 737 Interchangeable Flight Simulator System with Flight Control Upgrades and realistic Glass Cockpit Systems.

# Rever

Rever is a multi-function mini-hybrid UAV with VTOL capability. With an efficient modular system, Rever functions as a UAV and can be changed from a recreational plane to one providing basic medical supplies within an hour. Its modular system and straightforward fabricating methods enable replacement of damaged modules within hours. This would enable the user to have multi-mission capability.
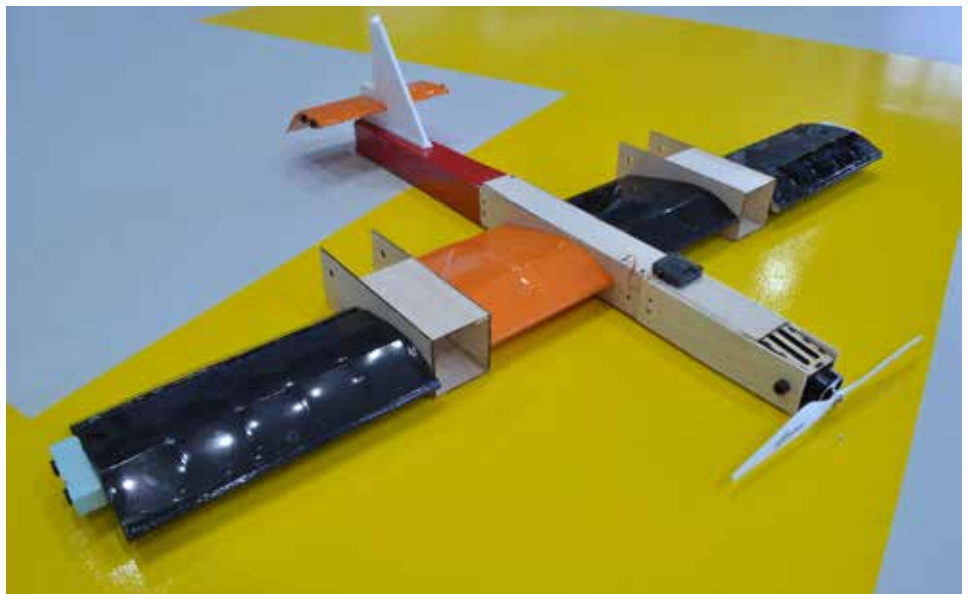
### Supervisor
Teo Ye Wei

### Team Members
Chen Benjamin,
Tong Jin Hui Joshua,
Loh Meng Keat Christopher,
Lim Cheng Yang,
Chua Zhi Yong


Rever UAV.

# Kestrel Surveillance Aircraft

This is a mini-VTOL (Vertical Take-Off and Landing) UAV system with surveillance and payload delivery capability. The UAV incorporates a modular design with the capability to carry payloads of up to 1kg. Lightweight and aerodynamic in design, it ensures smooth flights and flight transitions. This would enable the user to have multi-mission capability all in a single flight.

### Supervisor
Teo Ye Wei

### Team Members
Muhamad Hazim Bin Mohamed Rusdi,
Ng Liying Amanda,
Muhammad Syafiq Bin Sahri,
Lee Jia Ning, Faith Ong Yi Hui


Kestrel Surveillance UAV.

# Remotely Controlled Underwater Vehicle

UAVs are frequently used to investigate remote places. Remotely controlled UAVs show promising usage in inspection and also in the retrieving of objects in deep waters. The aim of this project is to develop an underwater vehicle using a remote control system. The prototype is designed to submerge in a water depth of 3 meters with thrusters to provide manoeuvrability.

**Supervisor**
Leong Mun Kin

**Team Members**
Chen Kailin,
Thet Lin Oo,
Toh Zheng Hui,
Neo Le Xuan,
Ashleigh Ngiam Tzeng Chia

The basic compartment to house the thrusters and the controls.

# Unmanned Self-propelled Patrol Vessel

The purpose of this project is to create a vessel which is capable of powering its own appliances on-board without reliance on the conventional diesel-method. This prototype uses solar panels for powering and can therefore be used as a patrol vessel by the authorities. It is a self- sufficient energy resource and will reduce the risk of endangering lives.

**Supervisor**
Joseph Lee

**Team Members**
Goh Guo Hao Nicholas,
Su'aidah Binte Karim,
Lee Kai Wen Shaun,
Ng Shi An, Tan Yu Qi

The Unmanned Patrol Craft.

# Remotely-operated Vehicle

The aim of this project is to further improve on the existing Remotely-operated Vehicle (ROV) which was done by students as a Final Year Project last year. The prototype has been designed to dive down in water and manoeuvre (port side/ starboard side) by using three thrusters. This year, the group aims to convert it to an AUV (Autonomous Underwater vehicle), equipped with a camera, sonar and sensors to detect any lifeforms around the area, measure water temperature and collect the data for further analysing.

**Supervisor**
Myat Soe

**Team Members**
Mohammad Nazire Bin Zulkhairi, Ammar Maruf Bin Aduka, Muhammad Rusyd Nasr Bin Hamdan, Muhammad Zaki Bin Zarud Ibrahim, Marcus Sopar Simanjuntak



A Torpedo Styled ROV design.

# Flying Spider

Drones have proven to be an effective tool in diverse applications - from surveillance to transport of payload. The project features aerial agility coupled with ground mobility to the doorstep, making the Flying Spider a versatile vehicle for air and ground operations. The built-in camera and gripper allow remote payload pick up and drop off.

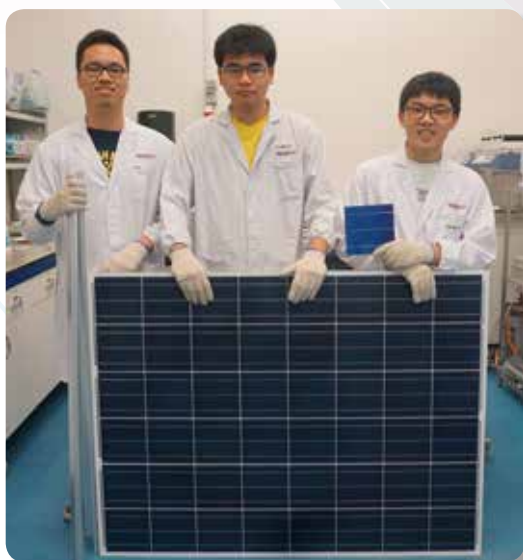**Supervisor**
Tan Tuan Kiat

**Team Members**
Zhu Yan, Ng Zhi Wei,
Kenneth Tok Yong Qin,
Tng Xue Li,
Lee Wei Jia



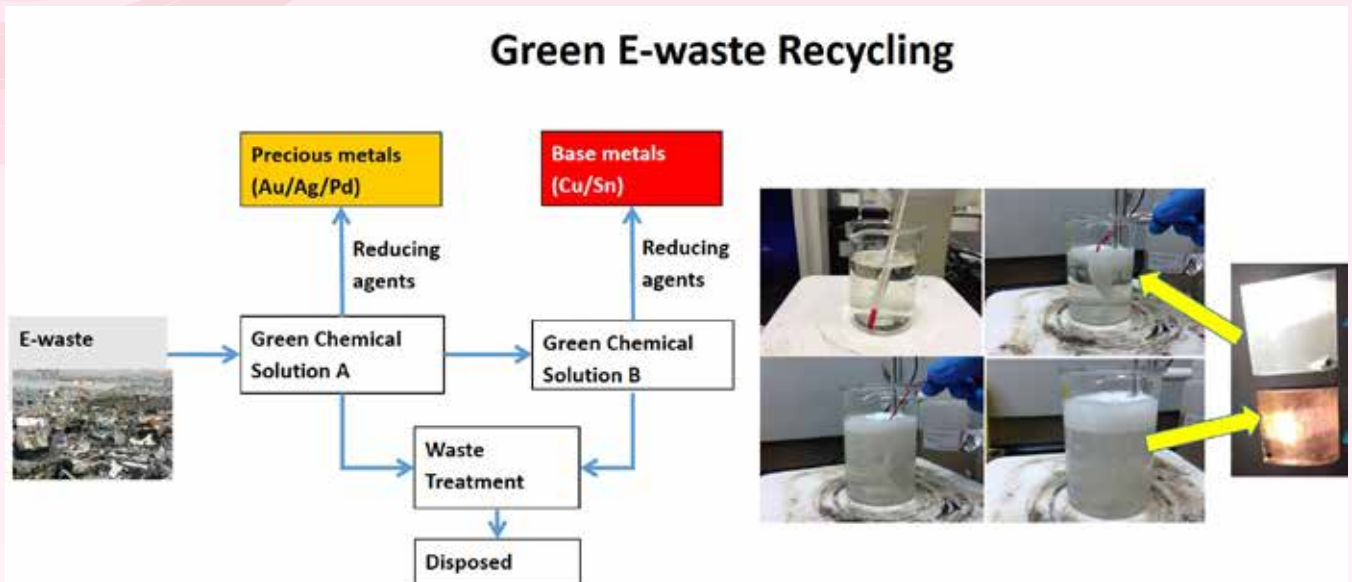Flying Spider flight mode.

# SP
# TECH TO🌐
# MARKET

The Research and Technology Development at SP is application-driven, aligning itself closely with industry needs and the broader national agenda.

These projects showcase our efforts in developing technology that is industry-relevant, with strong potential for market impact.

# SP TECH T⊕ MARKET

# Green E-waste Recycling Project



Green E-waste Recycling.

Conventional methods of recycling E-waste currently adopted by industries involve exposure to hazardous chemicals. These include the emission of strong volatile toxic nitrogen oxide and chlorine fumes from aqua regia and exposure to the toxic cyanide media. These are the hazards faced by workers dealing in the recycling of E-waste, hazards which endanger their health and safety. This proposed project aims to design, study and develop a new, green recycling technology for E-waste.

**Supervisor**
Lim Zheng Bang

**Industry Partner**
Cimelia Resource Recovery Pte Ltd

# PV Module Recycling

The aim of this project is to develop and evaluate processes to efficiently reclaim c-Si PV modules. Good disassembly processes will be developed to ensure reclamation of the various components in the module, such as aluminium frames, glass, Si solar cells and other high value materials. After the module is disassembled, each constituent component of the module should be reclaimed as much as possible. In our proposed processes, most of the PV module components can be reclaimed and reused, including silicon, silver, copper, aluminium and glass components.
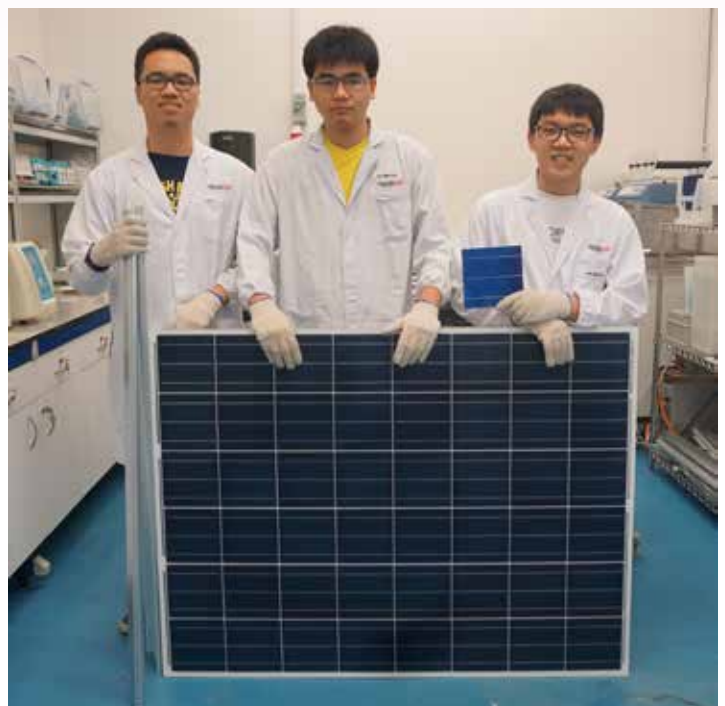
**Supervisor**
Li Xiaodong

**Team Members**
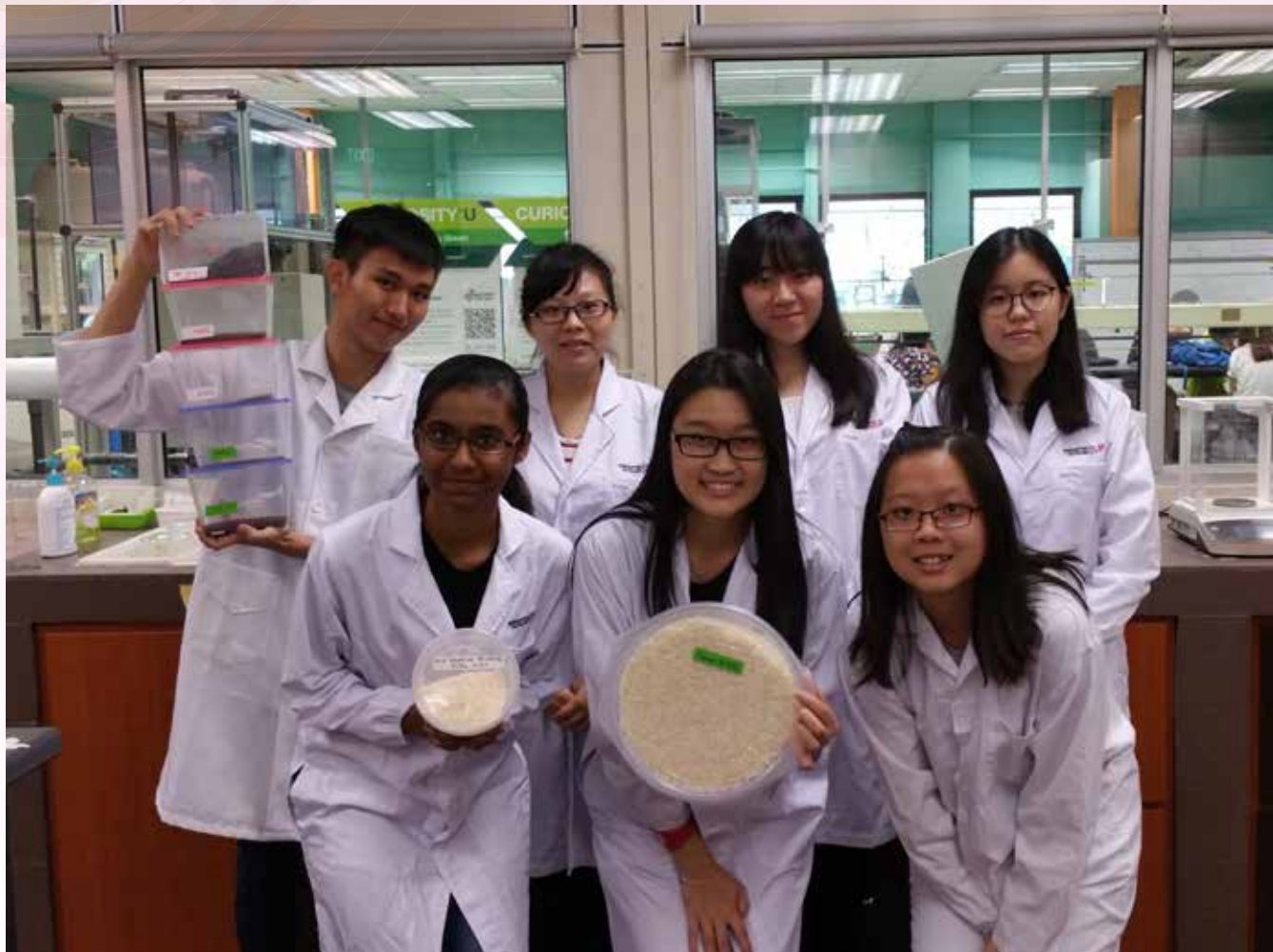Liew Guoloong Gordon,
Ho Min Kai,
Sun Ren Han

**Industry Partner**
Si Pro (S) Pte Ltd



Students working on end-of-life PV module disassembly.

# Removal Of Hydrocarbon By Dry Leaves And Sugarcane Bagasse In Water Medium



ABE Winning Team with their FYP Supervisor at the Greenwave Competition 2015.

Oil spills are major global environmental threats which can have a huge impact on the water environment. The use of a natural adsorbent can be considered as one of the cheapest methods for oil spill clean-ups. The objective of this project is to investigate the potentiality of using low cost natural adsorbents of dry leaves and sugarcane bagasse to adsorb hydrocarbon in water at trace concentration.

**Supervisors**
Handojo Djati Utomo,
Lim Zheng Bang

**Team Members**
Li Siyu, Jeannie Aw Yeong Jun Yi,
Eu Jun Nan, Lu Xiwen, Toh Yie Xuan,
Wajiha Begum Bte Ahmanalah, Ho Xue Yu

# Bottle Dispensing System



BDS: World's First Bottle Dispensing System for pharmaceutical industry.

Medication error at any phase of the medication process, even the dispensing stage, is costly as errors harm patients and expose health professionals to civil liabilities and criminal prosecution. Automation of the pharmacy workflow can reduce medication errors and improve efficiency of the medication picking, packing and labelling process. The equipment, the Bottle Dispensing System (BDS), is part of The Healthcare's industry-wide initiative on the Outpatient Pharmacy Automation System to eliminate medication error. When implemented, pharmacies can look forward to eliminating their picking and dispensing errors as the BDS automatically picks and dispenses based on RFID/barcode prescription.

**Supervisor**
Steven Tan Yih Min

**Industry Partners**
KK Women's & Children's Hospital,
Getech Automation

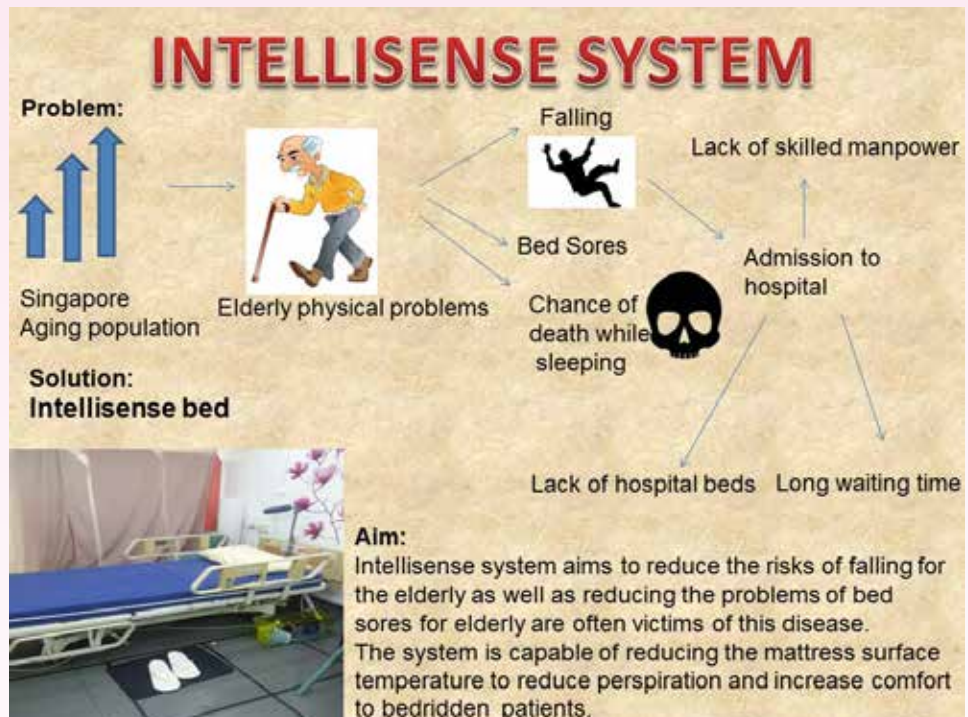# Intellisense Bed - An Anti-sweating And Patient Position System For Bed Sore Prevention

The Intellisense Bed aims to reduce the risks of fall for the elderly as well as reduce the problem of bed sores. This system is capable of controlling the mattress surface temperature to reduce perspiration and thereby increase the comfort of bedridden patients. The system provides nurses with visual and audio alerts when the need arises to turn the patient thereby reducing the risk of bed sore occurrence.

**Supervisor**
Jaichandar K S

**Team Members**
Nur Liyana Binte Mohamed Ayob, Terence Tay Han Jun, Binita Saha, Loh Jing Sheng, Ng Kian Peng



Intellisense System.

# iCollect

Innovative ideas on collection of documents without the need to visit a manned customer service counter is made possible by leveraging on technology. An alternative collection of identity documents without needing users to queue at an Immigration and Checkpoints Authority's (ICA) customer service counter is made possible through the design and development of the iCollect, an automated identity document dispensing machine initiated by ICA.

**Supervisor**
Steven Tan Yih Min

**Industry Partners**
Immigration & Checkpoints Authority (ICA),
NEC



Photo Credit: Immigrations & Checkpoints Authority

iCollect: The world's first self-service machine that dispenses secured documents automatically.

# OTHER MAE PROJECTS

### CLEANTECH & BUILT ENVIRONMENT

Guardian of the Clothes
Free Energy Generator

### HEALTHCARE & WELLNESS

Design and Fabrication of Microchannel for Dialysis Using Simulation Tool
GERI Chair for Elderly
Smart Wheelchair
Alf Machine
Elevating Platform to Assist Polio User

### INDUSTRIAL & AUTOMATION

Application of Stirling Engine in Homes/Community
Hybrid Charger
Development of a Mechanism for Automated Cell Manipulation
Brick Moulding Mechanism
Desktop Milling Machine for Quick Prototyping Application
Bass Blaster
Semi-Automated Shelter

### TRANSPORT & MOBILITY

HYDRONE UAV
Project SUBFLY
U-Skate
Aircraft Landing Gear Drop Simulator
Composite Bridge
Analysis of Aerobon Wing
Roller Koaster
SPYDER
Development of Ball-Shaped UAV
Hoverbike
360 Degree VR Cave with Aviation Environment
Interactive Virtual Reality Cave for Aircraft Familiarization
UAV Catching Robot

# OTHER EEE PROJECTS

## Cleantech & Built Environment

- A Small Portable PV(photovoltaic system) for Camping
- Active Camera Security System for Laboratory
- ALL in One Door Entrance System
- An Arduino-based Environment Friendly Project
- Aquaponics System
- Aquarium Water Changing System
- Arduino Based Security Enhancement System
- Automated Clothesline System
- Automated Dog Potty System
- Automatic Toilet Seat Cleaner
- Battery Management System for a Mobile Microgrid
- Camelot System
- Clean Energy Car
- Data Center Alert System
- DYNALO
- Eco-friendly Home Energy Saving System
- Energy Efficient Street
- Energy Harvesting from Daily Human Activity
- EzFish Farm
- Go Green
- Graphene Oxide for Deicing Application
- H2O Defender
- Harvesting of Piezoelectricity from Floor Tiles
- Home IP Audio Surveillance System
- Home Security System
- Home Solar Panel System
- Hydrogen Fuel Cell Car
- Innovative Energy Harvesting in Flight
- Intelligent Clothes Hanger
- Intelligent Sensor
- Intelligent Window Controller
- Mobile Microgrid System Monitoring and Control
- Mobile Solar Manager
- Mobility Operation Remote Trustee (M.O.R.T)
- Multipurpose Charging Station
- Paper based printable MEMS/electronics
- Parking Lot Reservation System
- Performance of sun tracker PV system in Singapore
- Safe & Secure Home
- Smart Grid DR Test Kit
- Smart Home System
- Smart Parking
- Solar Powered Automatic Sliding Window
- Solar Powered Home Appliance
- Solar-Powered Portable Scooter
- Substation Locations and Ring Circuit Distribution Optimal Planning for a Large Electrical Installation
- Sunstant
- The Green Charger
- Ventus Charger
- Waste Water Treatment and Control
- Water Ponds Alert System
- Water Ponds Monitoring System
- Wireless Door Answering System

## Industrial & Automation

- AuDS (Automatic Disk Sorter)
- Automated System for Painting
- Automating the Block and Box Test
- Car Locator
- CMOS IC Bandgap Reference
- Development of Material Handling Logistic Robot
- Em Toolbox
- Flexible Printable Electronics
- Home Delivery Make Easy
- In-car Voiced Controlled Navigator
- Instant MCQ Answers Template
- Intelligent Control System using Wifi
- Intelligent Luggage
- Interactive Robot Kit
- MTM - Machines That Make
- NATIONAL JUNIOR SOLAR SPRINT (NJSSC) PROJECT
- Pick and Place Machine for Food
- Project A.S.P. for 3D Design
- Receptionist Robot
- Remote Home Automation with Home WiFi
- Remote Tracking of Object
- RoboCup@Work
- Smart Flat Monitoring System
- Smart Robot for Semi-Conductor Process
- Strain Resistance Sensor Glove to Mimic Robotic Hand
- Test Bed for Linear Motors
- Unmanned Aerial Robot
- Wireless Data Throughput Visualization Tool

# Healthcare & Wellness

- 3D printed Prosthetics
- 4 axis Controller Design for Upper Limb Rehabilitation
- Assist in Digital
- Automated Drinks Dispenser
- Balanced Edge
- Biochip
- Camera Application to Assist Blind People Walking
- Continuous Real Time Pressure Monitoring Mat via DSP Means
- Continuous Real Time Pressure Monitoring Mat via Optical Means
- CoSpace@Home
- Customer Premise Equipment (CPE) Test Automation
- Development of a Biochip for Diagnostic Application
- Development of Smart System for Elderly
- Easy Access Home
- Easy Living
- Educational Enrichment Games in Electrical Engineering
- Educational Robot
- Elderly Friendly Home Devices
- Energy Detective Trial
- Flexible PDMS Battery for Biochip Applications
- Flexible Plastic Battery for Wearable Technology Application
- Health Enhancement Furniture
- Heart Rate Sensor for Healthcare Applications
- HELPING HAND
- Home based Cardiac Monitoring Device for Elderly Residents- Receiving Station
- Integrated Project: IOT (Smart Healthcare)
- Intelligent Strike Trainer
- LOL Challenge
- Low Cost Rahabilitation device
- MeDispenser
- Methodology and Assessment Criteria for Extending the Asset Life Span of Power Equipment
- Mobile Rice Cooker
- Musical Therapy Cart
- Pedal Power for Healthy life
- Personal Cosmatics Cooler
- Pet Food Dispenser
- Pill Dispenser
- Portable Hardware controller and User Interface design Therapeutic Elbow Brace
- Printable Flexible Sensors
- Pump a Beat
- Rapid Transit Signal Interlocking System
- Rechargeable Shoe
- S.S.U (Smart, Safety, Upgrade) Cane
- Sensorized Table for Rehabilitative Applications
- Smart Backpack
- Smart Elderly Fall Detection System
- Smart Garden
- Smart Sofa-Bed for Elderly
- Smart Walk Stick
- SP E-Bike
- Step-ON
- Treadmills Distance Accumulators
- Umbrella Aura
- Wearable Flexible Sensors and Interface for Rehabilitation Therapy

# Infocomm & Media

- An Open Source and Citizen Driven Computing Framework for IoT Innovations
- Automatic Transcription for Video
- Captury
- Cloud based Biometric Security System
- Cloud Computing Service to Monitor and Analyse Data
- Cloud9@T931 System Engineers
- Crowd Monitoring in SP Food Courts
- Crowd Monitoring System
- Ebook Development
- Event Bulletin Board
- Gemstone Image Analysis System
- GPA Tracking System
- GPS Interfaces and Software
- Handy Glass
- Helper Arduino-based Remote Monitoring System
- Indoor Human Tracking using Ultrasonic based Distance Sensing
- Intelligent Lazy Susan
- I-Shop - Backend
- I-Shop - Frontend

- IT infrastructure Supporting Data Science Research in a Hospital Setting
- IT Requirements for the FabLab
- Mobile Office (Content Management)
- Mobile Office (Issue tracker)
- Mobile Tracking Tag Application
- Network Predictive Analysis Program
- NFC Attendance System
- Personal Tutor Assignment
- Project Tracker
- Public Message Display System
- Remote Controlled Underwater Camera (ROV)
- SAM (Schedule Appointment Maker)
- Secure Cloud Storage
- Smart Campus Mobile Application
- Smart Workplace
- SP Course Helper
- SP Event Attendance System
- SP Order@Food
- TCP/IP Multimedia
- VMall
- Voice Conversion on Android
- Wheelchair Tracking System II

# Transport & Mobility

- 3D Quality-of-Service Signal Measurement using UAV
- A UAV with Video Surveillance Capability to Mosquito Breeding Ground on Roof Top
- Aerial Max
- Aerial Sensors
- Aeroids
- AIRCRAFT AUTOPILOT SYSTEM WITH INTERACTIVE 3D MODEL (Phase 2)
- AIRCRAFT FLY-BY-WIRE SYSTEM
- An Automated Image Stitching System
- AUV - Control
- AUV - Navigation using Inertial Sensors
- AUV- Vision and Navigation
- AUV-Surface colloborator
- Development of a Long Endurance Quadcopter that can inspect corrosion

- Development of a Fully Autonomous Quadcopter for Singapore Amazing Flying Machine Competition (SAFMC)
- Development of Multi-Robots Collaboration System
- EyeBike
- Finding NEMO - Flight Recorder Supplementary Power Source
- Intelligent Bicycle Aka i-baik
- Mini Aerial Devices
- Mini Vehicle 3
- Night Intruder Alarm System
- Night Scout
- NXT Flight Simulator
- PACE - Portable Aircraft Cell Evaluator
- Smart Luggage Conveyor System
- UAV with Video Surveillance

IN UNSURE TIMES, NOTHING BEATS SAFE PROCESSES.

# THIS IS **SICK**

**Sensor Intelligence.**

When industrial systems have to deliver high productivity, engineers don't rely on gut instinct. Instead, they rely on sensor technology from SICK. Our solutions ensure optimal processes. They stop expensive machine failure and downtime. They reduce changeover times. And they prevent personal injury and other accidents. In every industry and every area of factory automation. With photoelectric sensors, proximity sensors, fluid sensors, distance sensors, vision sensors, scanners, and opto-electronic protective devices – or services from SICK. When it comes to reliable production, the whole world draws on the engineering spirit of SICK. We think that's intelligent.
www.sick.com.sg

# Gemlogis✦



# *Natural Diamond?*
## Instantly identifies earth mined diamonds

## **TAUPE** *Diamond Segregator*

A compact, convenient tester to determine if a diamond is earth mined (natural), HPHT treated or lab created (CVD). Chemical Vapor Deposition (CVD) diamonds are virtually indistinguishable from mined diamonds. Traditional diamond testers using either thermal conductivity or electrical conductivity will not separate the two. This Gemlogis TAUPE is designed to identify a natural diamond from lab created stones that are becoming more popular.

⬡ **Tests from 0.02 ~ 12ct**
⬡ **For colorless diamond only (D~H)[1]**
⬡ **Instant Results with one touch button[2]**
⬡ **No interchangeable parts required**
⬡ **Light and compact to carry**

**Specifications:**
Testing Type: Colorless diamond only (D-H color)
Testing Range: 0.02ct up to 12ct max
Dimensions: 68W x 140L x 25H mm
Weight: 180g
Battery: Rechargeable (adapter included)

| EARTH MINED | HPHT / CVD |
|---|---|
| Not synthetic<br>Not HPHT treated | Maybe synthetic / CVD<br>Maybe HPHT treated |
| **Types Included:** Type IaA / IaAB / Ib | **Types Included:** Type IIa / IaB |
| **Earth Mined (Natural) Diamond** | **Suggest further lab testing** |

1) Does not test CZ or Moissanite. Must be colorless diamond.

2) TAUPE is not designed to determine whether Type IIa and IaB diamonds has been HPHT treated.
Suggest further lab testing*

## www.gemlogis.com

# POINTS OF CONTACT
For enquiries, please get in touch with us

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email to contactus@sp.edu.sg for our staff to follow up with you.

For more information, please visit https://industry.sp.edu.sg/contact-us/