FUSION

THE POTENTIAL OF TECHNOLOGY AND DESIGN

SUTD

SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Established in collaboration with MIT

ISSUE 05 / 2016

SUTD'S PIONEER BATCH OF STUDENTS GRADUATE

It was bright and sunny on 29 August 2015, when SUTD's first batch of students excitedly donned black gowns and mortarboards for their graduation ceremony. In his keynote speech at the event, SUTD's President, Professor Thomas Magnanti praised the graduates for having completed one of the most rigorous academic programmes in the world. He shared many anecdotes of his experiences with the students, and also thanked them for their pioneering spirit and for having left a significant imprint in SUTD's formative years. Tom, as the SUTD President is fondly called, further urged the graduates to reflect on SUTD's mission, to nurture technically-grounded leaders and innovators to serve society's needs throughout their lives.

Graduates posing with President Tony Tan and then Education Minister, Mr Heng Swee Keat

"Today, we are gathered for the graduation of the first cohort of undergraduate students in the history of this university...We also celebrate the graduation of 10 MIT-SUTD dual degree masters students. This is a moment of extraordinary significance and great poignancy...filled with great joy and emotion for me and the many others assembled here today."

Graduates walking towards the auditorium for their graduation ceremony

Graduates listening intently to the keynote speech

"Graduates, you have developed lifelong relationships with your fellow students and with the faculty and staff who have been here to guide and support you. And, a deep association with SUTD."

Tom also announced that SUTD would be giving all graduates a $500 e-account called the Lifelong Initiative for Education (LIFE) as an investment into their continuous professional development and technological relevance. The credits can be used by all graduates to take up courses conducted by SUTD and aims to foster a continuous learning spirit in them.

Then Education Minister, Mr Heng Swee Keat, who also gave a speech at the event, said that beyond the "Big D" of design, he also wanted to share a few more 'Ds' with the graduates as they stepped into the world beyond SUTD. He exhorted them to continue to "Dream big dreams, knowing that you have the ability to bring them into reality." The second 'D' was to "Dare to take the risks and work hard" as this is the foundation that all great accomplishments are built on." And the last 'D' was to "Define Singapore by making a positive difference in the lives of those around you, and build this nation into a stronger, more beautiful one in the years to come."

"As pioneers you have also had a direct impact on the curriculum and SUTD pedagogy as well as on the design of our campuses..."

SUTD President Prof Thomas Magnanti giving the keynote speech

In total, 308 students received their bachelors' and masters' degree certificates with more than two out of every three undergraduate students in the first cohort having either secured jobs prior to graduation or would be pursuing graduate studies. The majority of them had secured employment in more than 70 per cent of Singapore's key industries and emerging business sectors*, with the top three being Engineering (e.g. Aerospace Engineering, Aviation, Marine & Offshore Engineering, etc.), Banking & Finance, and Defence. Among them, one in four students had return offers from companies they had interned at.

Engineering Systems and Design pillar graduate Jocelyn Kow, one of those who impressed her supervisors so much during her internship that she received a return offer from the organisation six months before she graduated, said: "I was very happy that Keppel FELS liked the work I did during my internship. I learnt a lot about oil rigs and the company's operations from my mentor and colleagues during the four months I spent there and the tasks assigned to me were both challenging and exciting. I look forward to starting my career in such an interesting industry."

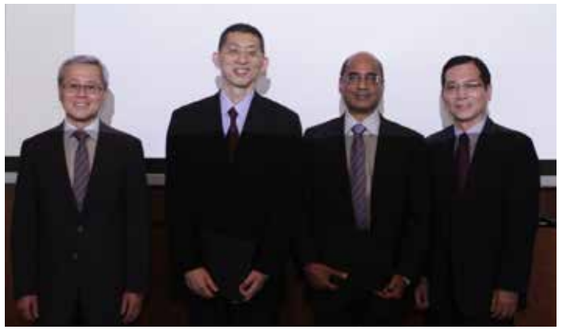
Mr Kevin Liu, British Petroleum's Regional Head of IT Operations, Integrated Supply & Trading, praised Information Systems Technology and Design pillar graduate Jean Tan, saying: "Jean has been a great asset to BP during her summer internship with us with her passion for innovation and relentless attitude in problem solving clearly on display. We look forward to her future contributions as she embarks on our BP Challenger graduate programme."

**Based on Economic Development Board's list of Singapore's industries and emerging business sectors.*

NUS-SUTD PHD PROGRAMME

As engineering problems are becoming more complex, there is a greater need for multi-disciplinary research to solve them. Hence, it was timely for SUTD and the National University of Singapore (NUS) to establish a Joint Doctor of Philosophy (PhD) degree programme in Engineering, the very first between two Singapore public universities. The Agreement Signing took place on 26 November 2015 and was also the inaugural collaboration between SUTD and NUS for education programmes.

Since SUTD and NUS have different strengths and expertise, this would be advantageous for students as they will be able to learn more from both sides. Each student will have two supervisors, one from each university, and is required to spend at least one year in the partner (or "host") university. They will also have access to both universities' facilities and expertise during their candidature, giving them greater resources and research flexibility.



SUTD's Prof Yeo Kiat Seng and NUS' Prof Mohan Kankanhalli (second and third from left) representing their universities in signing the Agreement

SUTD and NUS started enrolment of the first intake of students for the Joint PhD in January 2016, with subsequent intakes in August and September 2016. Both universities aim to enrol up to five students each annually for this four-year scholarship programme. Mr Song Wen Jian M. Ridhuan, a mechanical engineering NUS graduate and the first student to be accepted into the programme, felt that he would be getting the best of both worlds. He said: "NUS has depth in its engineering research and SUTD has a different direction that is not fixed in the traditional disciplines."

SUTD AND ZHEJIANG UNIVERSITY STRENGTHEN COLLABORATION

SUTD recently inked a memorandum of understanding (MOU) with Zhejiang University (ZJU), an extension of the successful collaboration between the two since they first collaborated in 2010.

Both universities will set up a Joint Innovation, Design and Entrepreneurship Alliance (IDEA in short); under IDEA, there will be two Centres—one IDEA Centre will be in the SUTD campus and one in ZJU's campus, to promote the exchange of ideas, research and talent between SUTD and ZJU. The IDEA Centres will look at design innovation in both Singapore and China, with initial focus on manufacturing, urbanisation and sustainability. The IDEA Centres in SUTD and ZJU will work closely with relevant entities in both universities to harness their strengths in Design and Engineering, to pursue academic activities relevant to China and to Singapore, and eventually commercialise their ideas or bring them to market.

The collaboration between SUTD and ZJU will be funded through a donation by the Ng Teng Fong Charitable Foundation, which will be giving S$11 million or RMB 50 million to provide initial support to the SUTD-ZJU IDEA Centre; RMB 25 million will be given to SUTD and ZJU each.

This ceremony took place in conjunction with the signings between the National University of Singapore and Tsinghua University, and Nanyang Technological University and Peking University as part of efforts to strengthen diplomatic ties between Singapore and the People's Republic of China.

In total, the Ng Teng Fong Charitable Foundation donated S$33 million or RMB 150 million to the six universities.

SUTD and ZJU representatives posing with Mr Robert Ng (eighth from left) from the Ng Teng Fong Charitable Foundation

ICONIC VOICES FROM MIT LECTURE

BY KEVIN TAN

NOBEL LAUREATE IN PHYSICS PROFESSOR JEROME FRIEDMAN

Professor Jerome Friedman, Nobel Laureate in Physics, gave the second lecture of the Iconic Voices from MIT at SUTD on 22 May 2015 entitled "Exploring the Large and Small Structure of the Universe".

Prof Friedman began by introducing satellites and the land-based observatories that observe the vast, unexplored universe and intrigued the audience with the large orders of magnitudes. He then went to the opposite end of the spectrum and talked about the fundamental particles of the universe. The problem at that time was that the Eightfold Way, proposed by Professor Murray Gell-Mann, had acted like a Periodic Table and predicted many undiscovered particles which required a new theory to explain it. One of them was the quark theory.

Prof Friedman believed in taking risks and decided to conduct experiments with others to verify the controversial quark theory, which later proved to be correct. Describing them as point charges, the Nobel Laureate showed how quarks are the constituents of the previous "fundamental particles", using the protons' and neutrons' quark composition as an example.

The day before the lecture, Prof Friedman had an informal sharing session with SUTD students. Interesting physics phenomena such as the twin paradox and the non-conservation of parity in weak decay were discussed to arouse students' interest in physics. His talk was so engaging that he had students sharing their thoughts on physical phenomena with one another even after the session ended.

Prof Friedman shared his personal story, that he was initially an arts student but had developed an interest in physics and pursued it purely based on passion. One takeaway he had was that one should always dare to take risks. Many students, including myself, were inspired by Prof Friedman's passion and conviction and I was very grateful to have this opportunity to hear from him.

THE SUTD LEADERS SERIES

BY JAYNE LIM & PANG YUN JIE

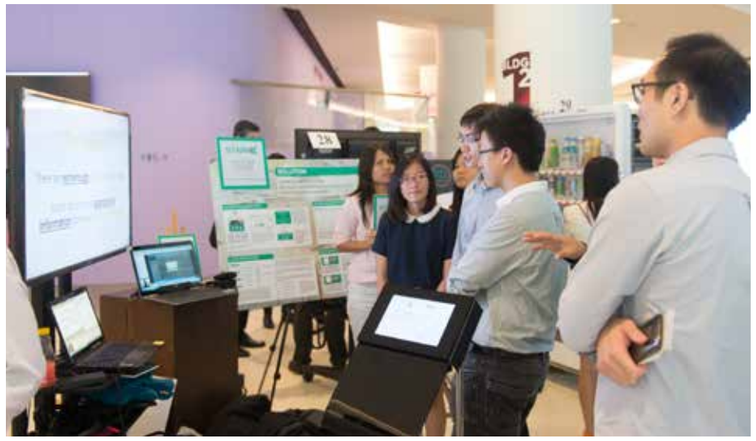
Group Managing Director of architecture firm, Ong&Ong Group, Mr Tai Lee Siang, gave a talk, "My Life – The City", at SUTD on 5 October 2015. He shared his experience as an architect and his rationale behind revamping an evolving city.

Mr Tai feels that history is important and sees the need to preserve it. He highlighted one of the more significant projects he had undertaken during his journey as an architect which incorporated historical conservation of the New Majestic Hotel, which had been developed from existing buildings located at the historic Chinatown district. Although the interior layout of the hotel had been renovated with contemporary artistic designs, it still retained much of its old colonial rustic charm. The hotel's new features included customised attic-styled rooms fitted with loft beds and an outdoor pool with portholes at its base from which light could pass through into the restaurant below. Mr Tai's designs envisioned the incorporation of both the old and the new instead of completely removing the old structures.

Additionally, Mr Tai shared how being an architect could be both turbulent yet fulfilling at the same time. The unpredictable economy slowed down his progress as an architect significantly and proved to be challenging, yet it was still a satisfying process. After making his mark in various architecture firms, he began to give back to the community by taking up leadership positions at various organisations, such as the Singapore Institute of Architects, which was a milestone for him. He is currently the Vice Chairman of World Green Building Council.

Finally, Mr Tai challenged the audience to think about a possible future outlook. He spoke about his view on space and time optimisation. He shared his plans to expand on the idea of creating spaces, which can enable people to carry out different tasks given the limited amount of time they have in a day. He also shared how he hoped that society could move towards a more public-transport-reliant system, which can ultimately reduce the usage of space for roads in land-scarce Singapore. Mr Tai also felt that green spaces should be relooked–instead of just dictating that there should be a green spot after 'X' metres, "We should design green spaces to evoke feelings of peace or inspiration in people."

FINAL-YEAR CAPSTONE PROJECTS



SUTD students and public viewing a Capstone exhibit

The Capstone (final year) projects bring together students from different pillars/disciplines to work in teams, contributing their respective expertise and skills to solve real-world problems. The projects, mostly industry-based, give students realistic design situations that span multiple disciplines, requiring a group effort to formulate a solution. Faculty instructors and industry mentors jointly supervise and guide the project teams to fulfil the project scope and deliverables. The other capstone projects are either student-initiated or entrepreneurship-based, where students plan to spin off companies based on their project ideas.

Altogether, 53 projects were exhibited on 31 July 2015 at the Capstone Exhibition. The range of projects spanned a wide scope, from healthcare to sustainable architecture design to smart technologies. Some of the companies that provided mentors for the students include Samsung, DBS Bank, SingHealth, Changi General Hospital, ST Kinetics and Singapore Tourism Board, to name a few.

The entire cohort of pioneers worked on Capstone projects in order to graduate.

Group picture of the final-year students at the Capstone Exhibition

HIGHLIGHTS

DE-FROST – An energy-saving storage device

DE-FROST

In this industry-initiated project with Samsung, students were tasked with designing an energy-saving storage device for fruits and vegetables that does not use cool air, but still maintains the groceries' freshness, similar to a refrigerator. SUTD students designed a food storage device that uses only 1.5% of energy as compared to a mini fridge. The device contains compartments which use a vacuum to maintain the fruits' freshness, while periodic flashes of ultraviolet LEDs kill bacteria or any micro-organisms that may grow on the fruit from being exposed to the external environment. For green leafy vegetables, the students designed a water bath that helps keep them hydrated and fresh.

Students
Adnan Ahmed Salman (EPD)
Clarence Teo Chuan Jie (ISTD)
Cynthia Tong Wan Ling (ESD)
Fu Lin (EPD)
Melissa Lim Huay Hsien (ASD)
Nivedithaa Palaniappan (ESD)

The team behind the Stealth Exercise Community Space project

ISTD student Aditya Batura showing how his smart wearable device (Toucan) works

STEALTH EXERCISE COMMUNITY SPACE

Khoo Teck Puat Hospital (KTPH) posed the problem of decreasing levels of physical activity in Singapore to a team of SUTD students, and tasked them to propose a solution. Students identified a perceived lack of time as one root cause to be addressed and conceptualised an "urban playscape" – a community space that provides a refreshing take on the concept of a playground. Their modular landscape design consists of aggregated triangular blocks with sloped surfaces that create a contoured ground within a public space.

There are also pressure pads scattered around the space and a wall of coloured panels, and stepping on each pad turns a panel on the wall. The public is therefore encouraged to sit or walk on the landscape, or play with the coloured panels through creating art or by playing games. Their interaction with the spatial intervention is a form of physical activity which has been disguised by the exploratory and playful nature of the terrain. This urban playscape will be situated along people's typical daily commute between destinations to provide a form of fun physical activity that melds into their daily routine.

Students
Lau Sook Han Gayle (EPD)
Liliani Saputri (ASD)
Ng Hui Lin (ASD)
Pan Shi Qian (ASD)
Stephanie Loh Qi Jia (ASD)
Tan Yong Kiang Jonathan (EPD)

SMART WEARABLE DEVICE FOR CHILDREN TO ALLEVIATE PARENTAL ANXIETY

Toucan is a smart wearable device that aims to foster an intimate bond between parent and child while mitigating parental anxiety resulting from child safety concerns. It is a pocket-sized modular hexagonal device which can take the form of a wrist watch, necklace or even a keychain. With this device, parents can receive updates on their child's activities and location in real-time via a smartphone application. Toucan's prominent features include a colour-based messaging function through which one can send colours to the child; lighting up the child's Toucan device with the corresponding colour. These messages, although abstract, can hold a special meaning for the child. Additional features such as an emergency response system and real-time communication through voice messaging alleviate the need for children to carry a mobile phone while allowing parents to be kept apprised of their children's whereabouts and emotional well-being.

Students
Aditya Batura (ISTD)
Fendy Lieanata (ESD)
Lim Jia Xuan (ASD)
Seah Tat Leong (EPD)
Sunardi (ISTD)
Toh Yong Cheng (ISTD)

WEARABLE DEVICE FOR THE VISUALLY IMPAIRED (NAVIO)

A student-initiated project, Navio was conceived to help the visually impaired to get around more easily and independently. SUTD students designed an anklet capable of infrared distance-ranging and haptic feedback, warning the wearer when they approach obstacles. The device is also able to inform them of the direction they should head towards to get to their destination through a phone app connected to the anklet.

Students
Chou I Hsuan (ASD)
Jung Hye Wook (EPD)
Pamela Dychengbeng Chua (ASD)
Patrick Dychengbeng Chua (EPD)
Tan Zi Jun Jean (ISTD)

The team behind the wearable device for the visually impaired

LEARNING CELEBRATION CARNIVAL 2015

Student explaining how his prototype works

The Learning Celebration Carnival is a showcase of what Freshmore students have learnt and developed during their Summer (May to September) vacation. This includes their participation in internships, research work or exchange programmes to the Massachusetts Institute of Technology (MIT) or Zhejiang University (ZJU). The Carnival took place on 23 September 2015 and featured 21 exhibits.

GLOBAL YOUNG SCIENTIST SUMMIT 2016

BY GOY HSU ANN

Prof Thomas Magnanti (far left) moderating a Global Young Scientists Summit 2016 panel discussion on "What the World be like in 50 years?"

(From right) Prof Cédric Villani, Prof David Gross, Prof Andrew Yao, Sir Anthony Leggett, Prof Jerome Friedman and Prof Richard Karp (Photo: NRF Singapore)

SUTD co-organised with NRF a lecture titled, "A fountain of ideas from the man who revolutionised the cloud", by Professor Stuart Parkin, winner of the 2014 Millennium Technology Prize

The Global Young Scientist Summit@one-north (GYSS) is an annual event organised by the National Research Foundation (NRF) Singapore, in partnership with the Ministry of Education, the Agency for Science, Technology and Research (A*STAR), the National University of Singapore, Nanyang Technological University, Singapore Management University and SUTD. Now into its fourth year, the Summit took place on SUTD's campus from 17 to 22 January 2016, bringing together close to 500 people – 21 top science and technology speakers, 300 young scientists, and 150 guests from the research community and industry – to mentor and inspire young, promising researchers.

The Opening Ceremony of GYSS 2016 was officiated by Mr Teo Chee Hean, Deputy Prime Minister and Coordinating Minister for National Security, and Chairman of NRF Singapore. An energetic dance performed by students of Pasir Ris Crest Secondary School titled "Dance Has NO Boundaries!", demonstrating the hopes, motivation and passion of youths, captivated the international audience. This was followed by an enjoyable performance from the SUTD's Acapella group Vocomotives, who harmonised to the tunes of popular Singapore songs, including "Home" and "Rasa Sayang".

Dr Tony Tan Keng Yam, President of the Republic of Singapore, was the Guest-of-Honour for the Closing Ceremony. Dr Tan emphasised the need to develop in our youths a curiosity to discover, the desire to experiment, and the respect for people who set out to develop new knowledge in his speech. At the finale, President Tan presented Mr Carlos Duarte-Guevara with the Singapore Challenge 2016 award for his winning proposal of a portable biosensing system that could speed up diagnosis of harmful food-borne pathogens in eight hours. Mr Duarte-Guevara is a PhD student at the University of Illinois at Urbana-Champaign.

SUTD postdoctoral researcher, Dr Wong Him Cheng was also one of eight finalists in the Singapore Challenge. His proposal was an industrially-compatible membrane filtration system that can effectively remove micron-sized particles.

INAUGURAL SUTD STUDENT ACHIEVEMENT AWARDS 2015

BY RAHAYU BINTE MOHD DIN

Student Achievement Award winners

Dance DerivativeZ, one of SUTD's oldest Fifth Row

Eleven individuals and six clubs were recognised for their significant achievements and contributions in Fifth Row or co-curricular activities.

The inaugural SUTD Student Achievement Awards Ceremony was held on campus on 22 July 2015. The winners were selected, after a rigorous and critical evaluation of 72 nominations, based on criteria which were guided by SUTD's core values of Leadership, Integrity, Passion, Collaboration and Creativity. At this event, we also celebrated the academic achievements of nine individuals from the pioneer batch, who have done exceptionally well in their junior year and who were also very active in their Fifth Row.

AWARD WINNERS

STUDENT ACHIEVEMENT AWARDS PRESENTATION

Environment Award
Li Yiyang (ESD)

Humanitarian Award
Noon Teo Woei Ming (ESD)
Rotaract Club

Laurel Award
Agrim Singh (ISTD)
Ng Wei Hong Darren (ISTD)
Chin Jia Kai Samuel (ISTD)
Members of Multi-Rotor Society

Student Service Award
Tay Jenn Chong (ASD)

Outstanding Club Award
Dance DerivativeZ
SUTD Bands
Mountaineering Club
Sports Core

Student Leader Award
Ng Sihui Grace (ASD)
Norakmal Hakim Bin Norhashim (ESD)
Kabincalan R Parthiban (EPD)
Muhammad Zaki Djuanda (EPD)
Cai Ruihe (EPD)

ACADEMIC AWARDS PRESENTATION (FOR SENIORS)

Keppel Awards of Excellence
Ng Yi Jin (ASD)
Clifford Mario Kosasih (ASD)
Lee Lexuan Benjamin (EPD)
Chen Yuankang (EPD)
Wei Wei (ESD)
Ng Jiayi (ESD)
Liza Ng Yu Shan (ISTD)
Swayam Narain (ISTD)

MIT Club of Singapore Excellence Award
Tan Yong Kiang Jonathan (EPD)

Details of the awards criteria can be found at http://www.sutd.edu.sg/osl_saa.aspx

Fifth Row activities form the core of campus life at SUTD. It promotes campus vibrancy and contributes to the holistic development of our students. The types of awards reflect the width of the activities that our students are pursuing, ranging from extreme sports to technology-based pursuits. A number of the winners were also very active in external organisations and activities beyond the University.

COMMUNICATIONS AND INFORMATION MINISTER VISITS ITRUST

Students explaining how they test out actual cyber attacks

The pervasive adoption of smartphones, tablets and internet connectivity in Singapore brings to the forefront the growing importance of cyber security for the protection of our IT systems. Minister for Communications and Information and Minister-in-charge of cybersecurity, Dr Yaacob Ibrahim, together with the Chief Executive of Cyber Security Agency (CSA), Mr David Koh, visited SUTD on 8 December 2015 to learn more about Cybersecurity Patrol Project and the Secure Water Treatment (SWaT) testbed, and to understand some of the cutting edge cyber security R&D work done by our iTrust researchers.

Prof Aditya Mathur, iTrust Centre Director, explaining how SWaT works to Minister for Communications and Information, Dr Yaacob Ibrahim

With the increasing use of Internet of Things (IOT), new ways of breaching secured networks have resulted. An SUTD student working on the cyber security patrol project demonstrated that a smartphone attached to either a drone or an autonomous vacuum cleaner, for example, could go around inconspicuously to hijack data wirelessly, eliminating the proximity issue required to break into a secured network.

The SWaT testbed is a miniature model of an actual water treatment facility, where researchers can test out actual cyber attacks, to better understand the weaknesses of the system, and in turn, help them develop more robust defence mechanisms to ward off such cyber attacks in future.

CSA's Mr Koh said: "We need talents in research and development to identify and mitigate cyber security risks. SUTD has done good work to identify some of these risks, for example the cyber security patrol project."

The iTrust team demonstrating the cyber security patrol project

Group photo of all IDC Robocon 2015 participants

HOW WE WON THE IDC ROBOCON 2015

BY LAKSHMI JANAKI DHANYA

Held in Singapore for the first time, SUTD hosted the 26th International Design Contest (IDC) Robocon 2015. 54 students from countries such as China, Egypt, Japan, Morocco, South Korea, Singapore, Thailand and USA were divided into 10 teams and given two weeks to design and build robots which would then be pitted against one another.

The initial part of the competition was probably the toughest, as all the teams had members from various parts of the world. Hence, communication amongst teammates was limited due to the language barrier. It was disappointing to have good ideas and not be able to share them with one another. However, we learnt that the old adage, "actions speak louder than words" was true. Since we could not communicate verbally with each other, we relied on hand gestures, pen-and-paper drawings and computerised 3D imaging. We started by making simple models of our ideas instead of trying to explain them in words. In this way, we managed to explore various strategies before selecting the best one.

Throughout the building process, it was eye-opening to see how people from different countries approached and reacted to problems, and how such interactions resulted in innovative solutions.

Slowly, our robots started coming together despite the many cultural and educational differences in our team. We managed to build two working robots in less than two weeks, and through this experience, we also learnt a lot from one another.

The theme for this edition of Robocon was "Space Cleaner". The robots designed were supposed to pick debris out of space. This was implemented in the final contest by having a semi-circular ring representing the 'orbit' on which one robot was supposed to traverse. The other robot was the one travelling through space and picking up 'debris' which was present in the form of small white Styrofoam balls, and depositing it back to a revolving central cylindrical platform (the Earth). The Styrofoam balls were of different colours, with each colour awarding different points. The team that received the most number of points was crowned the winner. In each round, two teams competed against one another, with each round being judged jointly by the professors from each participating school.

Teams hard at work building their robots

The concepts we used to build the robot were simple but fail-proof. Although our robots were big and therefore, a little slow, their methods of picking up the 'debris' were effective. This, in hindsight, was a major contributing factor to our victory. As we got through each round, our confidence in our creations increased and we got better at controlling the robots. This definitely paid off at the end, when my teammate manoeuvred the robot to put the collected debris into Earth with practised alacrity and secured us the win.

Overall, Robocon was a fantastic experience, made even more satisfying when we emerged victorious from the finals. We intend to put the multifaceted skills that we picked up to good use in the future.

IDC Robocon participants competing against one another

SINGAPORE UNIVERSITY OF
TECHNOLOGY AND DESIGN

Established in collaboration with MIT

FUSION - THE POTENTIAL OF TECHNOLOGY AND DESIGN

Office of Marketing & Communications, SUTD
8 Somapah Road, #06-301
Building 3 Level 6, Singapore 487372
T: +65 6303 6600
W: www.sutd.edu.sg/newsletter