

# BULLETIN@ RICE@UTeM

Research, Innovation, Commercialisation and Entrepreneurship

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## Wild Ideas

BUILDING OUR RESEARCH PROFILE:  
CHAMPIONING IN OUR OWN RESEARCH AREA

INDUSTRY, SOCIETY  
AND INTERNATIONAL  
RESEARCH COLLABORATIONS



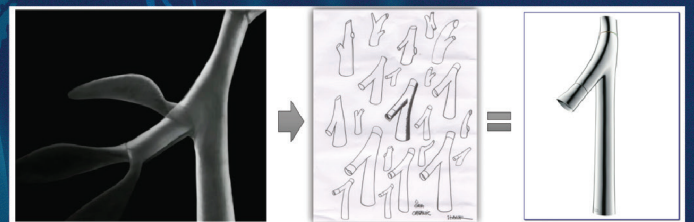
**Melaka Smart River Programme:  
Be Part of the Solution,  
Not Part of the Solution**

## RESEARCHER'S ACHIEVEMENTS



**Research Achievement in the  
Seoul International Invention Fair  
(SIIF) 2019, Korea**

## RESEARCH AND INNOVATION HIGHLIGHTS



**Design and Aesthetics;  
Important but Overlooked**



- TRASH ROBOT CLEANS UP RUBBISH IN MELAKA RIVER •
- SUNPOWER DONATED HIGH PERFORMANCE SOLAR PHOTOVOLTAIC MODULES TO THE FACULTY OF ELECTRICAL ENGINEERING • TECHNICAL VISIT TO ERL MAINTENANCE SUPPORT • UTeMEX 2019 •



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## Editor's Note

Assalamualaikum and Greetings,

Welcome to the 10<sup>th</sup> of RICE bulletin. On behalf of the RICE editorial board, I would like to take this opportunity to congratulate all our researchers for their excellent achievements in SIIF Seoul 2019 and UTeMEX 2019.

In this edition, we share the significant projects, collaborations and achievements of UTeM's researchers throughout the second half of 2019. We also highlights the current research works and findings by our researchers throughout the year of 2019.

Last but not least, I hope all of you will enjoy reading and contribute interesting news and articles to be shared with the readers in the first edition of year 2020.

Thank you.

Thank you.

Assoc. Prof. Ts. Dr. Massila Kamalrudin  
 Chief Editor

# Wild Ideas:

## BUILDING OUR RESEARCH PROFILE: CHAMPIONING IN OUR OWN RESEARCH AREA

By:

YBhg. Professor Dr. Zulkifilie Ibrahim

(Deputy Vice Chancellor (Research and Innovation), UTeM)



It is an exciting scenario to witness the increased interest among community of UTeM in research and innovation. We have reached the stage that almost everyone at UTeM is a researcher. In other words, almost all academics are actively involved in at least one research project, be it the internal funded research grant (short term research project), national funded research project, industrial or international research grant. While we are busy building our research profile, getting involved in any research that comes along the way, we tend to ignore an important goal: becoming the champion or expert in the area of our specialization.

In this case, there are three points that need to be considered: Firstly, researchers should be able to differentiate the nature of fundamental and applied research. Fundamental research focuses on building knowledge, while applied research focuses on product development, hence contribute to intellectual property and product commercialization. While fundamental research is motivated by gaps in the literature review, applied research is based on gaps in the industry. These differences are crucial particularly when drafting research proposal for grant application. The success application of the research grant depends on the nature of the research: fundamental or applied.

Secondly, researchers should not work in silo. They should work together inter discipline or multidiscipline to come out with research output that providing impacts to the society or nation. To do this, researchers could start by working together among research groups in a CoE. Current scenario is found that most researchers prefer to work only in their research group without collaborating with other groups in the CoE itself. Resulted from this practice, most of the developed prototypes are not suitable to be commercialized but left to the valley of death.

Finally, all researchers should plan from the very beginning to engage their proposed research with suitable industry. This is to ensure that their output later will be useful and will be used by the industry or stakeholders. Further, this approach will help researchers to align their research idea and output with the demand of the industries and not just by doing something that will be stored in the university lab.

In a nutshell, we need to re-strategize and engage in research that are demanded by our stake holders in order to build up our expertise. This is important to allow our researcher to be known by the industries and society at the national and international level.

## Melaka Smart River Program:

# BE PART OF THE SOLUTION, NOT PART OF THE POLLUTION

By: Dr. Yogan Jaya Kumar, C-ACT, FTMK



River Cleanup CSR program

Rivers play an important role in our lives. Unfortunately, many of us have forgotten about the importance of rivers and this has led to serious degradation in our rivers today. Rivers, if left untreated, can cause adverse events, such as pollution and flood. The Melaka Smart River Program is an initiative established by the *Universiti Teknikal Malaysia Melaka (UTeM)* to support local community and stakeholders to conserve Melaka River.

To support the program, a few river cleanup CSR activities were held between August and September this year (2019). UTeM's industry partners were also involved in the CSR program, which was organized in collaboration with the Melaka River, Coastal Development Corporation (PPSPM) and Melaka Historical City Council (MBMB). The cleanup area covers the river route from *Taman Rempah* to Melaka Central. In addition to cleaning the river, the aim of the program was to foster the spirit of love for the river

and to raise awareness among the local community and students on the importance of protecting our river.

UTeM's Assistant Vice Chancellor (Industry and Community Network), Professor Ts. Dr. Goh Ong Sing said the cleanliness of Melaka River should be taken seriously and UTeM is ready to jointly contribute to the conservation of Melaka River, which is one of the important tourism destinations in the State of Melaka.



Melaka River Fun Run participants





Kayak River Cleanup participants

In line with the appointment of UTeM as the Head of Cluster for the Smart Environment & Smart Energy by the State of Melaka, further initiatives were planned to assist the State's direction towards Melaka Smart City 2030. One of the highlighted initiatives was the Melaka Smart River Program, which was recently held on 23 November 2019, in conjunction with the Grand Cultural Festival Melaka River (GCF2019). Various activities were organized during the

event, including Melaka River Fun Run, Marine Robot Challenge, Kayak River Cleanup and Smart Hydrobike Innovation.

The program was officiated by Kota Melaka MP, YB Tuan Khoo Poay Tiong, the president of the Melaka Smart City Advisory Council (SCAC), in a brief ceremony attended by about 300 students of higher learning institutions and schools around Melaka, including 100 students from a special school in Melaka.

This program has been supported and sponsored by various parties, such as the state government and international companies from Switzerland, Hong Kong, China and Japan. Sponsors were received from YB Khoo, Exco Education, Human Capital, Science and



YB Tuan Khoo Poay Tiong, together with UTeM's Vice Chancellor and industry partners



Melaka Artificial Intelligence of Things (MAIoT) platform

Innovation, Datuk Noor Effandi Ahmad, Xinyi Glass (Malaysia) Sdn Bhd, Konica Minolta Business Technologies (Malaysia) Sdn Bhd, STMicroelectronics Sdn Bhd, SPA Autopart Group, LED Vision Sdn Bhd and the Malaysian Communications and Multimedia Commission (MCMC). Furthermore, these companies had also given their continuous support to UTeM by participating in the event.





The "Hidden Gem of Melaka" nearby Melaka Sentral@Sungai Melaka



Melaka Artificial Intelligence of Things (MAIoT) platform



Smart Hydrobike developed by UTeM

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Professor Goh said that among the objectives of the Melaka Smart River program was to provide platforms for students to demonstrate their creativity in solving problems of Melaka River, such as flood and water quality monitoring using Internet of Things (IoT) technology. It is expected that the program will have a direct impact on monitoring the quality of Melaka River through Artificial Intelligence of Things (MAIoT) platform. It will also help the state government to improve flood control in Melaka as well as to increase the aesthetic value of Melaka River.

Overall, the impact of the activities carried out since August 2019 has attracted the involvement of over 800 volunteers comprising students, government agencies, industries and local communities in the cleaning up of Melaka River. Over 1500kg of waste has been successfully collected. The program also showcased the Smart Hydrobike, an IoT-based water bike, an innovation from UTeM. Ultimately, a new tourism location in Melaka River, named the 'Hidden Gem of Melaka' has been established.



# TRASH ROBOT CLEANS UP RUBBISH IN MELAKA RIVER

By: Assoc. Prof. Dr. Mohd Shahrieel Mohd Aras, CeRIA, FKE

“Our river is our responsibility, and let us preserve and restore the beauty of Melaka River”: This statement was made by the Vice-Chancellor of *Universiti Teknikal Malaysia Melaka* (UTeM), Professor Datuk Wira Dr. Raha Abdul Rahim in her speech at the Melaka Smart River Program. Moreover, UTeM is always ready to offer its expertise in helping the State of Melaka. According to her, the activities demonstrate UTeM’s initiatives to support



Committee for Marine Competition



The robot will collect the rubbish

local communities and stakeholders to conserve Melaka River. To support the program, a few river cleanup CSR activities were held earlier in August and September this year. She said this initiative clearly shows that UTeM continues to demonstrate its role not only for the progression of knowledge, research and innovation, but also the modernization and enhancement of the community and state development.

One of the activities in the Melaka Smart River Program is the Marine Competition. The main objective of this program is to have solutions for cleaning the river, hence reducing river pollution. Focusing on a fun way of learning by undergoing the process of developing a robot and keeping the river clean, each team is required to develop a wireless robot that can collect rubbish in the river. This competition was organized by the student club, called the Associative of Inventive, Innovative and Creative Thinkers (ASIIC) with the support from the Centre of Robotics and Industrial Automation (CeRIA) and IEEE OES Malaysia Chapter. In this competition, students were required to build a robot than can function to collect wastes in the river. This is where innovation and engineering skills are needed to perform the assigned tasks, as well as encouraging a culture of innovation to solve problem among students.



Some of the robot in this competition





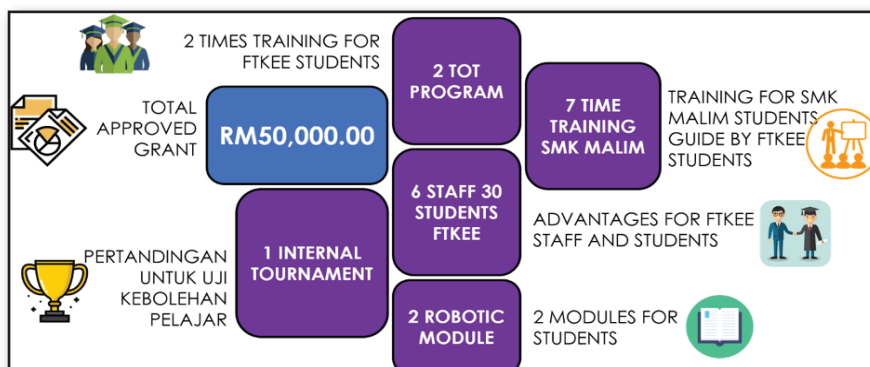
# ROBOTIC SYSTEM INTEGRATION USING ROBOROBO KIT APPLICATION IN SMK MALIM AND LOCAL COMMUNITY

By: Mohamad Haniff Harun, CeRIA, FTKEE

The rapid development of technology has resulted in many applications of robotic systems in a factory process. As such, it has become important to introduce robotic systems in the school curriculum. This program is one of the many efforts to integrate the application of robotic system in the school curriculum. Specifically, the introduction of the “Coaching the Coachee” blueprint can give a big impact to the primary and secondary students as it highlights the importance of robotic applications in the global arena today. This blueprint is categorized into four stages; 1) The process of drafting the “Coaching the Coachee” blueprint; 2) The Process of module learning and development; 3) The process of transferring knowledge; and 4) The process of defining the program. This blueprint is about sharing hands-on knowledge among school children on how to handle RoboRobo kits that are widely used in the developed countries, such as South Korea. Introduced mainly to the early year school children, the RoboRobo kit has been used to assist students’ daily learning. This kit allows students to create a variety of robots, thus encouraging them to build their own creativity. Students who have the exposure and collaboration with the school on robotic systems can foster their interest in robotics, hence cultivate their passion on robotics. This will give birth to a younger generation who have advanced knowledge of gadget development. These programs also help the local community to run programs that develop creative and competitive students.

This program was conducted in two phases: the first phase focused on training and was conducted from 14<sup>th</sup> October 2019 until 24<sup>th</sup> October 2019, and the second phase was for the internal competition at *Sekolah Menengah Kebangsaan Malim*, which was conducted on 9<sup>th</sup> November. This program was based on four main objectives, which are to:

- Prepare a robotic program design proposal known as ‘Coaching the Coachee’ by organizing a program participated by the local community;
- Provide robotics program recommendations at SMK Malim, Malacca for the purpose of sharing knowledge and upgrading education in schools towards robotics applications;
- Conduct learning, utilization and sharing of knowledge with local communities at the Malim National School, through activities such as robotic knowledge sharing programs, hands-on activities, and robotic competitions;
- Conduct ‘robotic learning and application clinics’ with the local community to ensure the use of robotic applications in the school’s co-curriculum.





# SUNPOWER DONATED HIGH PERFORMANCE SOLAR PHOTOVOLTAIC MODULES TO THE FACULTY OF ELECTRICAL ENGINEERING

By: Kyairul Azmi Baharin, Assoc. Prof. Ir. Dr. Gan Chin Kim, CeRIA, FKE

The Faculty of Electrical Engineering (FKE), UTeM has recently added another 4.62 kWp to its existing 24 kWp grid-connected Photovoltaic (PV) system, thanks to the gracious donation from SunPower that provides 12 pieces of P19 Performance Series Module. This project is part of an ongoing industry-university collaboration to evaluate the performance of various module technologies under tropical climate, characterized by hot and humid conditions throughout the year.



Figure 1: Installation (top view) and inverter model

Installed by Energy Possible Sdn Bhd, the system is located on the rooftop of FKE's administration building, alongside two other existing PV systems. The solar power output is delivered to the grid via a 4.5 kW Fronius Symo inverter installed at FKE's Solar Lab. Figure 1 shows the location of the installation together with the inverter used to convert the DC power from PV to AC. The electrical data from the inverter is integrated with the existing central monitoring system that logs the data simultaneously from all the connected PV systems in FKE's Solar Lab. This is essential for the systems' performance comparison analysis.

"We are always committed towards improving our module quality and performance to provide the best value for money to our customers", said Jacky Tey, Senior Manager Solar Solutions Sales, SunPower. Boasting a rated efficiency of 18.7% and 25-year combined power and product warranty, it is an optimal choice for customers who demand PV systems of high quality and reliable long term performance.

An initial study conducted for 14 consecutive days with two other module types (denoted as Module A and Module B) reveals that the specific yield for this module

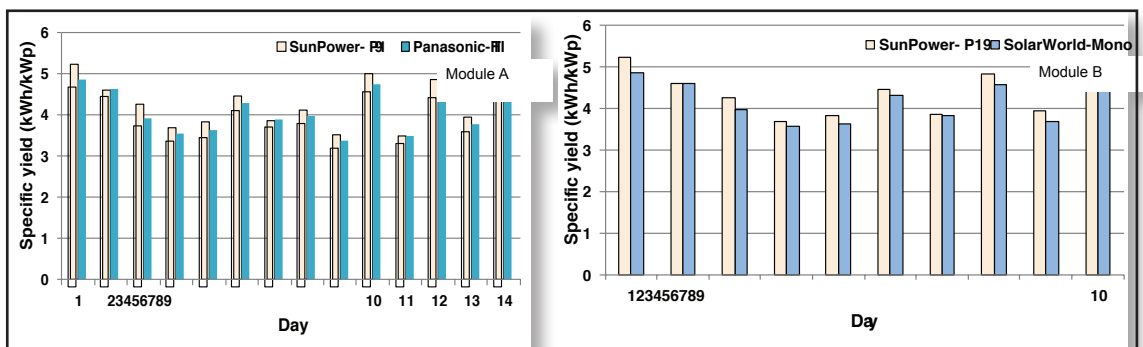


Figure 2: Specific energy yield comparison

has outperformed both of them for almost all the days under test, with a higher average yield of approximately 4%. Nevertheless, a longer term analysis would provide more meaningful conclusion. Figure 2 shows the daily comparison of SunPower's P-19 module with respect to Module A and Module B.

UTeM is always eager to contribute towards research in PV systems, particularly in analyzing performance in real operating environments. Concurrently, the research is also intended to equip our students with up-to-date knowledge on the current technology level so that they are better prepared to join the workforce in the renewable energy sector once they graduate.



# TECHNICAL VISIT TO ERL MAINTENANCE SUPPORT

By: Assoc. Prof. Ir. Dr. Mohd Azman Abdullah, CARE, FKM

In an effort to maintain a good relationship between the academia and the industry, a group of researchers from CARE, UTeM has made a technical visit to ERL Maintenance Support Sdn. Bhd. (EMAS) in *Kompleks Rel Udara* at Bandar Baru Salak Tinggi, Sepang, Selangor on 19<sup>th</sup> August 2019. The industrial visit was led by Professor Dr. Zahriladha Zakaria, accompanied by researchers from CARE, including Associate Professor Ir. Dr. Mohd Azman Abdullah, Associate Professor Dr. Mohd Fadzli Abdollah, Associate Professor Dr. Tee Boon Tuan as well as representatives from *Persatuan Staf Akademik Universiti Teknikal Malaysia Melaka (UTeMASA)*. The technical visit involved a two-hour meeting and site visit with the EMAS representative.



A site visit to E-MAS by UTeM delegations at Sepang, Selangor.

ERL Maintenance Support Sdn. Bhd. (E-MAS) was established in 1991 to commission, operate and maintain Malaysia's two fastest Express Rail Link (ERL) services. As the country's leading company, it is well known as the railway specialist that delivers safe, reliable and quality railway services while promoting railway as an environmentally sustainable and energy efficient mode of transportation. The Rolling Stock Division Manager, Mr. Norazman Abu Hassan, said, "This visit is a continuation of the relationship between UTeM and EMAS".



The research meeting between E-MAS and UTeM delegations during the visit.

Previously, Associate Professor Ir. Dr. Mohd Azman Abdullah has undergone a one-year industrial attachment at E-MAS. During this period of time, he has gathered a detailed insight on the railway maintenance operation and have gone through all the stages involved relating to this at EMAS. Several technical issues regarding railway maintenance have been presented and discussed thoroughly based on the data gathered.

The potential collaboration will be proposed between UTeM and EMAS. Even though the railway technology and equipment in E-MAS is rather old, some of the methods and parts are possible to be improved and analyzed with available equipment by experts in UTeM. At the preliminary stage of the research collaboration, oil samples from railway gearbox and transformer will be analyzed by UTeM and from this point, recommendations on the registered oil analyst will be proposed by the UTeM expert group. Other railway parts for possible research identified are wheel lubrication, wheel-rail interaction, railway pantograph, door mechanism, driver motor redundancy, railway ride dynamics and cabin acoustic comfort. CARE Manager, Associate Professor Dr. Tee Boon Tuan said, "With the network that we have established with E-MAS, future collaboration is highly encouraged." EMAS readily welcomes applications from UTeM staff as well as students for industrial attachment and training, respectively to this leading railway expert company in Malaysia.



## RESEARCH ACHIEVEMENT IN THE SEOUL INTERNATIONAL INVENTION FAIR (SIIF) 2019, KOREA

Selected researchers from UTeM have participated in the Seoul International Invention Fair (SIIF) 2019, organized by the 'Korea Invention Promotion Association (KIPA)' held on November 27 - 30, 2019 in COEX, Seoul, Korea. For this event, UTeM has submitted 9 products / innovations and achieved a success rate of 100% with a breakdown of one (1) Special Award, two (2) Gold medals, four (4) Silver medals and two (2) Bronze medals and breakthrough medals, as shown below: -



NO.	PRODUCT INNOVATION	PRINCIPAL	CO-RESEARCHER	AWARDS
1.	KISS FABRICS	ASSOC. PROF. IR. TS. DR. MOHD YUHAZRI BIN YAAKOB, FTKMP	MOHD AMIRHAFIZAN BIN HUSIN, KAMARUL AMIR BIN MOHAMED, HASOLOAN HEARY IAN PIETER, SITINOR WARDATULAINA BT MOHD YUSOF, PROF. DATO' DR. ABU BIN ABDULLAH, SAJJOD LAU TZE WAY	SPECIAL AWARD (POLISH INVENTOR & RATIONALIZER, POLAND)
2.	MUETLex	DR. NOORLI BINTI KHAMIS, PBPI	DR. HALIZAH BINTI BASIRON, DR. LEE MEI PH'NG, MASHANUM BINTI OSMAN, MOHD HARIZ BIN NAIM @ MOHAYAT, RAZILAH BINTI ABDUL RAHIM, NURHIDAYAH BINTI ABDUL BAREED, TUAN HAJI MOHD FAUZI BIN DATUK HAJI MOHD KASSIM, NOR QAILY BINTI SA'ARI, MUHAMMAD ATHIR BIN SUHAIMI	GOLD
3.	A NEW CLASS OF MICROWAVE BIO-SENSOR WITH HIGH-MEASUREMENT ACCURACY FOR MATERIAL PROPERTIES DETECTION	PROF. DR. ZAHIRLADHA BIN ZAKARIA, CRIM	RAMMAH AL-AHNOMI, NORHANANI ABD RAHMAN, AMMAR AL-HEGAZI, DR. NOOR AZWAN SHAIRI, ROHANI YUSOF, AZIEAN MOHD AZIZIE, PROF. DR. ZULKALNAIN MOHD YUSOFF	GOLD
4.	GREEN ZICHRO CUTTING TOOL	ASSOC. PROF. IR. DR. HADZLEY BIN ABU BAKAR, FKP	TS NORFAUZI TAMIN, PROF. MADYA TS. DR. UMAR AL AMANI AZLAN, PROF. MADYA DR. RAJA IZAMSHAH BIN RAJA ABDULLAH, MD NAIM FAHMI ABD MANAP, MD FAIZ MOKHTAR, ANIS AFUZA AZHAR	SILVER
5.	SUCAK-SUPER CAN KE	ASSOC. PROF. IR. TS. DR. MOHD YUHAZRI BIN YAAKOB, FTKMP	MOHD AMIRHAFIZAN BIN HUSIN, KAMARUL AMIR BIN MOHAMED, HASOLOAN HEARY IAN PIETER, SITINOR WARDATULAINA BT MOHD YUSOF, PROF. DATO' DR. ABU BIN ABDULLAH, SAJJOD LAU TZE WAY	SILVER
6.	INNOVATION ON VISUAL PERCEPTION DIAGNOSTIC TOOL FOR AUTISTIC DETECTION	PROF. TS. DR. FAAIZAH BINTI SHAHBODIN, CAES	DR. CHE KU NARAINI CHE KU MOHD, HELMI ADLY MOHD NOOR	SILVER
7.	A SIMPLE PICO HYDRO SYSTEM FOR LOW HEAD LOW FLOW WATER RESOURCES	IR. DR. MOHD FARRIZ BASAR, FTKEE	NURUL ASHIKIN MOHD RAIS, TS. KHAIRUL AZHA AZIZ, IZZATIE AKMAL ZULKARNAIN	SILVER
8.	ORIGAMI CP SEATER	MOHD AZLAN BIN MOHAMED, FTKMP	MOHD KAMAL BIN MUSA, MOHD QADAFIE BIN IBRAHIM	BRONZE
9.	LIGHT WEIGHT FRONT LOWER CONTROL ARM	ASSOC. PROF. TS. DR. MOHD SHUKOR BIN SALLEH,	TS. ZOLKARNAIN BIN MARJOM, MOHAMAD RIDZUAN BIN MOHAMAD KAMAL, PROF. DATO' DR. ABU BIN ABDULLAH, MOHD SUFFIAN BIN AB RAZAK, DR. SAIFUDIN HAFIZ BIN YAHAYA	BRONZE



# UTeMEX 2019



Held on October 9 - 10, 2019, UTeMEX 2019 is the Research and Innovation Carnival organized jointly by the UTeM Commercialization Centre (UCC) and all UTeM faculties. The theme for UTeMEX 2019 is "Humanizing Technologies in Digital Era". UTeMEX 2019 is open to all institutions of higher learning, polytechnics, community colleges and schools with the hope of inculcating a culture of research and innovation in the society. UTeMEX is intended to encourage researchers and students to create innovative research-based products, make an impact and have commercial value. Participation from the industry and community can lead to smart partnerships and provide feedback on product commercialization potential that is aligned with the concept of TUNAI (Technology @ University Advancing Industry) - Technology developed by researchers will be used by the community and industry.

This industry-university-community collaboration will increase the quality of products and facilitate the process of commercializing them. The objectives of UTeMEX 2019 is to be the official platform in UTeM and Melaka for exhibitions and competitions to showcase elements of creativity and innovation and to bring together local experts in research-based innovative products in line with the latest applications. Another objective is to obtain feedback from the industry and community on products which have commercial viability. It is also to strengthen the industry-university-community relationship in research and development activities for the production of high impact products. The organizers of UTeMEX19 received 179 products from various organizations and 20 professional judges from the industry were appointed to provide feedback on the real needs of today's industry.

## Categories and Themes



Parallel with UTeMEX, seminars from related organization were also organized. The objective of the seminars is to provide a platform for researchers to bridge the gap between the needs of research and industry. The seminars, which were conducted in either Malay or English language are as follows:

- **Kepentingan Perlindungan Harta Intelek (MyIPO)**
- **Pembiayaan Pengkomersialan Hasil Penyelidikan & Pembangunan (MTDC)**
- **How Do I Know if My Invention is Patentable? (TeelP)**
- **Path to Commercialization (TPM)**
- **IP Commercialization (PLaTCom Ventures)**
- **Innovate or Die (MaGIC)**



The list of participants and products exhibited in the carnival is shown below.

List of participants and products

Organizations	No. of products
UTeM	120
IPTA/ IPTS	23
UniKL	(UniKL 3, UMP 6, UniMAP 3, UnisZA 1, UiTM 3, UTHM 4, UUM 1, UPM 2)
UMP	
UniMAP	
UnisZA	
UiTM	
UTHM	
UUM	
UPM	
Sekolah – 15 (SK Parit Melana 1, SK Kerubong 1, SK Durian Daun 1, SBPI Selandar, MRSM Terendak 1, Tun Ghaffar Baba 3)	15 (SK Parit Melana 1, SK Kerubong 1, SK Durian Daun 1, SBPI Selandar, MRSM Terendak 1, Tun Ghaffar Baba 3)
ILP	7 (Selandar 6, Pasir Gudang 1)
Politeknik	9 (Politeknik Melaka 7, Politeknik Nilai 2)
Kolej Komuniti	3 (Pasir gudang 2, Selandar 1)
Kolej Vokasional	5 (Datuk Seri Md Zin 5)
KP MARA -	3 (Batu Pahat 1, KPM Bandar Penawar 2)



## UTeM TEAM WINS TWO TOP PRIZES IN TWO INNOVATION COMPETITIONS IN ONE DAY

By: Ir. Dr. Mohd Farriz Md Basar, CeRIA, FTKEE

For the first time in its history, *Universiti Teknikal Malaysia Melaka* (UTeM) was announced as the overall champion of two innovation competitions; the International Automation & Control Innovation Competition 2019 (ACEIC'19) and MTDC Business Challenge 2019 (MBC 2019). UTeM's teams from the Faculty of Electrical and Electronic Engineering Technology (FTKEE) won a total sum of RM 14,000.

The project with a title "Z-Blade Reaction Water Turbine for Small Streams" developed by Nurul Ashikin Mohd Rais and Izzatie Akmal Zulkarnian participated in the International Automation & Control Innovation Competition 2019 (ACEIC'19) in UNITEN, Selangor. The ACEIC'19 gathered 50 teams, from 15 international and local universities to showcase their products to industry key players and potential investors. Izzatie's project introduced a non-regulated design reaction hydraulic machine known as the Z-Blade turbine (ZBT). The turbine is considered to have the simplest geometrical design and requires minimal fabrication process. Hence, it requires no high-tech manufacturing machinery and no expert workers due to its non-complex design. Furthermore, the turbine is a fish-friendly turbine. The team brought home the Gold Medal, Overall Champion Award, a Trophy and cash prize of RM 3,500. The simplicity and the sheer brilliance of the design also won them the Best Project Innovation in ACEIC'19 and received the IEEE Malaysia Section Special Award.

Another project from FTKEE, UTeM is the "Smart Pico Hydropower Generation System" led by Amarjeet Singh, Harirajan Naidu and Poobalan Velasamy. They participated in the MTDC Business Challenge 2019 organized by Malaysia Technology Development Corporation and UTM Center for Student Innovation and Technology Entrepreneurship. The competition aims to support and accelerate the commercialization of innovations of students from institution of higher learning and instil the entrepreneurial spirit among youths in Malaysia. The project presented an interesting and innovate method which utilizes a significantly smaller volume of flowing water to generate electricity without the need of large and expensive reservoirs and permanent civil work structures. In addition, the force from a small stream is strong enough for the pico hydro system to operate efficiently. The system has a life span of up to three years minimum with a payback period of just one year. The innovation beat 30 other teams of students from public and private universities, polytechnics and community colleges. Amarjeet and his team received a cash prize of RM1,000 and RM10,000 in product development funding, together with MTDCs consultative services.



Ir. Dr. Mohd Farriz Basar, the Deputy Dean of the Faculty of Electric and Electronic Engineering Technology (FTKEE), attended both award ceremonies. He is also the principal investigator for both projects which was carried out under the Prototype Research Grant Scheme (PRGS) and Fundamental Research Grant Scheme (FRGS) funded by the Ministry of Higher Education of Malaysia and the URIF Grant funded by *Universiti Teknologi Petronas* (UTP). He commented that there are still many potential sites which have yet to be exploited, and there are many untapped opportunities for the generation of electricity using pico hydro power technologies. The benefit from the system and potential market size for the ASEAN region alone is vast. He also added that both competitions provided constructive platforms for researchers, innovators and industries to come together, to share and collaborate towards IR.40.

Ts. Dr. Rostam Affendi Hamzah, Dean of FTKEE UTeM, in a statement to Buletin RICE 2019, said that with this double win, FTKEE UTeM has become the first faculty in UTeM to win two prestigious innovation competitions in one day. The success reflects UTeM's role as an institution of excellence that empowers technical and vocational education training (TVET). Simultaneously, it makes UTeM as the most sought after technical public university in Malaysia.



# Design And Aesthetics; IMPORTANT BUT OVERLOOKED

By: Mohd Qadafie Ibrahim, CoSSID, FTKMP

Industrial Revolution (IR) 4.0 has become the big words nowadays. However, many people do not really pay attention to the starting point and the whole buzzing trend. Design is actually the trigger factor for IR 4.0. Well-designed products create demands from customers thus, there is a need for good manufacturing system to cater these needs. However, there are only a certain quarter of people who are aware of this and take proactive approach to fill the gap. Singapore for example, has had established a design university. The Singapore University of Technology and Design (SUTD) is a design centric, multidisciplinary university set up with the collaboration of MIT. To be fair, Malaysian government is also aware of the importance of design; thus, they introduce a subject called 'Reka Bentuk dan Teknologi' (RBT) in the secondary school starting from form one.

Another scenario is that the inventors and researchers that produce and design new technologies and products have problems to produce a good design, even though their creations are novel and beneficial. It is because they are not exposed to product development process despite the fact that they are experts in their respective fields. As the result, the inventions do not get the appropriate attention from the public and fail in the market. Therefore, there is a need to find ways to help researchers to become a good inventor. Additionally, similar fate is also faced by inspired inventors and enthusiasts from all walks of life in creating the innovations, as they lack of proper guides to create all rounded design.

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As for the design of creation, the main elements are form and function. Form is the aspect that gives the product its physical shape. On the other hand, function is related to the usage of the creation. A beautiful form is called aesthetic. Although it is important, many fail to address in their design. To highlight this point, let's see the water tap case designed by Philippe Stack (Figure 1). He is transforming ordinary functional product into a balanced design between functionality and aesthetics. Inspired by tree branch, the faucet character is distinctly organic. The result is a beautiful tap with charismatic identity.

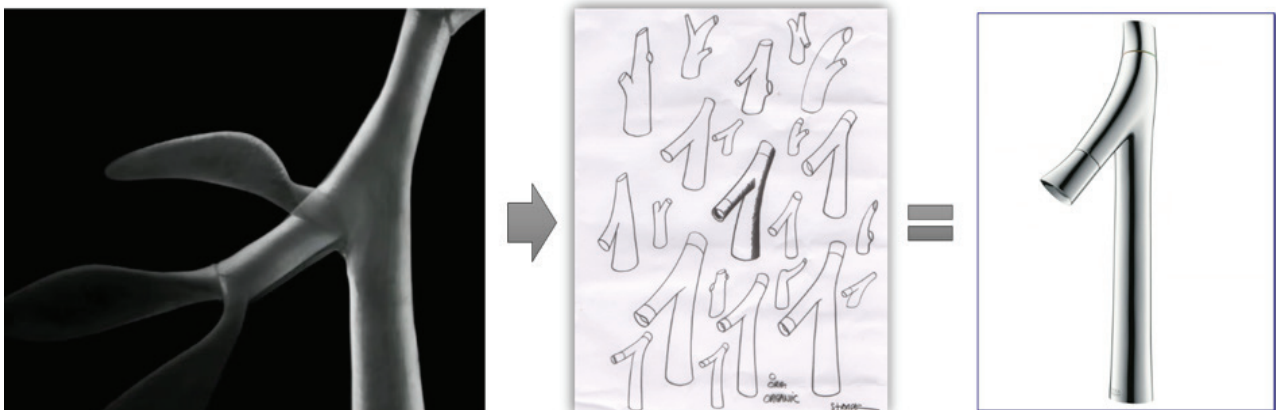


Figure 1: AXOR Stack Organic faucet design ([www.axor-design.com](http://www.axor-design.com))

To address these two issues, there is an opportunity to have a new design solution that is able to help the innovators and designers to create a good and all-around product. In this case, innovators whether they are from one student or researchers in the universities should be able to have a clear picture on the design process they are working on. Integrated Qualitative Method (IQM) is the new design framework that enables the innovators and designer a better approach between form and function. This is an on-going design research proposal for PhD candidacy. This method is using industrial design engineering (IDE) approach, which is currently being adapted in several universities all around the world. One of them is the Technical University of Delft, in Netherlands has published a book, Delft Design Guide that explains TU Delft design method. It is a well-known design framework and has been used as a textbook for many design programs worldwide.

As for IQM (figure 2) framework proposal, there are a few distinguishing principals. First of all, it separates design and development process in two independent circles so that, the innovators and designers can have clear roles and functions regarding the processes and considerations, while the aesthetic elements are infused into the design process. Then, the design review will be taking place with Marketing and Engineering personnel. These two circles can rotate independently before it meets at a point (red dot), thus provide an explanation for the infinitive word in the name. As for qualitative word, it comes from approaches and design tools that have been adapted along with the design process.



Figure 2: Infinitive Qualitative Method (IQM) design process framework

The highly structured and controlled design process will help innovators and designers to progress their ideas in a very focused direction. The framework currently under revision is going to be validated before it is established as a legitimate solution, although, the preliminary findings show very positive outcomes. Therefore, a new design solution offers a very objective guides to create an innovative product with a balanced form and function aspects. However, please be aware that it is being developed for a simple consumer product in mind.



# WHY WE NEED CULTURAL CONSIDERATION IN DESIGNING GREEN PRODUCT?

By: Dr. Ihwan Ghazali, C-TED, FTKMP

An awareness on environmental protection is increasing during the last decade. The term of "sustainability, sustainable development, zero waste" is concerned with such as reducing the energy consumption, waste generation, air and water pollution become a trend that should be the concerns of industries around the world. As it is, the industries are highly encouraged by legislation to produce green products where the process of production starting from raw material selection, production, distribution, use and end of life product should have less impact to the environment.

There are a lot of attributes of green product characteristics that we can see in the market. Green product characteristics refer to the attributes that are embedded on the product as the effort to minimize the environmental impact. For example, the characteristics of less energy consumption product for electronic product such as air-condition, fridge, water dispenser to reduce energy usage, the product made by recycled or recyclable material to minimize waste generation, using light weight material to reduce the usage of virgin material, using harmless material, eco labelling and so forth. However, the consumers may have different preferences on these kind of green product attributes. It can have positive and negative effect on consumers' preferences. It depends on how the consumers can get the values from purchasing the green product. Not all consumers really understand the objective of green product. Therefore, as the initial stage of product design, the designers are required to clearly catch up and understand what is the market need for green product. If the designers fail to determine the green characteristics that can be embedded in their design, the consumers' interest on green product in the market will be lacking.

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One of the ways to capture the consumer's preferences is by understanding the cultural of consumers on green product. Culture can be defined as the natural setting of a social relation, i.e. how civilization may arrange their habits in the group (Hofstede et al., 2002). According to Ghazali et al. (2017), consumer's preferences on green product can be influenced by cultural values. Five cultural dimensions i.e. Masculinity (purpose orientation)-femininity (appearances or style preferences), collectivism (group preferences)-individualism (self-concern), long-short term orientation (present or future concern), uncertainty avoidance (action to minimize unclear situation) and power distances (gaps between high level and low level) have been tested in Malaysia in order to know whether cultural value can provide significant influences on green product for consumers in Malaysia. In term of green product, Malaysian consumers are affected by long term orientation, uncertainty avoidance and low power distances. Under these three dimensions influences, this study identified that eco-label, energy efficiency and reduce harmful material become the top three most important green product characteristics preferences.

Based on this information, the designers should prepare deeper potential strategies to meet the consumer's preferences on green product by considering customer's long term orientation, reduce consumer's uncertainty and produce green product that can be acceptable for all level consumers

(low power distances). For example, the implementation of providing product services, easily self-maintenance and upgraded to extent product life time can be used as strategy to meet customer's long term orientation. High quality of recycle or recyclable material and less harmful material can be used as strategy to reduce the consumer uncertainty. Finally, providing clear information on eco-label to increase the consumer understanding of green product can be used to reduce power distances of consumers on green product.

To conclude, culture is a program of mind that can influence many aspects in our life. The example above is only a brief explanation that limits the design of green product. It can also be used to evaluate in several interesting research areas, such as the strategies of implementing the concept of I.R 4.0 considering cultural influences, design strategies for life cycle assessment (LCA) based on industries culture and so forth. I believe that the consideration of cultural value will provide more valuable information to decision makers such as designers, policies maker and industries management to perform more detailed evaluation for their design strategies.

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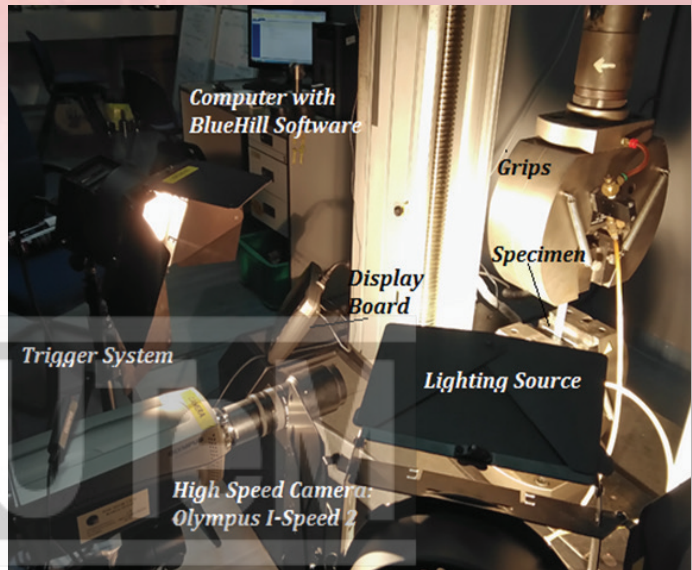




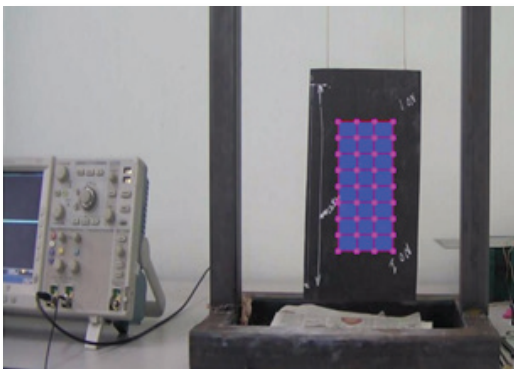
# NON-CONTACT DEFORMATION AND EVALUATION TECHNIQUE FOR MECHANICAL CHARACTERIZATION

By: Ts. Dr. Ahmad Fuad Ab Ghani, CArE, FTKMP

**DIC** is a non-contact, optical method which captures digital images of a surface of an object then performs the image analysis to obtain full-field deformation and measurements. This can be achieved by creating different methods like dots, grids and lines among others on the specimen surface. This technique starts with a reference image (before loading) followed by a series of pictures taken during the deformation. Deformed images show a different dot pattern relative to the initial non-deformed reference image. These pattern differences can be calculated by performing a correlation of the pixels of the reference image and any deformed image, and a full-field displacement measurement can be computed. The strain distribution can then be obtained by applying the derivatives in the displacement field.



Setting Up of DIC on Tensile Test Specimen Under Study



Scan Point on The Plate Under Vibration Study

Scanning Laser Doppler Vibrometer (SLDV) is used for non-contact measurement, visualization, analysis, and measurement for the vibration of a structure or component with a very high spatial resolution. It determines the operational deflection shapes as easily as video recording. The SLDV is commonly used in acoustic, architectural, aerospace and automotive structural dynamics analysis. This test is based on vibration with free boundary conditions by using non-contact out of plane single head scanning laser doppler vibrometer measurement. SLDV is capable

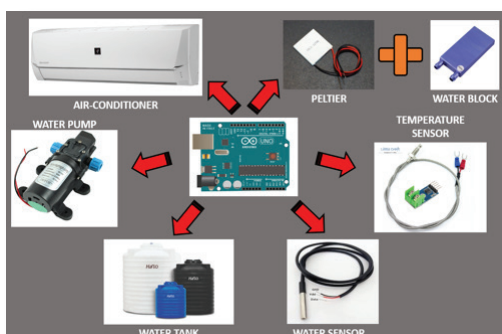
of assessing bending formation that corresponds to the bending formation due to the first vibration mode excitation.

# PERFORMANCE ANALYSIS OF LIQUID-COOLED PANEL SYSTEM FOR AIR CONDITIONER USING PELTIER EFFECT

By: Mohamad Haniff Harun, CeRIA, FTKEE

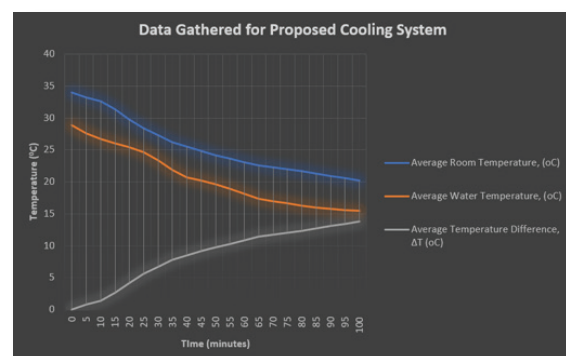
This Liquid-Cooled Panel System for Air Conditioner reviews the recent advances of thermoelectric materials, modelling approaches, and applications. Thermoelectric cooling systems have advantages over conventional cooling devices, including compact in size, light in weight, high reliability, no mechanical moving parts, no working fluid, being powered by direct current, and easily switching between cooling and heating modes. In this study, it focused on the replacement of the outdoor unit (compressor) for conventional air-conditioner. This system uses water as cooling agent to replace refrigerant system. It involves using Peltier Effect which converts current to increase the temperature between the two junctions of the Peltier. The water will flow through these changes in temperature, which results in cooling the air through the process. From this process, it took 60 minutes to achieve 20.2 0C and consumed 1.3 A, which showed better performance compared to the conventional method. This can reduce the cost of the project in terms of maintenance, bills, materials and gases. This system can be operated without relying to the compressor, which improved the systems in terms of noise, low electricity usage, small size and use of water as a coolant agent.

This system used Arduino UNO microcontroller as the brain for the whole system. Arduino will control all the operation for cooling system and for monitoring purposes. The parts of cooling system are water block, water pump, water tank, cooling piping and air-conditioning itself. Monitoring system involved is more on controller such as Arduino, temperature sensor, water sensor and Peltier.



By integrating all the components, a complete liquid-cooled air conditioner system builds according to each characteristic. As a short practical idea, water will be filled from the hose to the correct repository tank and it will stream the water through the water siphon and ventilate into water tank. In this water tank system, the combination of the Peltier cell with the water block will experience biasing of water temperature, which is hot and cold. The high temperature water will leave the tank and flow through the left tank. The left tank comprises of heated water will stream over into water square to change into cold water. Along these lines, this cycle is continuous and utilizes a similar measure of water. The cool air is being blown through the indoor unit.

For gathering the temperature, three temperature sensors will be attached at the tested room (master bedroom), air-conditioner itself and water tank. This is to measure the current temperature, while the system is operating for 100 minutes. All the temperature sensor link with the Arduino and data are displayed through the serial link communication. Each data was taken every 5 minutes to measure the efficiency of the system compared to the conventional air-conditioning.



From the collected data, it shows that this system is capable of producing cool air as much as conventional air-conditioning using the compressor. This system is able to produce around 13.8oC temperature difference and can cool the room up to 20.2oC. Not only that, this system used up to 1.3 Ampere only rather than the average usage from the conventional air conditioning that used up to 5.67 Ampere.



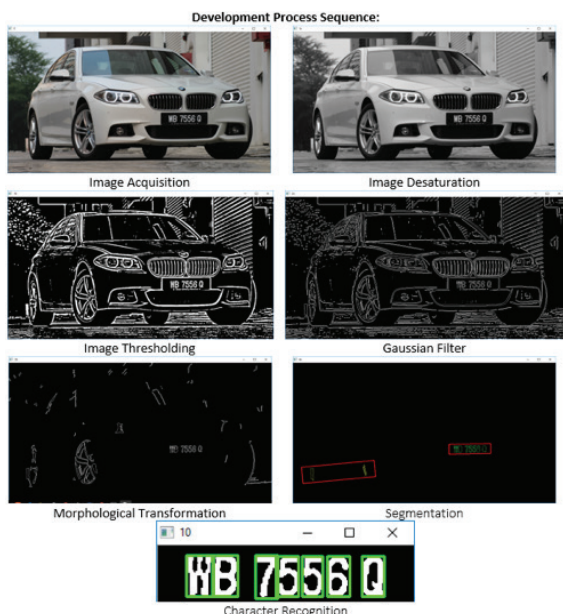
# PORTABLE AUTOMATIC NUMBER PLATE RECOGNITION (ANPR) SYSTEM ON A RASPBERRY PI 3

By: Ts. Shamsul Fakhar Abd Gani, C-ACT, FTKEE

Automatic Number Plate Recognition (ANPR) system is used in automating access control and security. It can be used for identifying stolen cars in real time by installing it to police patrol cars and detecting vehicles that are over speeding on highways. An ANPR system is essentially a means of identifying the number plate of a vehicle by extracting the information from an image file using image processing techniques. The process typically consists of image acquisition, image preprocessing, determination and extraction of region of interest (ROI) and interpreting the pixels into numerically readable characters using optical character recognition (OCR). However, this technology is still relatively expensive; in November 2014, the *Polis Diraja Malaysia* (PDRM) purchased and installed 20 units of ANPR systems in their patrol vehicles costing nearly RM 30 million. A cheaper alternative of a portable ANPR system running on a Raspberry Pi 3 with OpenCV library is proposed here. Once the camera captures an image, the image desaturation, filtering, segmentation and character recognition are all done on the Raspberry Pi before the extracted number plate is displayed on the LCD and saved to a database. The main challenges in a portable application include a crucial need of an efficient code and reduced computational complexity while offering improved flexibility.

An 8 megapixels (MP) Raspberry Pi camera can be attached to the on-board Raspberry Pi camera connector, and this creates an image capture system with embedded computing that can extract information from images without the need for an external processing unit. The multiple GPIOs available can interface with external devices and can be used to make results available to other devices. Considering the requirements of image processing compared to the Raspberry Pi's processing module and its peripherals, it is decided that the system is capable on executing the specified tasks. Experimental results show that the designed system is decent enough to run the image capturing and image recognition algorithm.

Sometimes the system fails to recognize characters correctly, where letters are filtered out causing the character not to be registered in the data structure.



In some cases, the system confuses similar letters such as D from O or 6 from 8 and so on. Based on the conducted experiment, it is found that the processing on the Raspberry Pi 3 took 2 to 3 seconds to process the image and come out with the recognized number plates, with a success recognition rate of 85%. The system performs magnificently, but it is hoped that the Raspberry Pi foundation can come out with a newer model with better processing power to eliminate the 3 seconds delay needed to produce the results. In the meantime, future work may be done to improve the accuracy in the recognition process as well as speed up the time taken to produce the output on the algorithm side.

# DESIGNING A RETRACTABLE SWINGING DRIVER'S SEAT FOR A PERSON WITH WALKING DISABILITY

By: Dr. Shamsul Anuar Shamsudin and Mr. Zairulazha Zainal, CARE, FKM

The Malaysia Education Blueprint 2013-2035 and the Higher Education Blueprint 2015-2025 state clearly the needs of students with disabilities, with a clear message that the country's education system aspires to be holistic, accessible and inclusive [1]. According to the United Nations International Children's Emergency Fund (UNICEF), accessibility to sites, facilities and buildings is one of the most important prerequisites for the inclusion of both children and adults with disabilities [2]. Hence, one of the main design considerations is to build a device which allows a disabled person who uses a wheelchair and a non-handicapped person to operate a vehicle without modifying much of the driver's seat. Such design consideration is made with the assumption that the disabled driver could still use his or her legs to push the paddles as needed and that there is another person to take care of the wheelchair for the driver. Nevertheless, that situation could be the best-case scenario.

People with disability still need to move various distances for a variety of reasons [3]. Today, many people on wheelchairs move around in many places unassisted thanks to the advent of motorized electric wheelchairs. Disabled people nowadays value their independence just like normal people [4,5]. However, for farther distances, crutches and wheelchairs might not be suitable for travel. Hence, they too need to be able to enter and operate vehicles should there be no other person to drive them. There are many examples of physically-disabled drivers who could drive and take care of their wheelchairs all by themselves, as shown in [6]. Even the control paddles can be controlled by hand through some mechanical or electrical means. Over the years, many have invented machines to enable physically-challenged drivers to get on and off the seat including one by Crain et al. from the Chrysler motor company [7].

The target of the project is to have a system that accommodates drivers with disabilities without making too much conversion to the driver's seat in the vehicle, particularly a van or a pick-up truck. This type of vehicle is a little higher compared to a sedan or a compact car. The design should permit other normal people at other times to operate the vehicle and minimize the loss of any available space for other passengers. Moreover, there is an assumption that the lightweight wheelchairs that a truly-independent disabled person might use are collapsible and foldable for easy storage. Hence, the focus is on the synthesis of a four-bar linkage mechanism for supporting the movable driver's seat since it is a single-degree of freedom machine. Some of the design considerations may include the use of a slider-crank, parallel four-bar linkage for pushing out the seat, wedge surfaces for achieving height changes, and gearing or its equivalent mechanisms to get the suitable angular speed of the seat. The three-position synthesis was utilized to get them fixed and moving pivots that are utilized to create the mechanism. This well-established procedure is thoroughly explained in the works of kinematicians like Erdman, Sandor, Kota, and Myszka in [8,9].

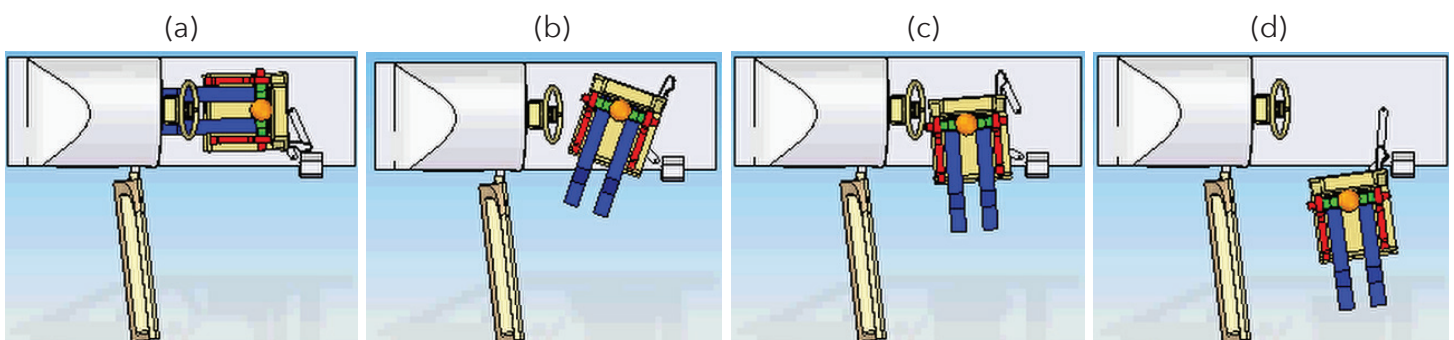


Figure 1: Progression of the designed driver's seat as seen from top.



As agreed with our advisor, Dr. James Joo from the Wright-Patterson Air Force Base, the driver's seat will turn to the left when the driver's door is open, probably activated by a switch. Then, if possible, the seat needs to go down vertically a little to reach a reasonable height from the ground so that the person could move from the driver's seat to the wheelchair or vice-versa. The realization of such a machine should consider many other aspects like gearing, chain, and sprockets, and strength of parts as covered in literature such as [10].

The final design went through three-dimensional solid modeling using Solid Edge. Figure 1 shows the progression of the seat as it rotates counterclockwise while avoiding objects such as the steering wheel and the B-pillar. The design is very promising, and it could be beneficial to a lot of independent drivers who have disabilities in the lower extremities.

This preliminary design has proven its functionality in the solid modeling environment. Hence, it has high potential to be further developed into a complete product that could be attached underneath the original driver's seat. However, there are still many aspects like actuators and other components that need to be detailed out. The authors would like to acknowledge the original work by Ryan, CT, and Anuar in [11], where the study was done based on a 1997 Dodge Grand Caravan. The original work emphasized the use of basic linkage mechanisms. In reality, it might be more desirable to include other types of mechanisms like cams and multiple actuators.

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