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PROJECT IDEAS FOR MECHANICAL ENGINEERING STUDENTS

TS DR MOHD FAIZAL FAUZAN
IR DR SIVA KUMAR

PROJECT IDEAS FOR MECHANICAL ENGINEERING STUDENTS

For

Amirah, Daniel and Alya

PREFACE

At the School of Engineering, the curriculum is aimed at producing engineering talent that is capable of revolutionizing contemporary engineering practice. This is done through the execution of projects that demonstrate knowledge and skills attainment whilst working in teams that function and are guided by the principles of high performing teams. The engineering laboratories on the campus serve as a platform for students to conceive, design, implement and operate innovative thoughts that they have. Students are strongly encouraged to use these facilities to enrich their learning experience and more importantly add value to the product or system that they have conceived. Engineering students need to play an active role in deploying viable, sustainable and cost-effective solutions that would meet the demands of the challenges of the world. This book listed some of the selected real projects that Mechanical Engineering students at Taylor's University have produced in the past few years. It will give basic mechanical engineering students project ideas to others. It is also in our hope that this book can inspire youngsters out there to pursue the Mechanical Engineering Degree as their choice of studies.

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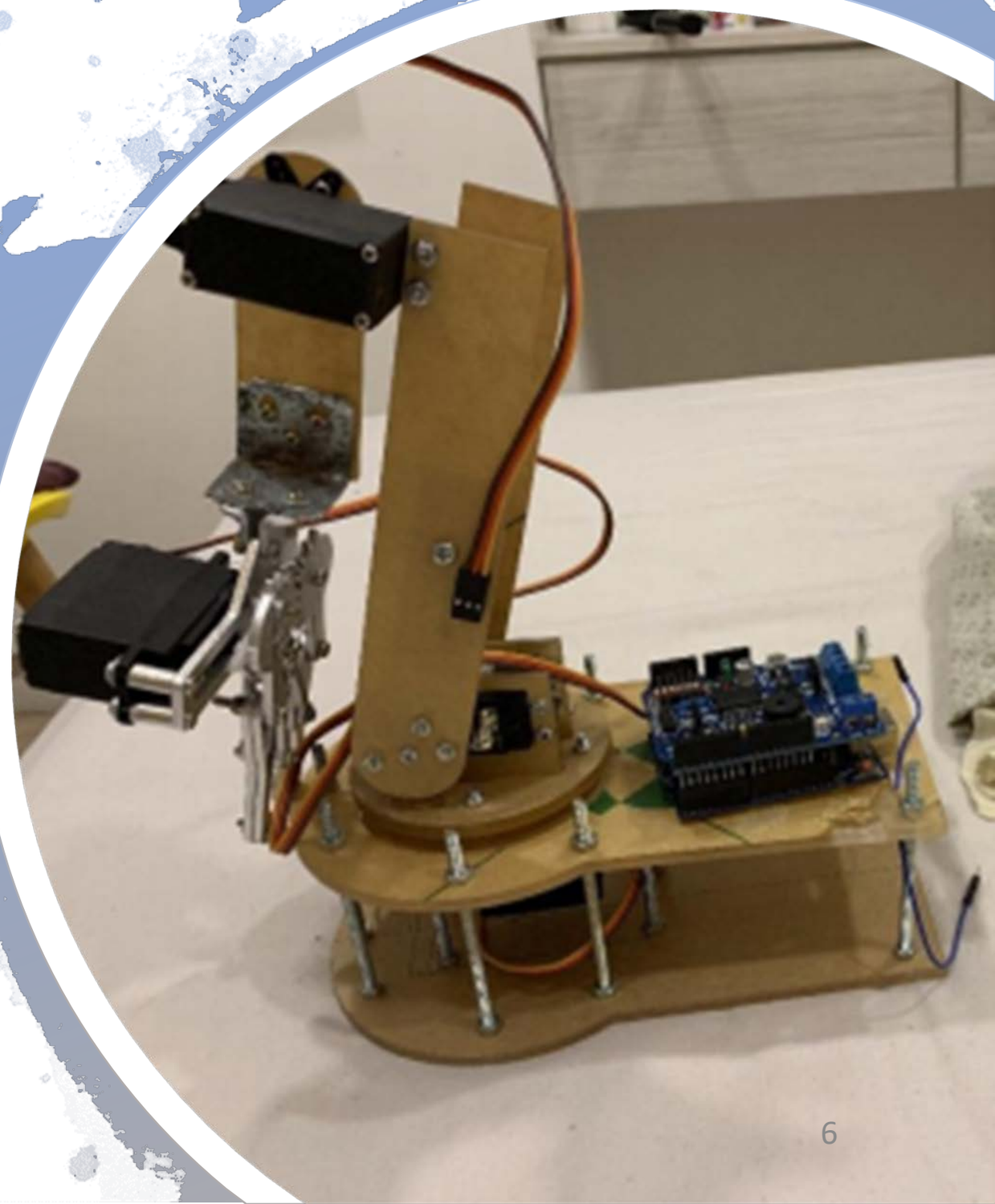
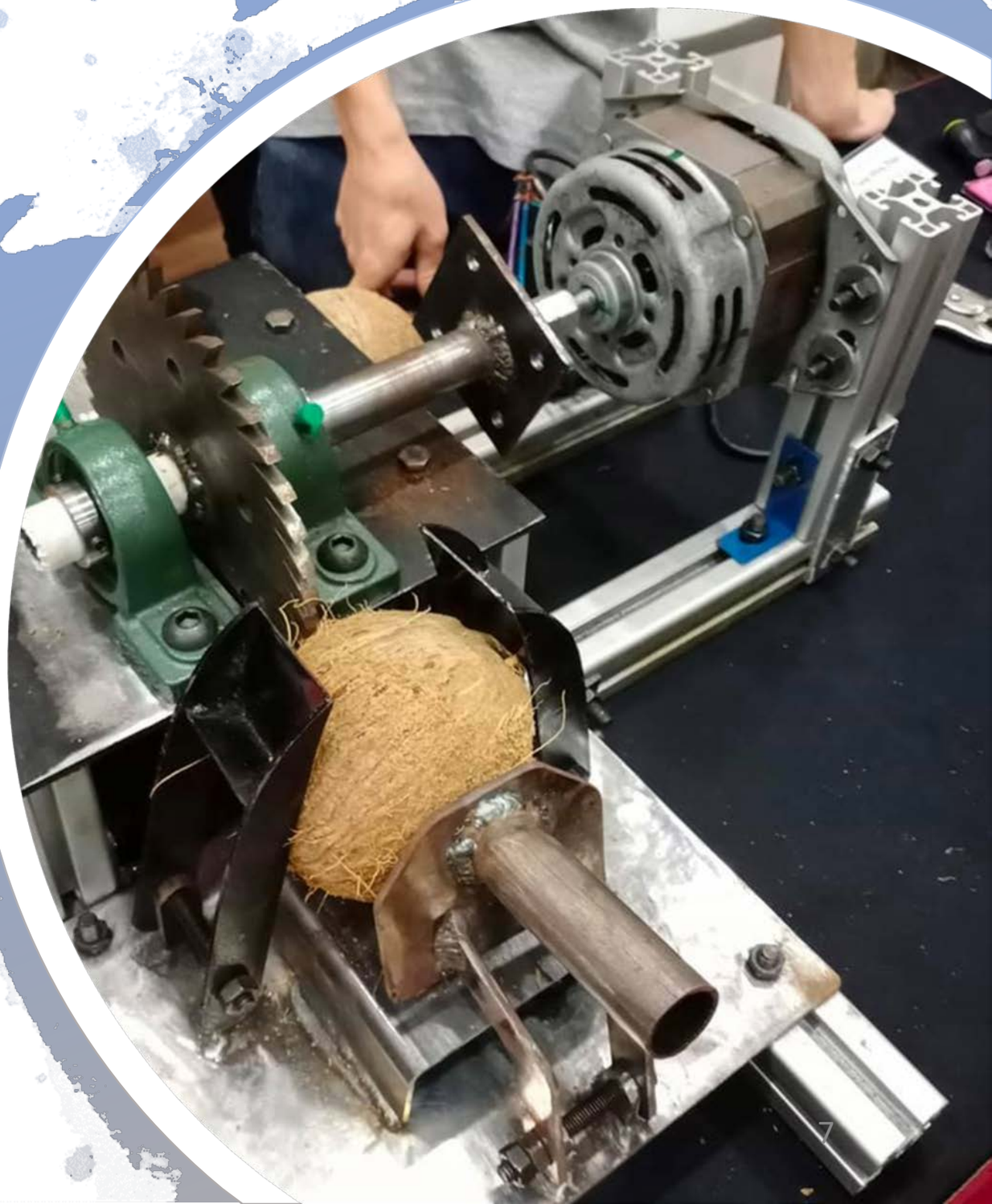


1. Robotic Arm for Autistic Children’s Teaching Aid

There are a major number of care centers for children with autism. Also, in the current market, many toys are specifically designed for autistic children. There are various ways in which others are helping autistic children. One of which is making toys that are designed to help specific symptoms of autism. One of the symptoms that the autistic children have, is lacking focus. It is very difficult to capture the attention of such children. The objective of this project is to make a puzzle whose pieces require attaching and detaching using a robotic arm.



2. Coconut Deshelling Machine

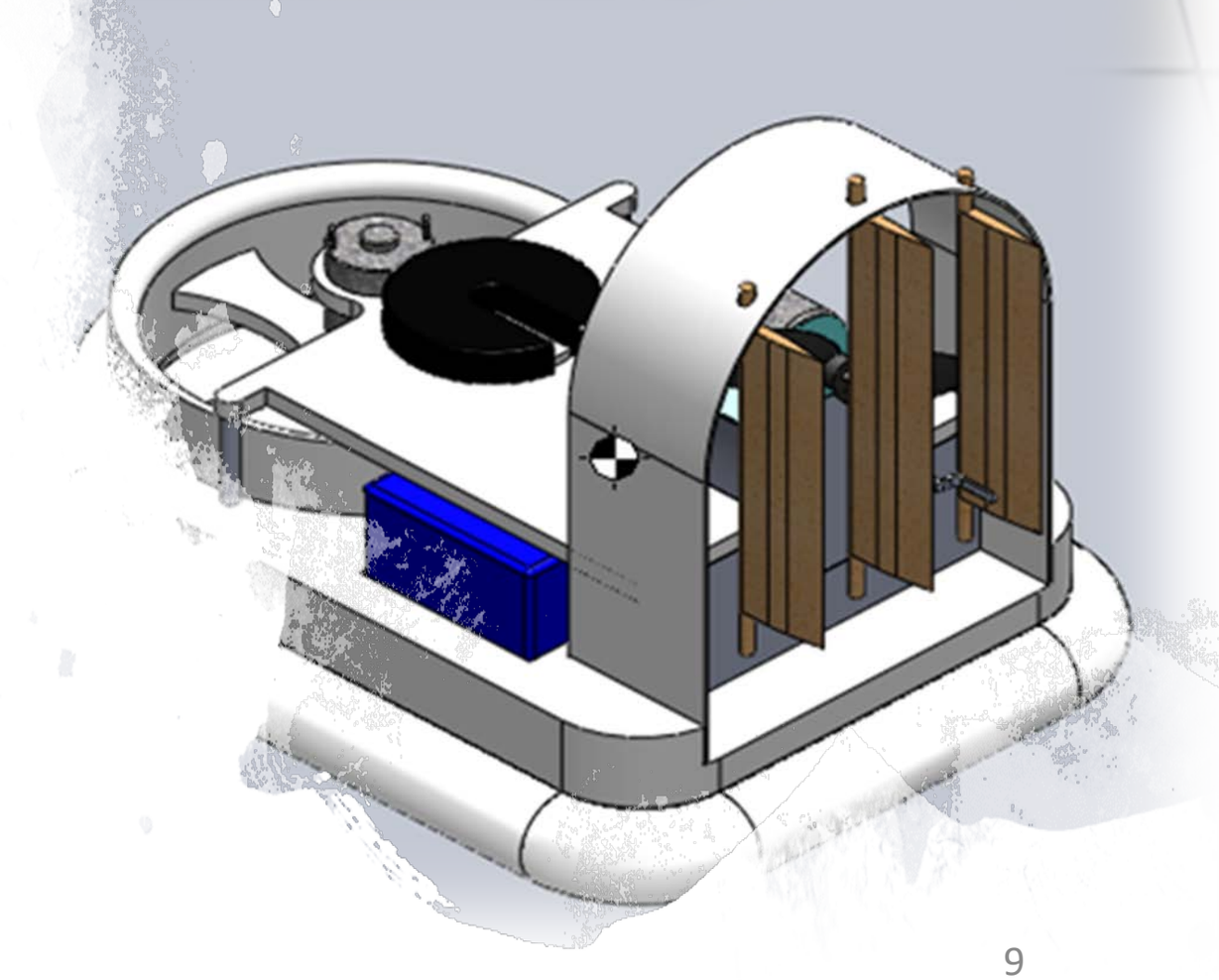
The current coconut deshelling method for removing the hard-shell from dried coconuts in the industry is very dangerous as the worker's hand is always in the risk of injury. We would like to have an automated (or semi-automated) machine/technique that can remove the hard shell of the dried coconuts without human hands or body involved or in danger. If the proposed automated machine can remove this softshell automatically, it would add value to the design or machine.

3. Automated Solar panel cleaning device

For photovoltaic panels efficient operation, the system must have appropriate cleaning conditions so that the dirt will not obstruct the solar radiation incidence. Solar panels need regular cleaning to ensure they are working at their optimum efficiency and spraying them with the hose from the ground or relying on a heavy downpour won't necessarily get the job done. Like the windows on your house, they need to be scrubbed and polished for maximum effect. However, washing the panels can be time-consuming or require costly automation–and it takes a lot of water, especially for a large solar farm like TNB Solar Farm in Sepang. Ideally, solar panels should be cleaned every few weeks to maintain peak efficiency, which is especially hard to do for large solar-panel arrays. To solve this problem, it is proposed to build an autonomous Solar Panel Cleaning Robot to do the job.

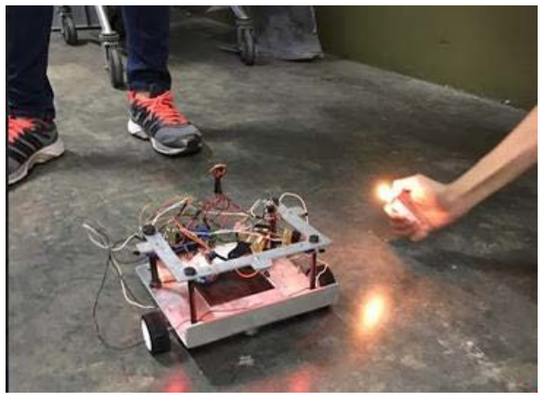
4. Thermal Camera Hovercraft

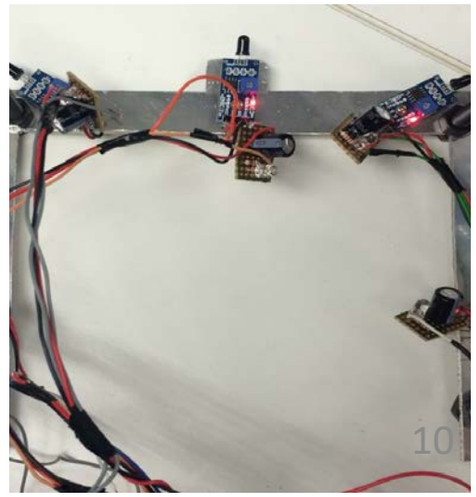
Malaysia has a tropical rainforest climate owing to its location on the equator of the planet; therefore the country only undergoes two seasons; dry and wet. Flooding is a common occurrence in Malaysia during the wet monsoon season which usually occurs from late October to early January. In a flood scenario, traversing from one location to another becomes a major problem due to the environment a vehicle has to work with. This environment will be a combination of bodies of waters in some areas and land/mud in some areas with debris scattered throughout. Therefore, we had to choose a vehicle that could work in such an environment. The idea we chose to go with was the hovercraft as it was an amphibious vehicle that could traverse in both wet and dry mediums with ease. The other core component behind the out design is the thermal imaging system. Thermal cameras work by measuring the radiation generated by heat on from the object in its field of view. The software in the camera then estimates the surface temperature of the object and maps the temperature into a color range display. By combining the two systems; thermal imaging and hovercraft, my group aims to create a scouting robot that can be sent ahead of rescue teams to locate and relay the location of stranded victims to search and rescue teams.



5. Automated fire-fighting robot

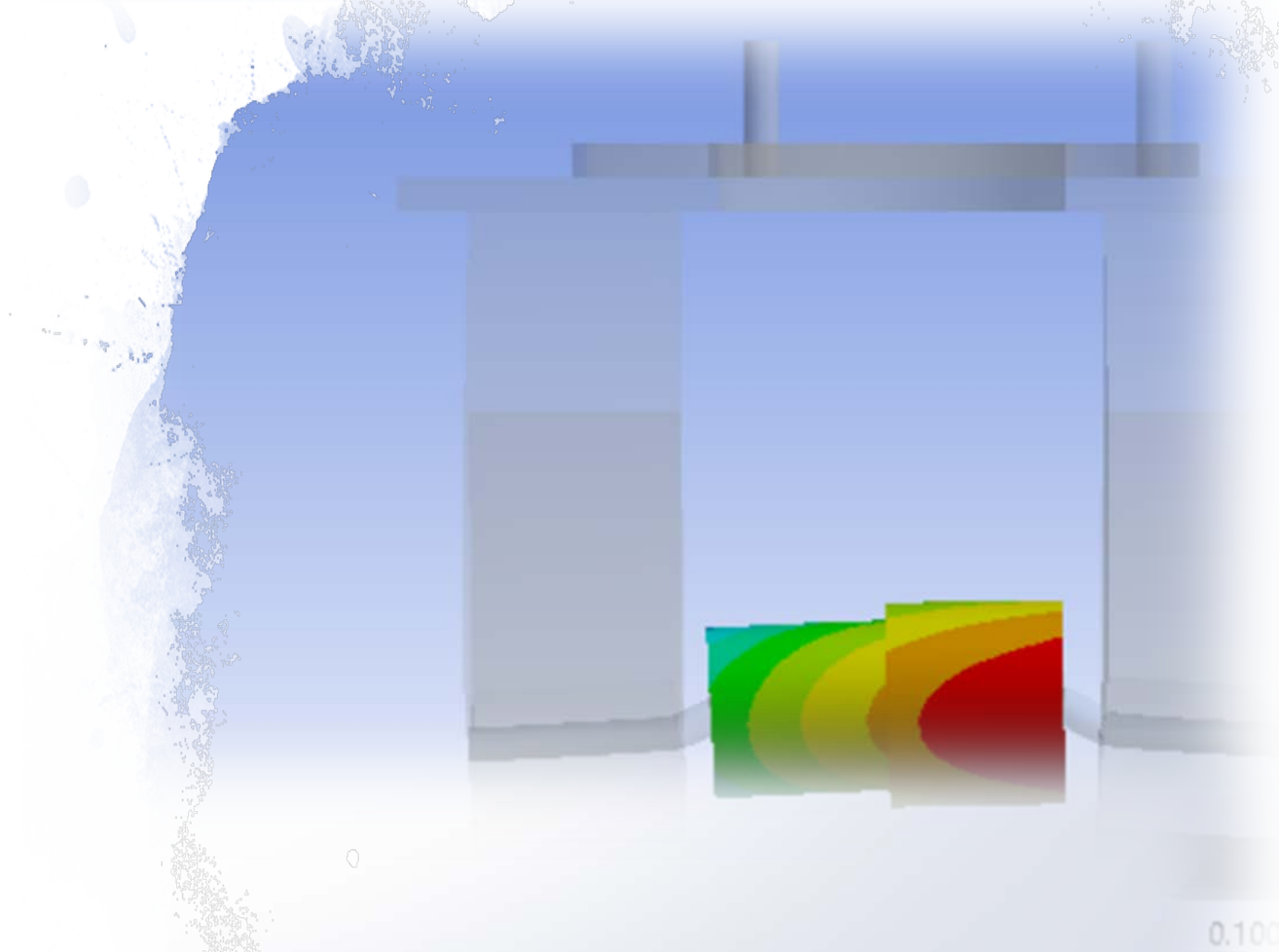
According to the Fire and Rescue Department Malaysia (JBPM) 2014 Annual Report, a total of 99,830 emergency calls which 54,540 (55%) calls involving fire cases were been made to JBPM. The annual report shows that death and injuries to fire had rapidly increased from the year 2013 to the year 2014, with a total of 139 death cases and 389 injuries. From the JPBM 2014 report, the time/duration of the fire response team remains crucial in determining the success of a fire extinguishing and rescue. Plenty of actions has been carried out by numerous fire extinguishing department, such as building additional fire stations in hopes to increase coverage areas just to reach fire scenes quickly. It has been found that the root cause of fire accidents to be dangerous is the long response time for firefighters. Therefore, the objective of this robot is to standby at high fire risk areas and search for fire automatically while maneuvering through obstacles. It does so by integrating itself with present fire/smoke alarms. If the alarms are triggered a signal will be drawn by the alarm and activating the robot to carry out the extinguishing process.

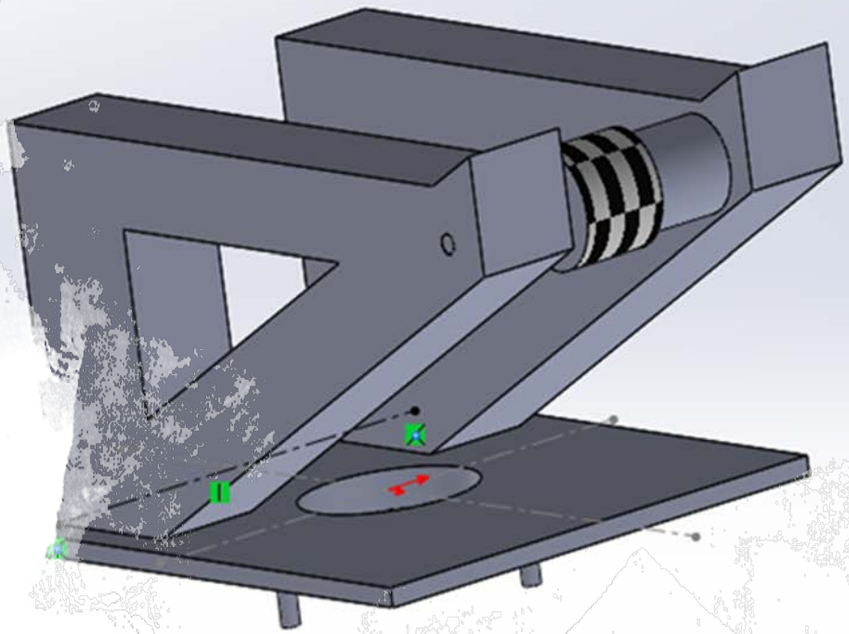


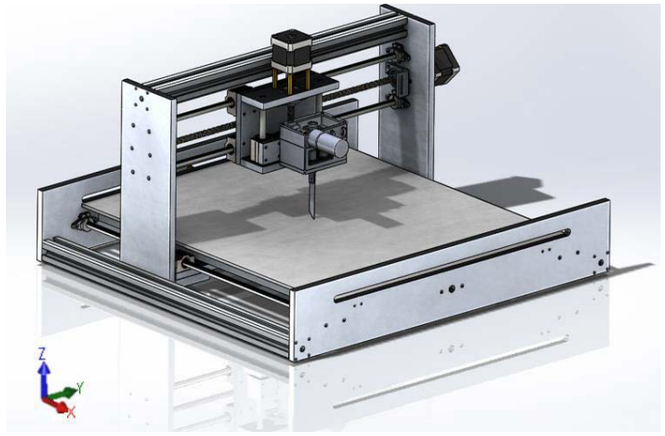


6. Weight Lifting Robot for Humanitarian Missions

Earthquakes and landslides are some of the examples of a major natural phenomenon that can cost thousands of lives. A certain percentage of the deaths mentioned is due to the events occurring after the phenomena itself. Deaths from these events happen due to the lateness of the search and rescue teams. Survivors from these phenomena might be trapped or lost due to collapsed buildings or even stuck in between heavy objects that they just cannot free themselves from without the help of heavy lifting machinery. The robot is designed to help these people and survivors during the time. The robot will be able to help carry these heavy objects that are refraining from people to escape. The robot is remotely controlled so that it reduces the amount of energy needed to be done by humans.







7. Paper Cutting Machine

Architects spend most of their time building paper and cardboard models of their designs. This is because most architecture models involve a lot of cutting and trimming of thin sheets of materials and most cutting is done by hand. In Taylor's University, there is a fully functioning industrial laser cutter but was not frequently used by the students. Laser cutters were difficult to set up and students lacked in-depth operating knowledge which students felt would be much faster and easier to manually cut the material. Furthermore, most materials used by architecture students are paper and cardboard which are prone to burn marks since the laser produces a considerable amount of heat to cut through materials. Therefore, this again presented itself as an opportunity to pursue the challenge of providing a solution that is in between laser cutting and manual cutting.

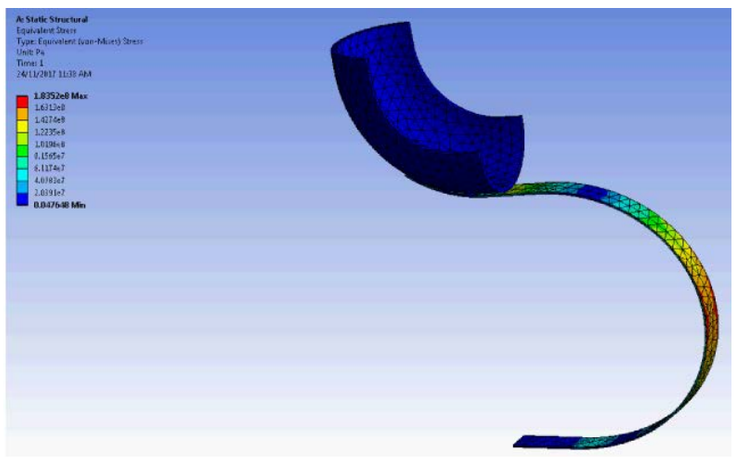
8. Organic Fertilizer Machine

Most factories are using traditional methods in producing organic fertilizer. All the processes are mainly by the manual process of mixing the fertilizer by a human. The process in making the fertilizers consist of three major part which is filtering the raw material, mixing the raw materials by using the concrete mixer and lastly packaging the product. All the process above is time-consuming because the workers must filter the raw material many times to get the fine forms and during this process, the workers may have injured or had muscle strains as the movement of back forth is repeated many times. Therefore, a machine will be built to solve those issues. The machine can be separated into three parts which are the filtering part, mixing part and transferring the soil.

9. Solar Water Distiller

Clean water is scarce in remote areas of the world. About 1.8 million people are killed by diarrheal diseases while tens of millions of the rest are in a terrible state of health due to unsanitary water conditions. While there are many cheap ways to treat water in rural areas such as plain sedimentation, slow sand filtration, and bio-sand filtration, these filtration methods remove physical contaminants in the water but not the microscopic ones that still exist in water. These “filtered” water still pose a threat to society. A simple way of purifying water would be to bring it to boiling temperature to kill off any microscopic pollutants residing in the water, but this does not remove limescale, chemicals and other pollutants in the water. Thus, the aim is to invent a water filtration system that was affordable and easy to maintain.

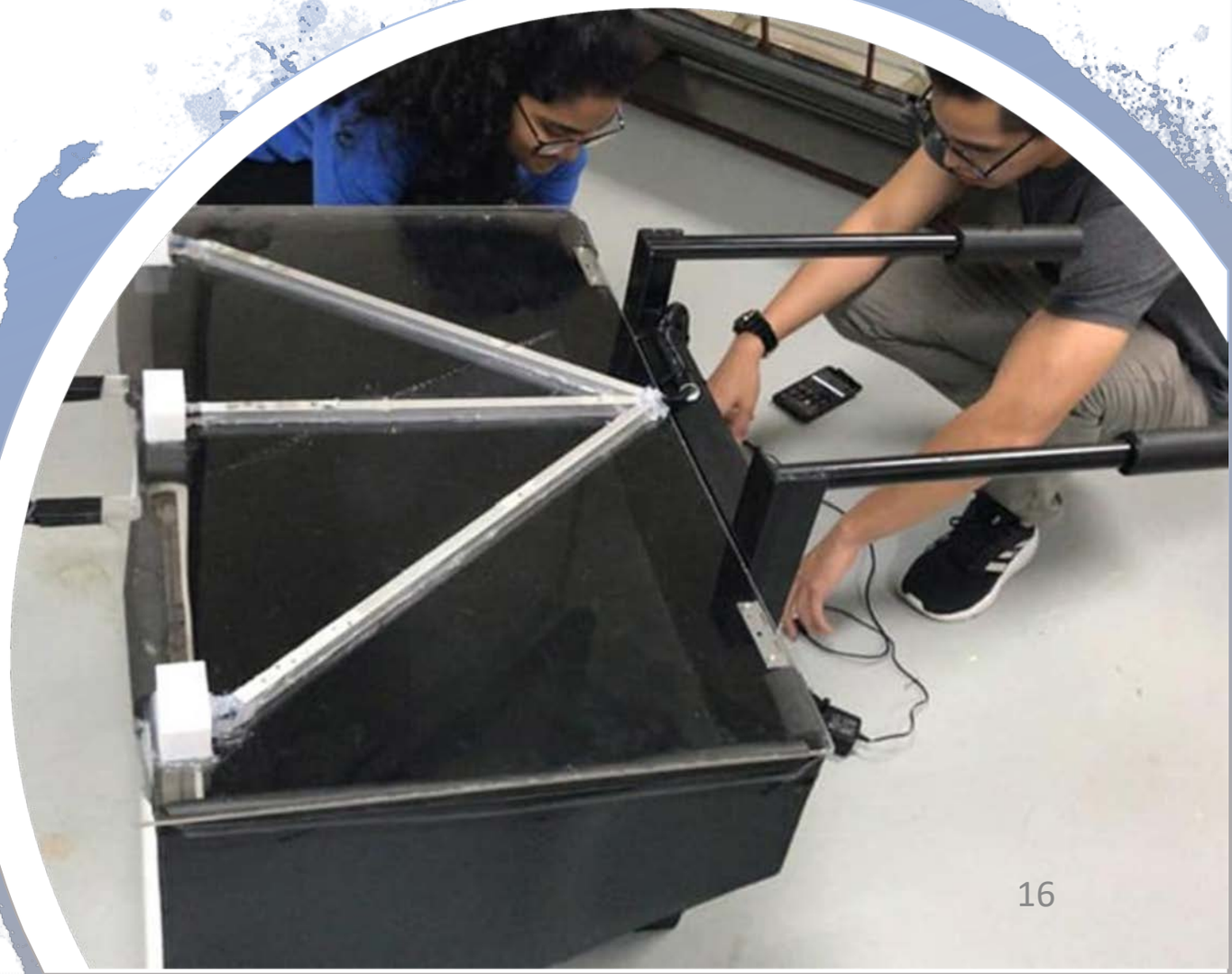
10. Walking Aid



About an average of 3500 young people, especially children suffer from injuries related to the usage of crutches. One of the most common injuries caused is crutch paralysis, which is a form of paralysis that affects the arm due to excessive compression by the crosspiece of a crutch. Consequently, Electromyography (EMG) is required for the diagnosis of such a condition as it helps assess the health of muscles and nerve cells that control them (motor neurons). After analyzing the background information on the disadvantages of crutches, it is required to successfully engineer the design for a new product. The aim is to mitigate all the existing disadvantages of the crutches to optimize or even replace existing markets for walking aids.

11. Automated Chicken Feeder

One major problem of the conventional open chicken feeder is it attracts rats. Rats can bring disease to the chicken and your family. Therefore, a closed chicken feeder with an automated function is needed to overcome the rodent problem, especially in large chicken farms.



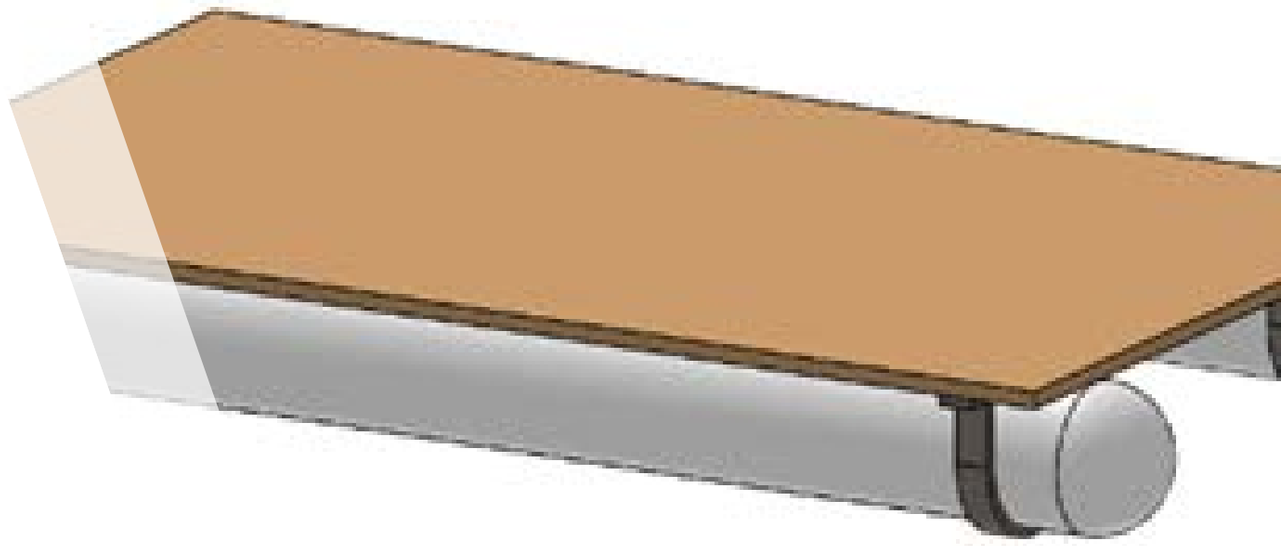
12. Formula SAE (FSAE) Racing Car

When you talk about top tier race drivers, training begins from as early as they can get into a go-kart and head out onto a track. But when does training for a race engineer start? In many cases, there are dedicated race engineering or automotive engineering courses that teach students how to function professionally, but it is also a practical hands-on experience that plays a large part in shaping these engineers. The best way to get a broader range of students interested in racing and motorsports is to offer a program within the school. The Taylor's Racing Team is one such program, with a rotating crew of students as each batch of seniors' graduate and the juniors take the helm. Taylor's Racing Team (TRT) is an avenue for students to unleash their potential by challenging themselves and putting their knowledge into practice. Students design and manufacture formula-style racing cars to participate in not only home-grown competitions but also in the Formula Society of Automotive Engineers – a prestigious international competition.

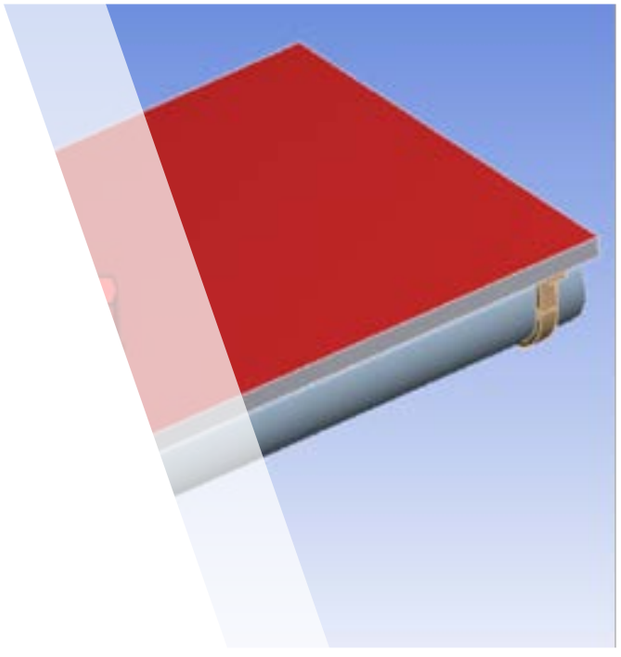
13. Quasi Passive Exoskeleton

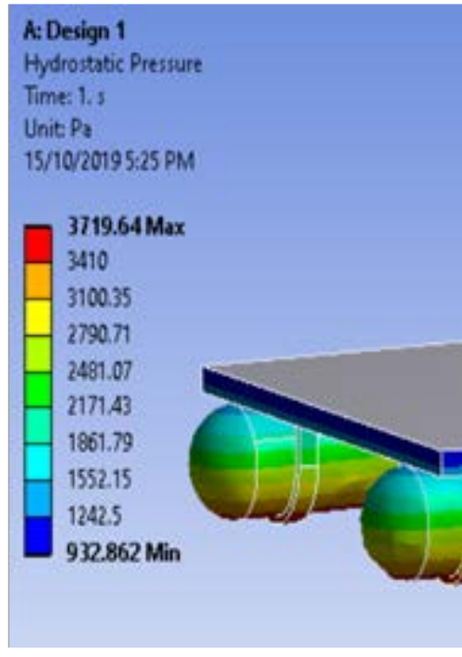
Walking is a crucial part of human locomotion. However, there are a lot of factors that affect the efficiency and ability to walk. Every year, at least 1 million athletes including professionals and youths suffer from sports injuries. Legs injury requires time to heal and rehabilitation. The design of Quasi Passive Exoskeleton will assist in the rehabilitation of the injured patients.

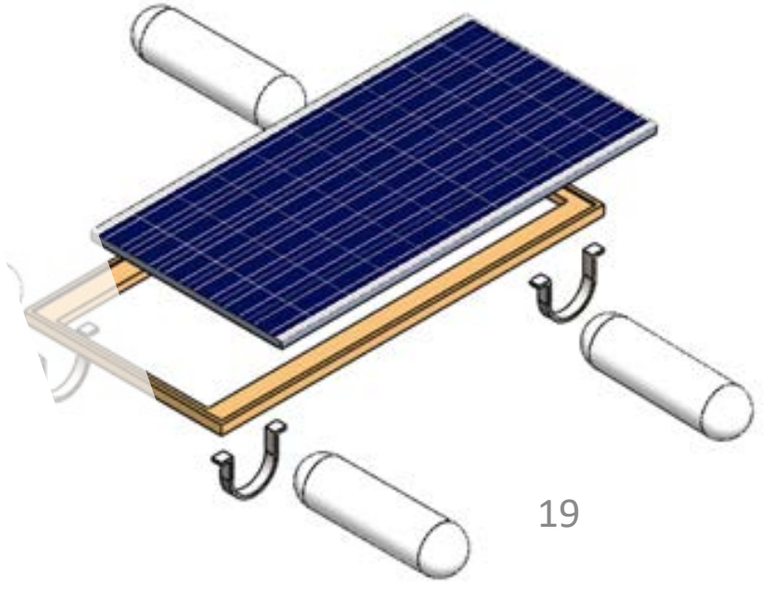
14. Solar Panel Floaters Using Recyclable Materials



The floating photovoltaic system is a new concept in solar technology that responds to the observable rise in electricity demand, limitations of land availability, along with the fast depletion of fossil fuels. The installation of PV modules has proven to be an intense burden on land requirements which is a ceaseless premium commodity. Hence, floating photovoltaic systems have numerous advantages over the conventional land mounted ones; such as higher power generating efficiency and ease of installment. However, the investment cost of floating PV plants raises doubt for commercialization due to the high manufacturing cost of each unit. Essentially, the flotation device called the pontoon constitutes nearly 50% of the investment cost. Therefore, this project aims to make a solar panel floater from recycling materials to cut down the cost of floaters.







15. Remote Controlled Palm Oil Loose Fruit Collector

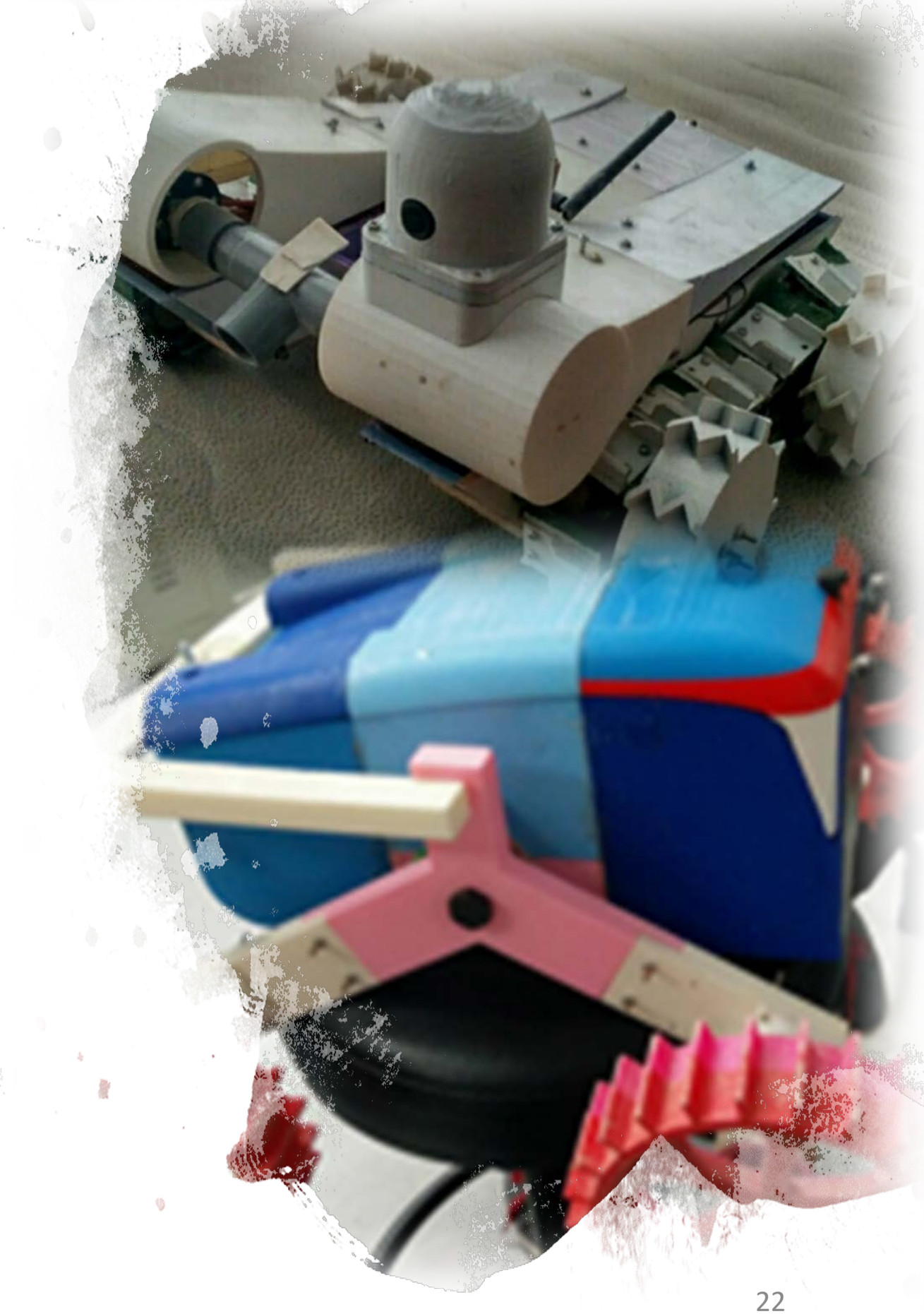
In oil palm plantations, the fruits will ripe and falls off to the ground. When the fruits are all scattered on the ground, the workers would walk around and pick all the fruits one by one. This is a very long and tiring process. Therefore the objective of this project is to collect the palm oil fruit that is scattered around the oil palm plantation. This project does not only save time, it also reduces the amount of headcount that is needed in collecting and assembling the loose fruit.

16. The Air-Jelly

In the past few years, a new technique was demonstrated by using drones for search-and-rescue, surveillance, traffic and monitoring the atmosphere. Initially, many approaches were done in constructing aerial robots and by using a jellyfish as a source of innovation a German automation company called Festo came up with a product called an Air-Jelly. Therefore, the aim is to construct a fully operational Air-Jelly about the one that was built by Festo.

17. Lunar Rover

The Google Lunar X Prize was created in 2007 as an incentive for people around the world to create an era in the future that allows humans to have cheap access to the moon and space. The objective of this competition is simple, that is to land a privately funded lunar rover onto the moon, move 500 meters and transmit high definition video and images back to the earth. Total prize money of 30 million is allocated for this cause. This competition is held for some reason; one of them is that the moon contains an abundant amount of rare metals and materials that are used on earth. This project aims to create a lunar rover that can travel for 500m, take pictures and videos in high definition and avoids obstacles autonomously.

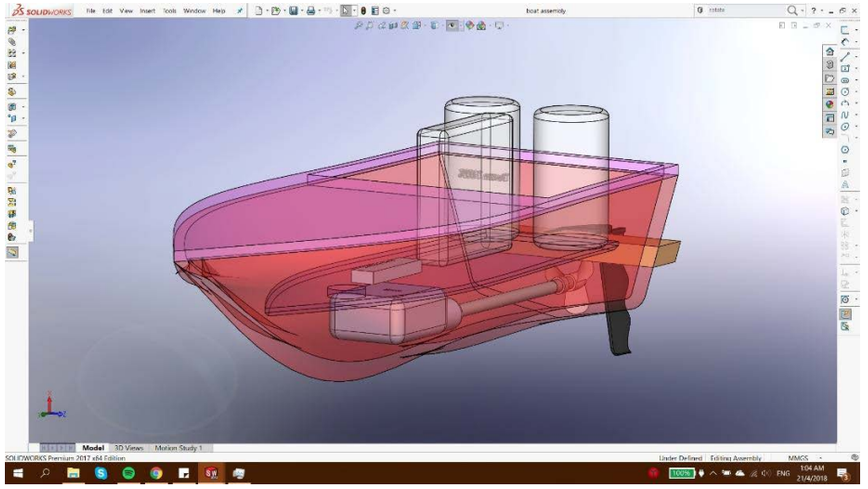


18. Human Powered Vehicle HPV

In the world today, fossil fuels are used often as energy sources. There can produce electricity by burning them and also for transportation. Therefore by burning them, this brings harm to the environment. The increase of carbon dioxide in the environment causes the greenhouse effect. This greenhouse effect is one of the main factors that cause global warming. Therefore, human-powered vehicle is introduced.

19. 3D Printed Hydrogen Fuel Cell Boat

Among the 14 Grand Challenges that were determined by the National Association of Engineers (NAE), one of the challenges is to “Restore and Improve Urban Infrastructure”. This challenge is closely related to transportation, maintenance of infrastructure and the effect that it will have on the environment. The modes of transportation using alternative energy sources were able to resolve the issue at hand. This is because transportation is one of the biggest contributors to not only environmental pollution but also the maintenance of infrastructure due to the harmful gases and by-products released by various modes of transport. One of the alternatives to the combustion engine is Hydrogen Fuel Cell. A boat would be the most effective way to use a Hydrogen Fuel Cell because it is a form of sea transportation. Water from the sea can be converted to hydrogen by the electrolysis process as the main fuel for the boat.



Ts. Dr. Mohd Faizal Fauzan is an Award-Winning Academics at Taylor's University Lakeside Campus. His research works focus specifically on Sustainable Development and Green Technology. Currently, he holds the position of Programme Director for Mechanical Engineering at Taylor's University. Dr. Faizal was born in Keningau Sabah (Malaysia) in 1987. He received his Ph.D. in Engineering in 2015 from Universiti Malaya (Malaysia). He has received several important recognitions to his career, including "Vice Chancellor's Award, Taylor's most cited academic", "Anugerah Khas YB Menteri Pendidikan Malaysia: Rekabentuk Kurikulum & Penyampaian Inovatif (AKRI)" and also several awards from Elsevier for "Outstanding Contribution in Reviewing". Dr. Faizal is also recognized as Professional Technologists (Green Technology) by the Malaysia Board of Technologist (MBOT).

Ir Dr. Siva Kumar is a professional engineer with 18 years of experience with brands like Panasonic. He is also recognized as a Chartered Engineer in Malaysia, the United Kingdom, and Australia. He is currently working with Taylor’s University as the Head of School. He launched his engineering career in one of the largest cathode ray tube (CRT) manufacturing companies in the world and out of sheer passion pursued his postgraduate studies. His enthusiasm to seek new knowledge, coupled with a compelling vision to produce engineers capable of addressing global challenges through effective enhancement of knowledge, nurturing of skills and an emphasis on emotional intelligence propelled him towards the academic field in which he has remained for the past 15 years. He is a firm believer in continual quality improvement and in imparting his knowledge to all to create a teaching and learning environment where teachers and students can dream big, be different and have fun.

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