

MOHAMAD HAZIQ BIN AHMAD YUSRI

DEVELOPER & PROGRAMMER



ABOUT ME



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I am a robotic engineer with 4 years of experience in programming and currently in last semester for master's degree at UiTM Shah Alam. I have loved making robots since high school and ambitious to produce a robot of my own that can be used to help and facilitate daily work. Apart from that, I teach a lot of basic programming to all ages from primary school to University level. With programming I also have experience in the field of Internet of Things (IoT), and Augmented Reality (AR).



SOFTWARE SKILLS

PROGRAMMING : C++

PROGRAMMING : PYTHON

PROGRAMMING : HTML + CSS + JS

3D DESIGN (CATIA/TINKERCAD)

AUGMENTED REALITY (AR)



EDUCATION

2020-Current Universiti Teknologi MARA (UiTM) Shah Alam
Master of Science in Mechanical Engineering
(RESEARCH)

2015-2019 Universiti Teknologi MARA (UiTM) Shah Alam
Bachelor (Honour) of Mechanical Engineering
CGPA : 3.65 (First Class Honour)

2014-2015 Universiti Teknologi MARA (UiTM) Puncak Alam
Foundation in Engineering
CGPA : 3.42
MUET : Band 3

2009-2013 SMK Seri Pagi Senawang
Science Account
SPM : 8A 1B
Qualification : LCCI Certificate (Lvl 2)



EXPERIENCE

Sport Engineering & Artificial Intelligence (SEA-IC) UiTM | Feb'19 – Current

- OTHM Qualification (Vivatel Hotel Kuala Lumpur)**
23 – 29 August 2020
 - Provide professional programming tutoring to the participants and also assisting professional lecturers.
 - Teach them how to resolve software problem (programming).
- Research Assistance**
 - Develop an Augmented Reality (AR) platform in marine sector
 - Develop autonomous UGV using ROS environment
- Arduino Class (Hardware and Software)**
 - Provide personal programming class using Arduino for University students.
 - Provide basic and advance Arduino training to the high school, bachelor and foundation students.
- TVET IOT 4.0 (24/2/2020) – UiTM smart class room**
 - Provide professional programming tutoring in Industrial Revolutions (IR 4.0) to the senior lecturers.
- Science, Technology, Engineering & Mathematics (STEM) 2020**
 - Assist and Coordinate STEM activities for the STEM's competition at UiTM Pulau Pinang.
 - Provide IoT training and tutorials to the STEM's participants.



PROJECTS



LANGUAGES



MALAY



ENGLISH



JAPAN



ARABIC

PROJECT 1

AUTONOMOUS NAVIGATION FEATURE ON UGV USING ROBOTIC OPERATING SYSTEM (ROS) ENVIRONMENT



INTRODUCTION



This project presents a study, focuses on the use of a Robotic Operating System (ROS) environment to manage and control the motion characteristics. The combination of LiDAR sensor and Raspberry Pi 3B microcontroller enable the UGV to sense and decide the task with better accuracies, e.g., avoid objects and obstacles while performing prescribed navigation tasks. In order to verify the effectiveness, several assessments are designed and put to the test.



DEPLOYMENT



The overall overview of the deployment of the logistic management system is illustrated by the following stages.

Stage 1: Design prototype model of UGV

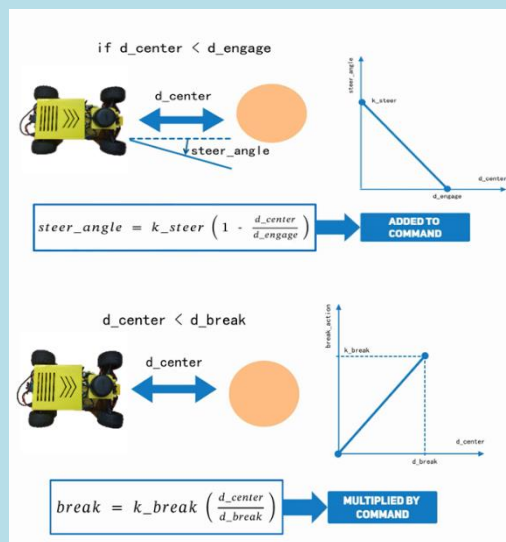
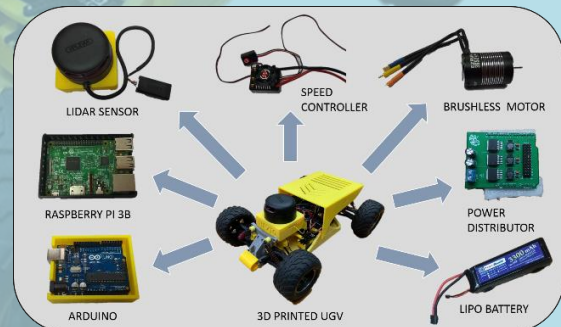
Stage 2: ROS environment setup in Raspberry Pi on Ubuntu OS

Stage 3: ROS communication applications
(Publisher, Subscriber, Topics)

Stage 4: Electronics and power distribution setup

Stage 5: Programming Ecosystem deployment

The design of heavy-duty chassis for the UGV process is done by using CATIA software. Then, the prototyping process is facilitated by 3D printing technology and almost 80% of the UGV parts are printed including gears using Polylactic Acid (PLA) material type. The mechanical design of the UGV focused on sustaining heavy loads and abrupt changes during accelerating and braking.



The major part for the UGV is the power supply. The 3 cells battery that contain 11.1V, and 3300mAh is used to distribute the power to all electronic devices equally using power distributor. Power distributes as follow:

Raspberry Pi 3B : Operates at 5.2V and 1.35A

RP LiDAR A2 : Operates at 5.0V and 1.50A

ESC : Operates at 11.1V and 45A (max)

Arduino : Power supply from Raspberry Pi 3B

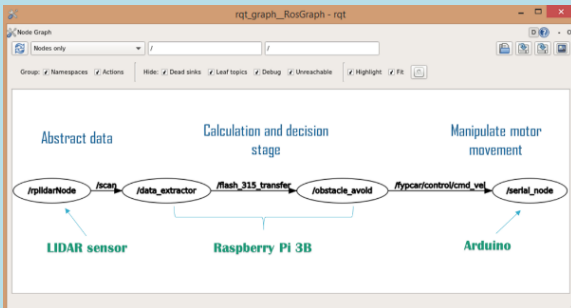
Next, to manoeuvre the UGV automatically, the UGV needs decision maker that will calculate the steering angle, and avoid from colliding with the obstacles. Therefore, simple drive formula has been applied into the system by manipulating the incoming data from the LiDAR sensor.

PROJECT 1

AUTONOMOUS NAVIGATION FEATURE ON UGV USING ROBOTIC OPERATING SYSTEM (ROS) ENVIRONMENT



ROS NODE FLOW



Next, the UGV is setup using the following node flow structure :

- 1) Extract data from the LiDAR sensor
- 2) Apply decision maker formula
- 3) Calculate and Estimate the surrounding distance
- 4) Give command to the motor via Arduino

These structure are deployed on ROS environment



CODING

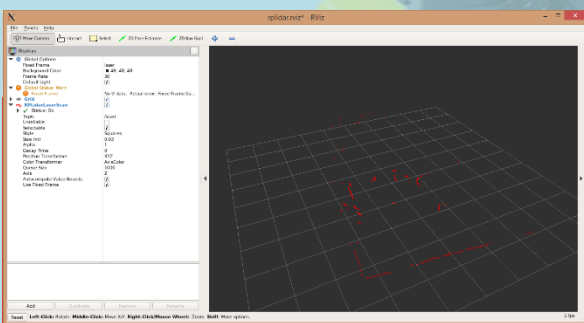
In this UGV system, python and C++ programming architecture are used in ROS environment. There are 4 ROS nodes structure with different type of programming languages applied for each section. The LiDAR node will publish the data in form of distance and angle for every 1 degree of rotation. Then, decision maker node will subscribe the LiDAR node and estimate the movement speed and direction for the UGV. Lastly, the speed data will be sent to the Arduino to move the motor.

```
int main(int argc, char **argv)
{
    ros::init(argc, argv, "data_extractor");
    ros::NodeHandle n;

    ros::Subscriber sub_laser = n.subscribe("/scan", 1, clbk_laser);
    my_pub = n.advertise<std_msgs::Float32>("flash_0_transfer",1);
    pubg = n.advertise<std_msgs::Float32>("flash_45_transfer",1);
    you_pub = n.advertise<std_msgs::Float32>("flash_315_transfer",1);
    ros::spin();
}
```



DATA INPUT



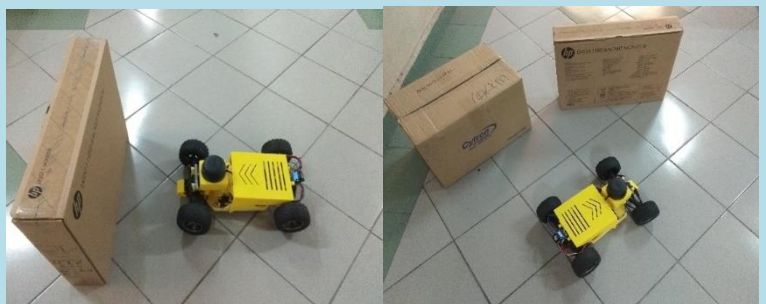
Rviz framework displayed the data points obtained from the LiDAR sensor. The points are plotted in 2D cartesian plane and form point clouds mapping. These points show the obstacles surround the UGV and the distance between them. Therefore, with these data, the system can decide a safe path to manoeuvre until reach the destination point.



FIELD TEST

The UGV is successfully tested running on the hallway with 2 boxes as obstacles. The UGV stop moving when there are suddenly object appeared that block its path. But, if the object is static, the UGV will automatically change directions to avoid from colliding.

Get more details about this project here



DEPLOYMENT OF AUTONOMOUS NAVIGATION FEATURE ON AN UNMANNED GROUND VEHICLE (UGV)

ABSTRACT

This project presents a study about the deployment of autonomous navigation feature on an unmanned ground vehicle (UGV). Specifically, the study focuses on the use of a robotic operating system (ROS) to manage and control the motion characteristics. To realize autonomous navigation, an advanced light detection and ranging (LIDAR) sensor is integrated into the UGV. The core hardware Raspberry Pi and Arduino are used for sensing and actuating mechanisms. The aforementioned core hardware enables the UGV to sense and decide the tasks with better accuracies, e.g., avoid objects and obstacles while performing prescribed navigation tasks. In order to verify the effectiveness of the proposed solution, several assessments are designed and put to the test. The outcome of this project is will be beneficial in the manufacturing industry for example in material handling section in assembly plant and managing inventory of goods in warehouse such as Amazon, Lazada companies, .

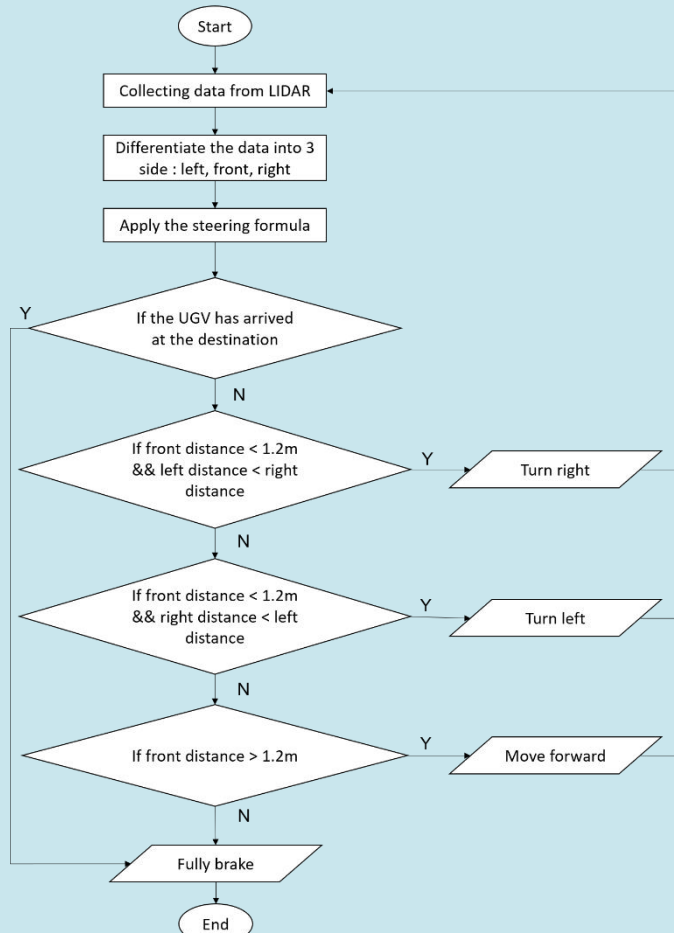
INTRODUCTION

The advent of fourth revolution industry (IR4.0) catalyzes the growth of digital technology which has solved many industrial problems in production, manufacturing and logistics. In this project, we explore and conduct a study on logistic of finished parts in much detailed context pertaining to hardware and software components in order to effectively transport a finished part from one point to another. This is done through the deployment of robot operating system (ROS) framework on the logistic management system.

OBJECTIVE

1. To apply the light detection and ranging (LIDAR) sensor on the UGV in avoiding the obstacles.
2. To develop an algorithm in robot operating system (ROS) environment for the UGV in python and C++ languages.

METHODOLOGY



Programming ecosystem of the UGV

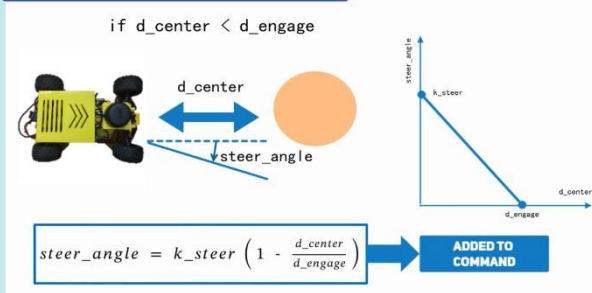


Figure 1: Steering formula in avoiding the obstacles

RESULTS AND DISCUSSION

1. Design optimization and development

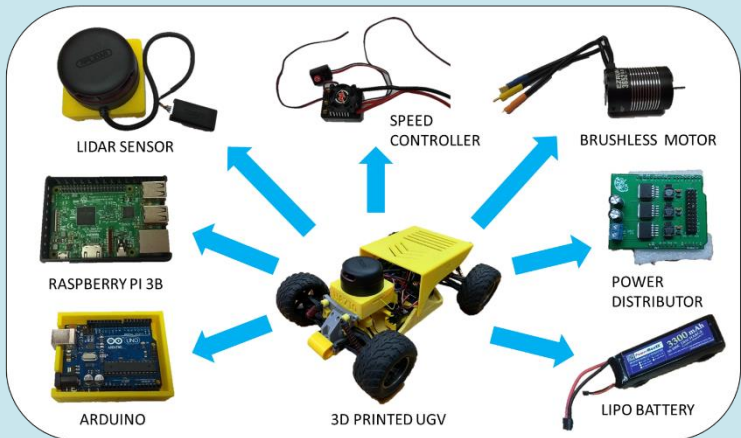


Figure 2: UGV main devices

2. Experimental result



Figure 3: UGV fully brake when the distance is less than 0.4m



Figure 4: UGV successfully avoid the obstacles

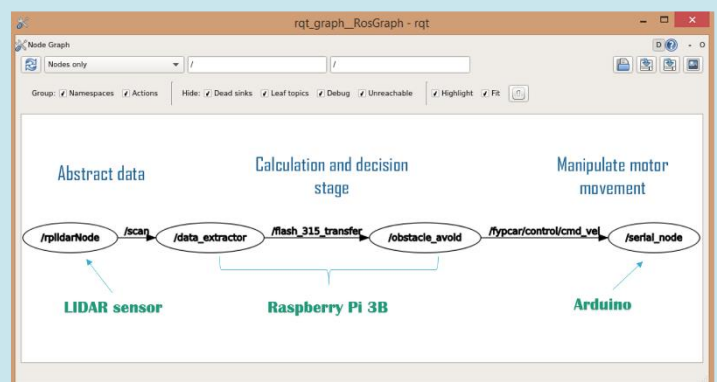


Figure 5: Programming structure in ROS environment

CONCLUSIONS

In conclusion, this project has successfully developed the logistic management system that employs UGV as the main test bed and utilize a LIDAR sensor to optimize autonomous navigation task.

In this project, a number of programming languages, and software were deployed to ensure the UGV behave according the prescribed goals.

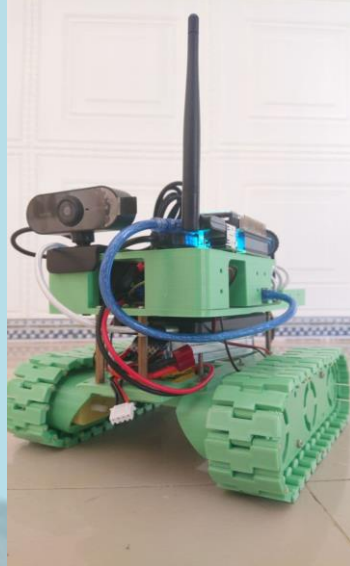
The results illustrate that the low speed movement provide greater accuracy but it is a trade off between accuracy and processing time.

It is also found that, ROS environment response smoothly with acceptable latency (time delay) and give rise to better control of the UGV.

PROJECT 2

Air Quality Monitoring using Surveillance Ground Vehicle (SGV)

Indoor Testing



This SGV is a hobby project during lockdown due to the pandemic of Covid 19. The objective of this robot is to monitor any activities that happened inside and outside the house. In the same time, this robot is equipped with humidity and CO_2 gas sensor to observe the indoor and outdoor air quality. While, for the microcontroller, Raspberry Pi 3B+ is used as a main controller to control the motor and received the sensors data via ROS environment. The simple programming of C++ is used to link up the motor and the laptop keyboard together.

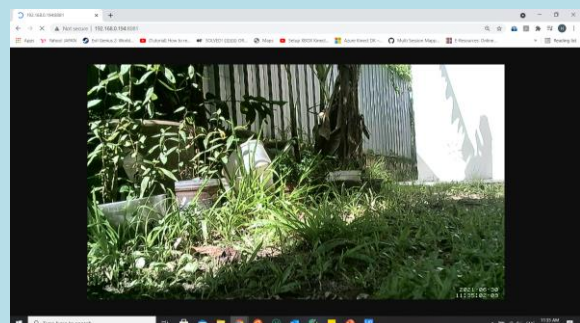
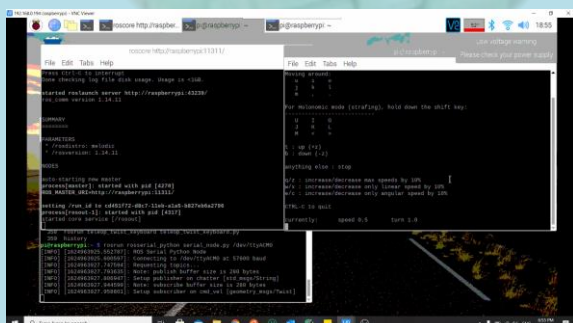
Outdoor Testing

This SGV is controlled via keyboard command to manoeuvre around the house. It can go as far as the SGV connect with the home WIFI network. If the SGV move outside the WIFI signal range, the user cannot control the SGV until the signal comes back. Therefore, to increase the WIFI range, WIFI antenna is used as a WIFI extender.

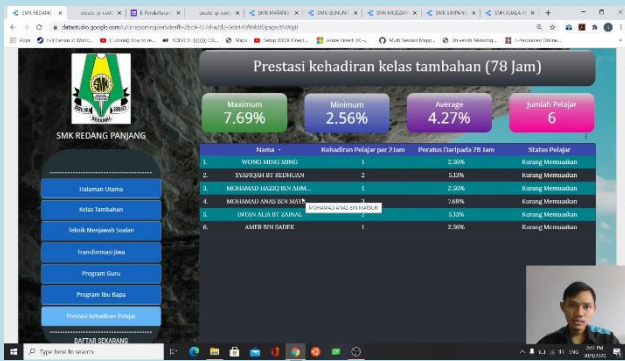
The body kit of this SGV is designed in CATIA and printed using PLA material. The SGV is powered by Power Bank and 2200 mAh LiPo battery to power up 4 DC motors and Raspberry Pi 3B+.



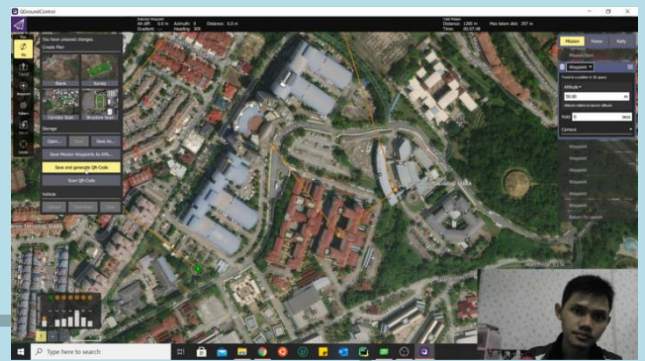
Robot vision



OTHER PROJECTS



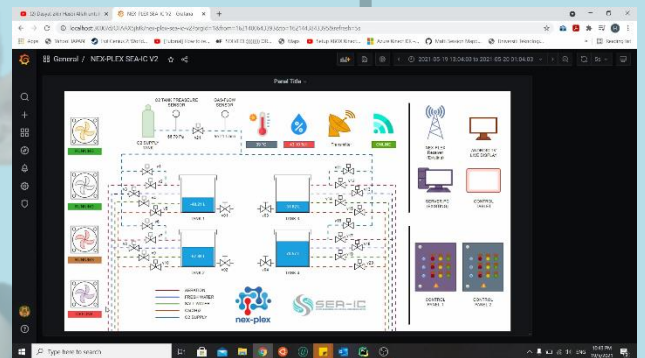
Develop Dashboard for SMK Redang Panjang



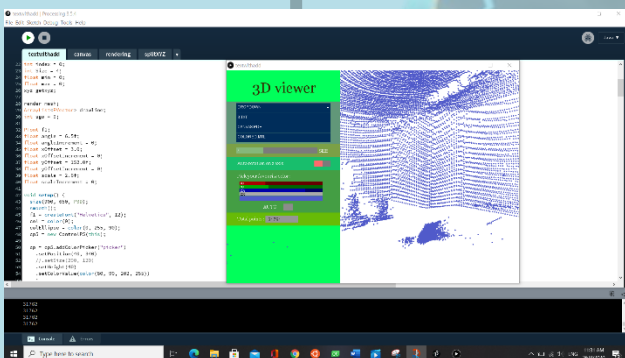
Adding QGroundControl (QGC) features



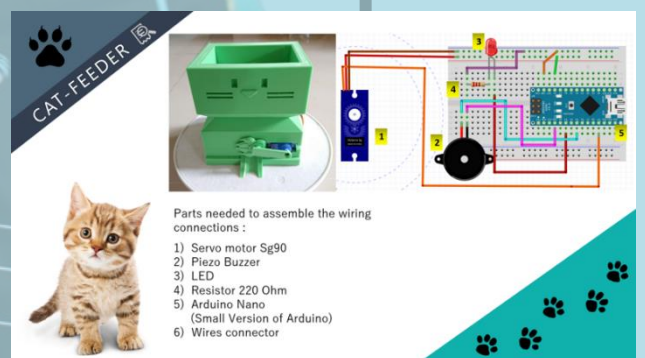
Develop GUI for Arduino Interface



Develop IoT Monitoring Dashboard



Develop GUI for 3D View for point clouds using Processing software



Develop Automatic Cat Feeder for Arduino Course



Develop Simple Mini Tank Controlled by Raspberry Pi



Develop Combat Robot For Competition

ACTIVITIES & ACHIEVEMENTS

OTHM Qualification

Venue = (Vivatel Hotel Kuala Lumpur)

Date = 23 – 29 August 2020

Summary :

Provide professional programming tutoring to the participants and also assisting professional lecturers. Teaching them how to use Raspberry Pi as a medium for Internet of Things (IoT).



Science and Technology Festival

Venue = SMK SEKSYEN 14

Date = 10 November 2020

Summary :

Demonstrating the benefits Internet of Things (IoT) program to the students and teachers. Then, expose to the students with current technology such as home automation, 3D printing, and robotics.

ACTIVITIES & ACHIEVEMENTS



Custom Hands On Integrated IoT Project for Industrial Application

Venue = UiTM Shah Alam (Smart Class Room)

Date = 24 - 28 February 2020

Summary :

Provide professional Internet of Things (IoT) training to the participants and assisting professional lecturers. Increase their understanding about coding structure and behaviours.



IOT Tutoring

Venue = UiTM Shah Alam (SEA-IC)

Date = 04 November 2019

Summary :

Provide personal tutoring to team SMK Sungai Buloh before entering the National Innovation Competition. They won a trophy for 2nd place in the competition.

REFERENCES



اَبُو كَرِيْمٍ سَيِّدِي تِي كَوْنُو كِي مَارَا
UNIVERSITI
TEKNOLOGI
MARA



SEA-IC
SPORTS ENGINEERING AND ARTIFICIAL INTELLIGENCE CENTRE



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Faculty of Mechanical Engineering UiTM Shah Alam

Position = Senior Lecturer

Company = Sport Engineering & Artificial Intelligence (SEA-IC)
(Founder & Head of SEA-IC)

TEL = 010-6051919



Mohd Hanif Mohd Ramli (Dr.)

Faculty of Mechanical Engineering UiTM Shah Alam

Position = Senior Lecturer

Company = Sport Engineering & Artificial Intelligence (SEA-IC)
(Founder & Programmer of SEA-IC)

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