MOHAMAD HAZIQ AHMAD YUSRI

DEVELOPER & PROGRAMMER

ABOUT ME

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I'm the founder of SHARK company, a trailblazing venture at the forefront of Augmented Reality (AR) and Virtual Reality (VR) technologies. As an entrepreneur driven by a passion for pushing the boundaries of human experience, I embarked on this remarkable journey to transform how we interact with the digital and physical worlds. My fascination with the potential of AR and VR began long before the technology reached its current state. Over the years, I closely followed the evolution of these immersive technologies, eagerly anticipating their transformative impact on various industries. Witnessing AR and VR's fusion of art, science and technology, I was inspired to establish SHARK as a beacon of innovation and creativity, especially in enhancing education system.

SOFTWARE SKILLS

PROGRAMMING : C# + C++

PROGRAMMING : PYTHON

PROGRAMMING : HTML + CSS + JS

3D DESIGN (BLENDER)

AUGMENTED REALITY (AR) - UNITY

LANGUAGES

MALAY

ENGLISH

EDUCATION

2020-2023 **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**

- **International Innovation Competition (IINNCOME 2022)**
  - Develop AR in teaching Arabic linguistic terms (Silver Award)
- **Blender Class**
  - Basic Blender training to SMKA Tun Rahah for 2 days
  - Provide 3D printing services for their 3D design
- **MAHA 2022 Project with LKIM**
  - Develop AR apps for exhibition display at MAHA 2022 in the main hall A
  - Design 2 models: ship and solar dome to display in AR environment
- **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 classroom**
  - Provide professional programming tutoring in Industrial Revolutions (IR 4.0) to the senior lecturers.

PROJECTS

PROJECT 1

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

INTRODUCTION

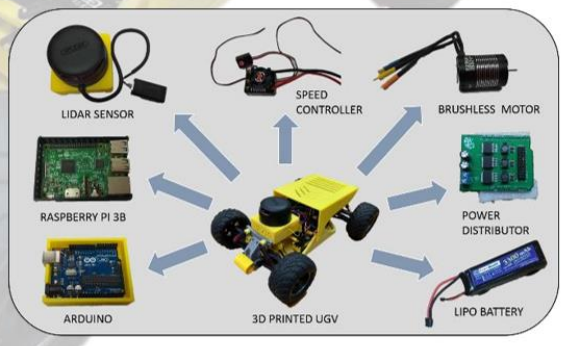
This project presents a study, focuses on the use of a Robotic Operating System (ROS) environment to manage and control the motion characteristics. The combination of LiDAR sensor and Raspberry Pi 3B microcontroller enable the UGV to sense and decide the task with better accuracies, e.g., avoid objects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

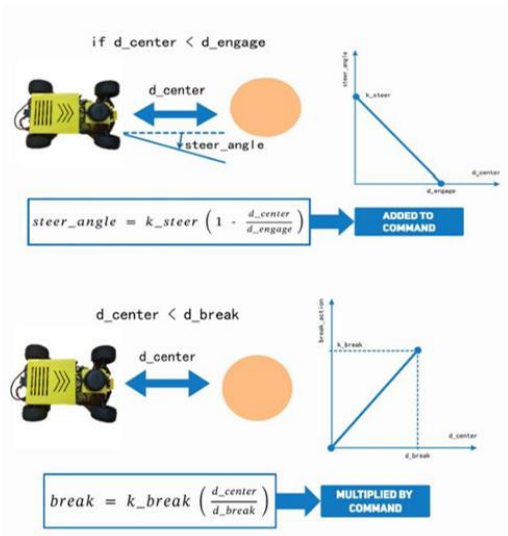
DEPLOYMENT

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:

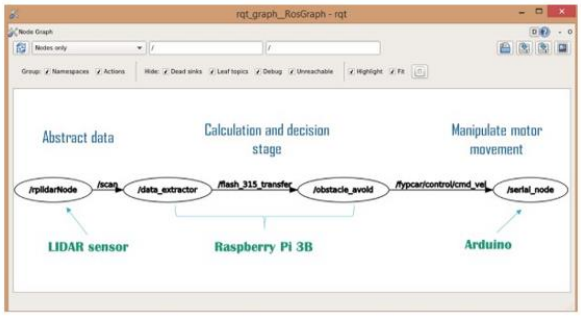
Raspberry Pi 3B : Operates at 5.2V and 1.35A
RP LiDAR A2 : Operates at 5.0V and 1.50A
ESC : Operates at 11.1V and 45A (max)
Arduino : Power supply from Raspberry Pi 3B

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

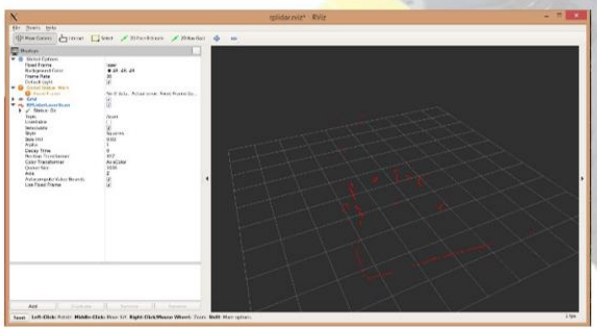
These structure are deployed on ROS environment

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

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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, .

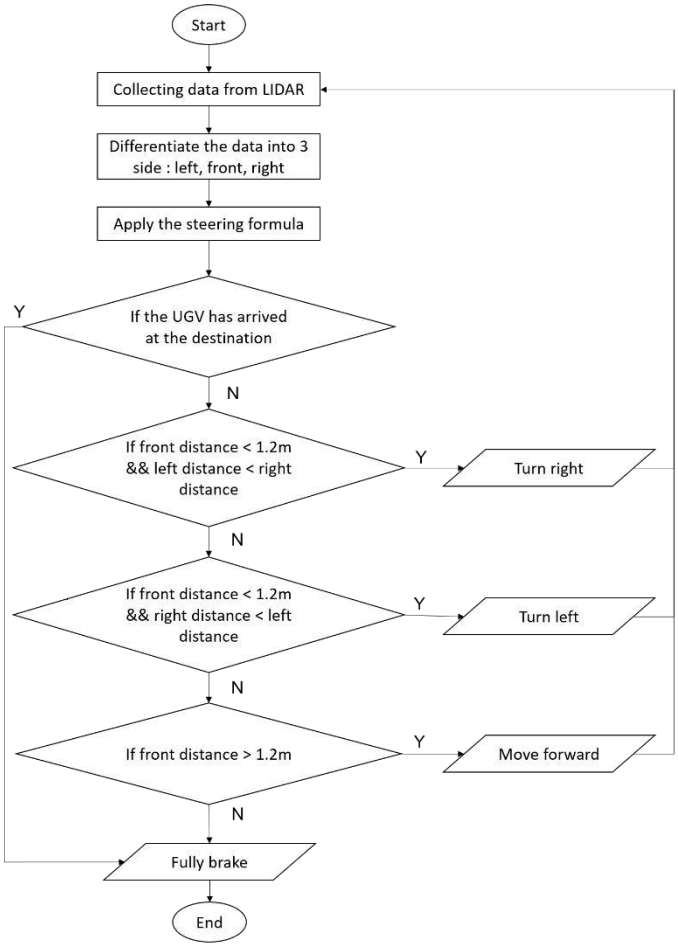
INTRODUCTION

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

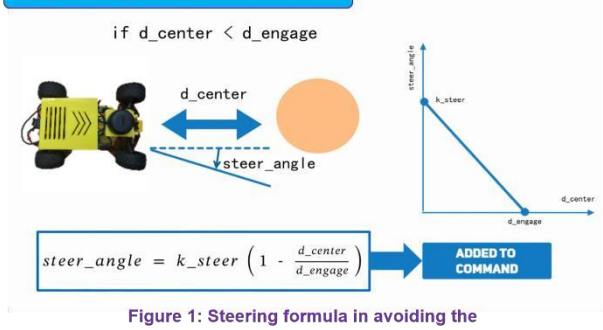


Figure 1: Steering formula in avoiding the obstacles

RESULTS AND DISCUSSION

1. Design optimization and development

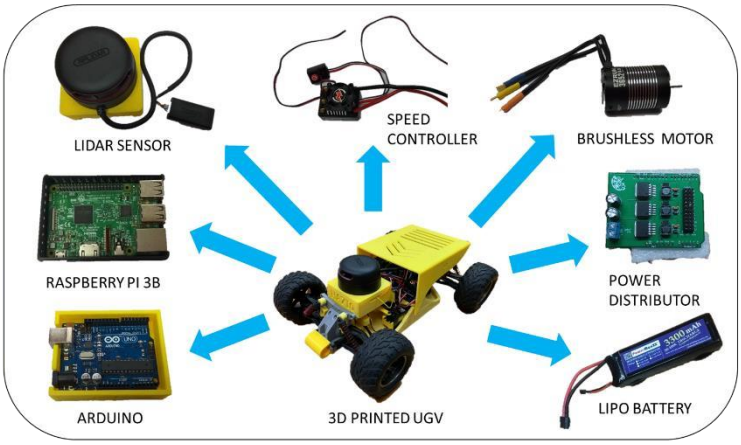


Figure 2: UGV main devices

2. Experimental result

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

Figure 4: UGV successfully avoid the obstacles

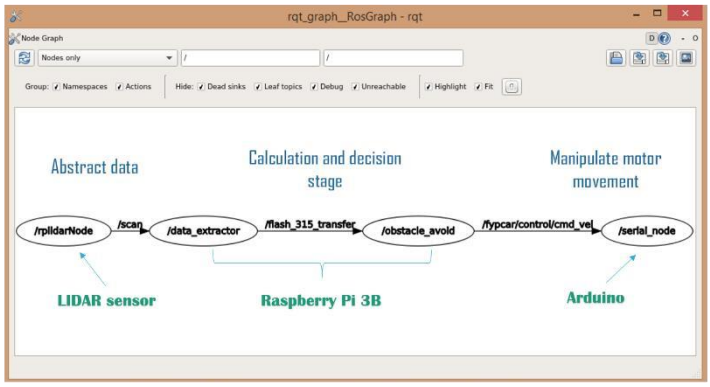


Figure 5: Programming structure in ROS environment

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.

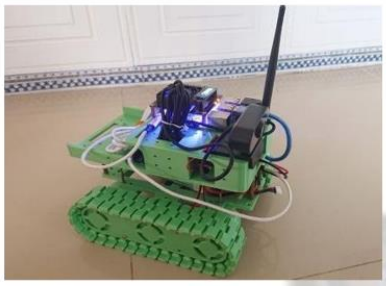
The results illustrate that the low speed movement provide greater accuracy but it is a trade off between accuracy and processing time.

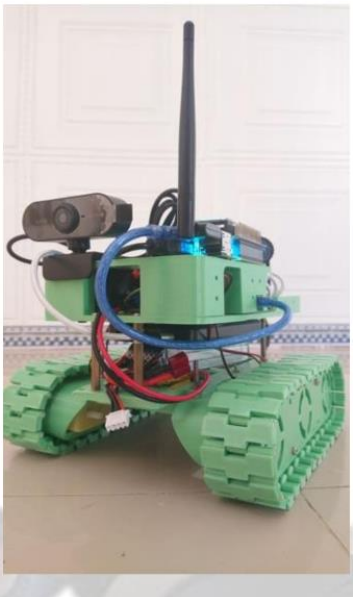
It is also found that, ROS environment response smoothly with acceptable latency (time delay) and give rise to better control of the UGV.

PROJECT 2

Air Quality Monitoring using Surveillance Ground Vehicle (SGV)

INDOOR TESTING





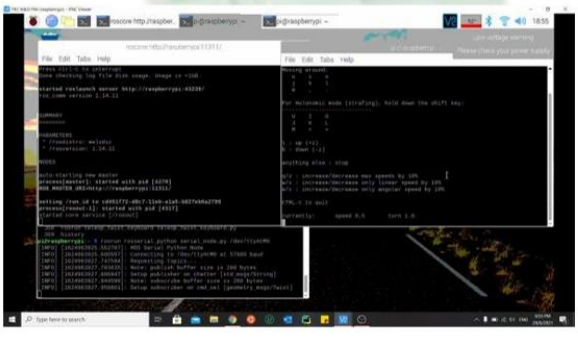
This SGV is a hobby project during lockdown due to the pandemic of Covid 19. The objective of this robot is to monitor any activities that happened inside and outside the house. In the same time, this robot is equipped with humidity and CO_2 gas sensor to observe the indoor and outdoor air quality. While, 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.

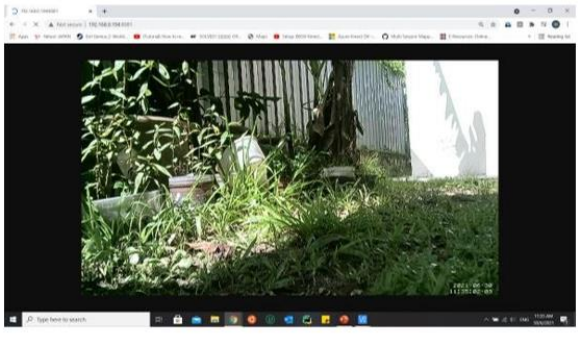
OUTDOOR TESTING

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.

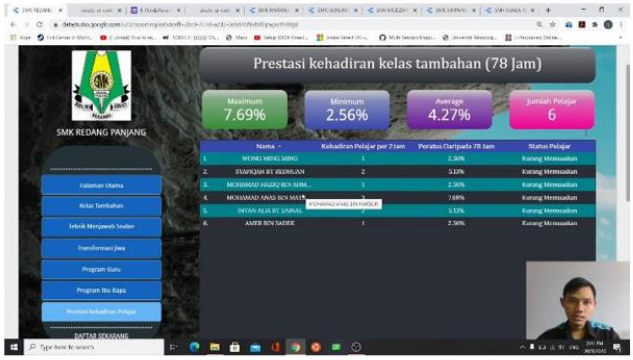
The body kit of this SGV is designed in CATIA and printed using PLA material. The SGV is powered by Power Bank and 2200 mAH LiPo battery to power up 4 DC motors and Raspberry Pi 3B+.

ROBOT VISION

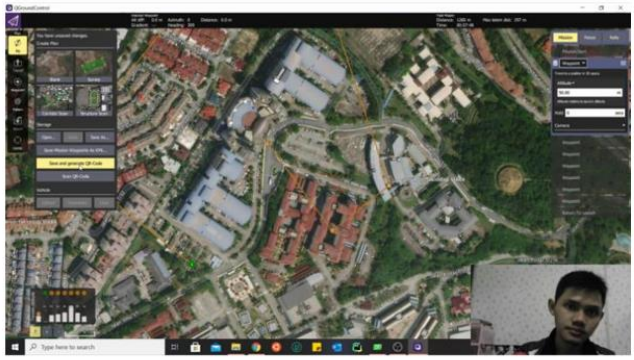




OTHER PROJECTS

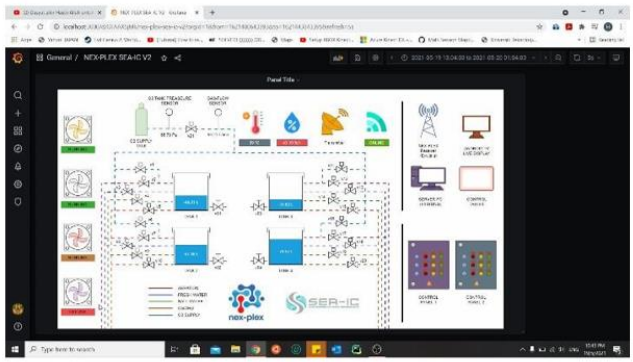


Develop Dashboard for SMK Redang Panjang

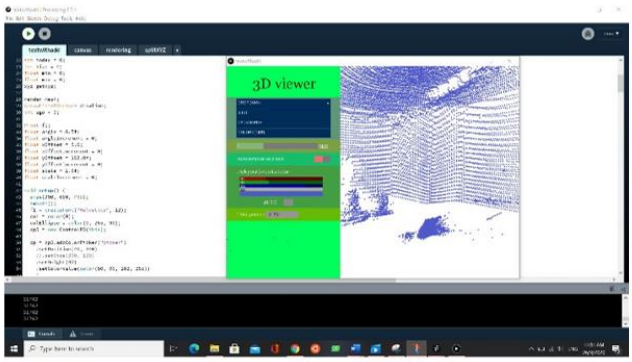


Adding QGroundControl (QGC) features

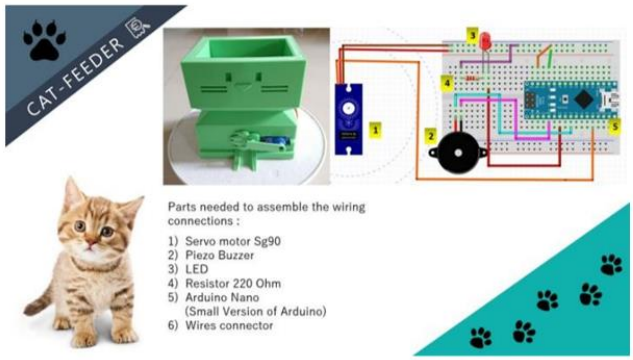
Develop GUI for Arduino Interface



Develop IoT Monitoring Dashboard



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

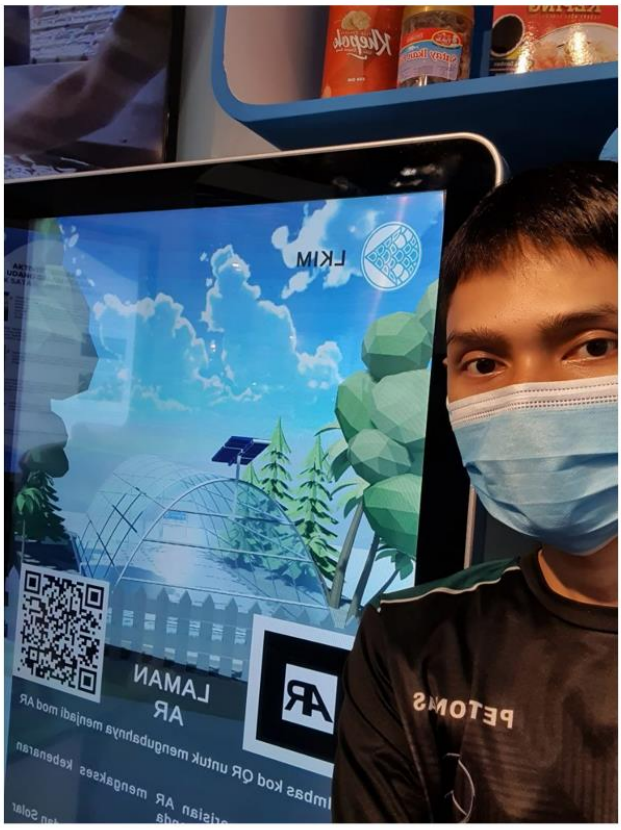


Develop Automatic Cat Feeder for Arduino Course

Develop Simple Mini Tank Controlled by Raspberry Pi

Develop Combat Robot For Competition

MAHA 2022 PROJECTS



Solar Dome dashboard displayed in hall A

Modern Ship dashboard displayed in hall A

MAHA 2022 display area

ACTIVITIES AND ACHIEVEMENT

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 AND ACHIEVEMENT

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

Zulkifli Mohamed (Ts. Pm. Dr.)

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)

TEL = 011-62747554

UNIVERSITI TEKNOLOGI MARA

SEA-IC
SPORTS ENGINEERING AND ARTIFICIAL INTELLIGENCE CENTRE

EAGLE ATTECH