POLITEKNIK
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

SMART IOT VACUUM CLEANER

NURUL FATIHAH BINTI ABDUL GHANI

(08DJK20F2004)

ENCIK IDRIS BIN KAMARUDDIN

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2022/2023

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This report was submitted to the Electrical Engineering Department infulfillment of the requirement for a
Diploma in Electrical Engineering (Control)

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2022/2023

CONFIRMATION OF THE PROJECT

The project report titled "Smart IOT Vacuum Cleaner" has been submitted, reviewed andverified as a fulfills the conditions and requirements of the Project Writing as stipulated

Checked by:

Supervisor's name :

Supervisor's signature:

Date :

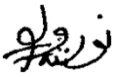
Verified by:

Project Coordinator name :

Signature of Coordinator :

Date :

"I acknowledge this work is my own work except the excerpts I have already explained toour source"



1. Signature :

Name : **NURUL FATIHAH BINTI ABDUL GHANI**

Registration Number : **08DJK20F2004**

Date : 23/12/2022

DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : SMART IOT VACUUM CLEANER

SESSION: SESI 2 2022/2023

1. **I,NURUL FATIHAH BINTI ABDUL GHANI(NO KP:020420-09-0072)** is a final year student of **Diploma in Electrical Engineering, Department of Electrical, Politeknik Sultan Salahuddin Abdul Aziz Shah**, which is located at **Persiaran Usahawan, 40150 Shah Alam, Selangor**. (Hereinafter referred toas 'the Polytechnic').

2. I acknowledge that 'The Project above' and the intellectual property therein is theresult of our original creation /creations without taking or impersonating any intellectual property from the other parties.

3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meetthe requirements for awarding the **Diploma in Electrical Engineering** to me.

Made and in truth that is recognized by;

a) NURUL FATIHAH BINT ABDUL GHANI)……

Identification card No:020420-09-0072)

NURUL FATIHAH BINTI ABDUL GHANI

In front of me,

ENCIK IDRIS BIN KAMARUDDIN

(750108-08-6073)

As a project supervisor,on the date: 23/12/2022

ACKNOWLEDGEMENTS

Praise be to Allah I have completed this Project with His permission. It also wouldnot have been possible without the kind support and help of many individuals andorganizations. I would like to extend my sincere thanks to all of them. I am highly indebted to my Supervisor Encik Idris Bin Kamaruddin for his guidance and constant supervision willing sacrifice the time as well as for providing necessary information regarding the Project & also for his support in completing the Project.

I would also like to express my gratitude towards my beloved parents Encik AbdulGhani Bin Abu Samah and Puan Norhamisah for their support in term of spiritual and encouragement through the process of the Project.

Not forgetting that, siblings, peers and my close friend for their kind co- operation, encouragement and who is always there for me through thick andthin which help me in completion of this Project.

Finally, thanks once again to all of them who are directly and indirectly involved with me completing the Final Year of this Project. May Allah bless andsmooth your daily life.

ABSTRACT

This System using a Solar based on floor cleaner robot and it can cleaning the outdoorspaces. In general, mechanical movement is used to make a movement resource that is an input through process to produce some other movement to create the output. Such as, for this project movement of Smart IOT Vacuum Cleaner is designed special, it hasan interesting movement that can be controlled by using 2 option which is with application found in Mobile Phones to control the vacuum Left, Right, Front (Forward)and at the Back. Second option is, move by Solar Panel, the vacuum will start to move when receives a direct light, such as the Sun. It is because this solar can absorb the sunlight as an energy source to produce an electricity.

ABSTRAK

Sistem ini menggunakan Solar berasaskan robot pembersih lantai dan ia boleh membersihkan ruang luar. Secara umumnya, pergerakan mekanikal digunakan untuk membuat sumber pergerakan yang merupakan input melalui proses untuk menghasilkanbeberapa pergerakan lain untuk mencipta output. Seperti, untuk Pergerakan projek Smart IOT Vacuum Cleaner ini direka khas, ia mempunyai pergerakan yang menarik yang boleh dikawal dengan menggunakan 2 pilihan iaitu dengan aplikasi yang terdapat dalam Telefon Bimbit untuk mengawal vakum Kiri, Kanan, Depan (Hadapan) dan di Belakang. Pilihan kedua ialah, bergerak menggunakan Panel Suria, vakum akan mula bergerak apabila menerima cahaya langsung, seperti Matahari. Ini kerana solar ini bolehmenyerap cahaya matahari sebagai sumber tenaga untuk menghasilkan tenaga elektrik.

LIST OF TABLES

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

In today's era of globalization, there are many types of vacuum to suck dust or dirt. In addition, there were various types of leading brands in the world. Usually, thevacuum sucks in debris because it creates a pressure difference between the area tobe cleaned and the suction tube. With this vacuum in the market, it will be easier forusers to clean the place that is difficult to inhaled.

A purpose of this project was to use a microcontroller (Arduino Nano) to automatically make a vacuum move using 2 mode which is by control in smartphone apps or with solar panel receives a direct light when in outdoor. On topof that, this vacuum cleaner will have an IR Sensor to allow the vacuum cleaner to avoid obstacles so that it can move freely until the place is properly cleaned.

1.1.1 Internet of Things

Interest in the Internet of Things (IOT) is increasing rapidly. The IOT is a technology that connects various devices which have a communication function and sensors through the Internet. Connected devices exchange the data over the Internet and provide services to people. Such as, the smart home as a part of the IOT, as well as Smart IOT Vacuum Cleaner that provides intelligentservices to users in the home.

To provide appropriate services for the Smart IOT Vacuum Cleaner environment, it is important to infer the situation. There were some researchers about this situation with various sensors, such as ultrasonic sensor, and the other part of component.

In this case study, to activate the robot vacuum cleaner automatically, it need to develop a situation aware model that would determine whether the vacuum cleaner can be activated or not according to user's situations. The situation awaremodel should deactivate the vacuum cleaner if the user is an inconvenient situation for cleaning, such as cooking, dining, taking a rest or folding laundry.

1.2 BACKGROUND RESEARCH

For background research, I have browsed the research gate website, IEEE exploreand also searched for information about the project on google.

1.3 PROBLEM STATEMENT

Vacuum is one of the electronic equipment that using air pump to create half of vacuum to clean dust and dirt on the floor. In this era, nowadays using this modern technology is much easier rather than using manual, the users need to bend down to clean the dust and dirt on the floor. Other than that, it requires a lot of energy and takes a long time to make the place clean. A user also need to focus on one thing justto clean the surface of the area.

1.4 RESEARCH OBJECTIVE

The main objective of this project is to produce a vacuum machine with IOT thatcan help and facilitate users in cleaning the surface more effectively. Besides, it canreduce the use of energy and time of user on their daily life in cleaning the surfaceof the area. A user also can do another task while cleaning using vacuum.

1.5 SCOPE OF PROJECT

This design uses an existing vacuum machine and has been modified by using IOT principles and solar panel. It has its own interesting movement and it can be controlled by using 2 option:

a) Application found in mobile phone(IOT)

   Such as, when pressed “R” capital, the vacuum will move on the right side.

b) Solar Panel

   Will start to move when it receives a direct light such as the sun.

1.6 PROJECT SIGNIFICANCE

Through the research I have done, the importance of this project is:

i. It simplify the user’s work. With the presence of a vacuum, the user does notneed to use more energy to tire themselves out.
ii. Easy to store and carry.
iii. Can be used in a long term.
iv. In a places that difficult to clean, vacuum will be one of the best solution tosuck dust and dirt on the floor.

1.7 CHAPTER SUMMARY

In this section of chapter 1, the Internet of Things (IOT), refers to all electronic devices (also known as object) that can communicate privately via the Internet. Technology from smartphones to smart environments, such as smart watches, smart homes, smart cities and smart car. Among the example that gain aground today are smart watches to monitor the health of user who wear a smart watch and even smart cars that are still in experimental phase by Google and alsofor agricultural automation and monitoring on construction sites.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

In the beginning of this study, planning is done to ensure that the design will fulfilled. The concept of project scope is to meet the desired of project. Effort in search reference material is an important factor to ensure the overall of effectiveness project and reports completed. So with this, some information related to the project has been searched and collected so that this project is known and can function properly. The result will be processed and applied at thedesign to meet exact specifications and meet the requirements of the Diploma project.

2.2 PREVIOUS STUDIES/REVIEWS/INVESTIGATION

In the production of a project, technology plays a role for something to work operates smoothly and systematically. By this Smart IOT Vacuum Cleaner, a user's no need to use a manual methods in cleaning the area because the Smart IOT Vacuum Cleaner will be produced utilizes movement automatically by using a smartphone where the most important concept is used inthe construction of this project is cleaning and moving automatically.

2.3 CHAPTER SUMMARY

This section is focusing on one section, it is about introduction to literature review project as well as about the previous research that I have done beforethe result of this project.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 INTRODUCTION

To realize this Project as a ready-to-use product make it easier, a very comprehensive plan is being implemented. A step-by-step procedure is done so thatthe Project can be completed within the stipulated time. This includes controlling the Smart Vacuum Cleaner with IOT systems for circuit design testing and validation.

3.2 PROJECT DESIGN AND OVERVIEW

As mention in the previous chapter, the designed of this controller circuit usingArduino and then to Proteus Software continue convert through PCB circuit.

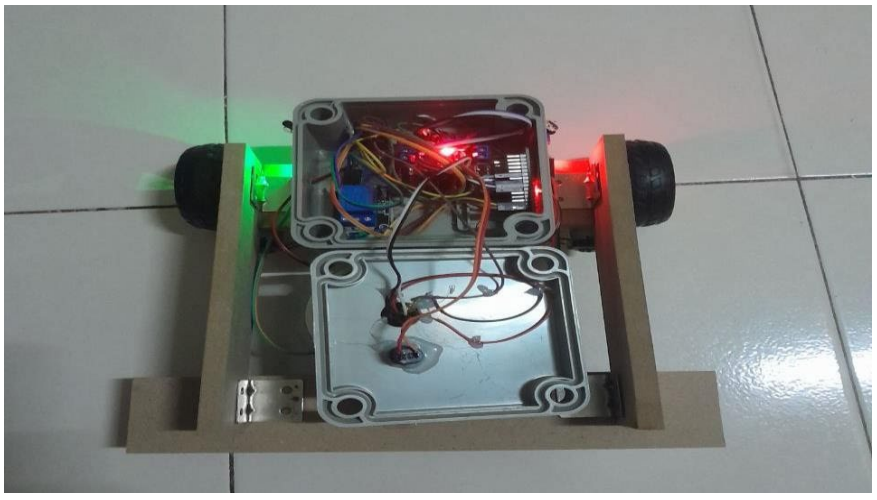


Figure 3.2.1 Pictures of Project

3.2.1 Methods/Procedures/Techniques for generating projects

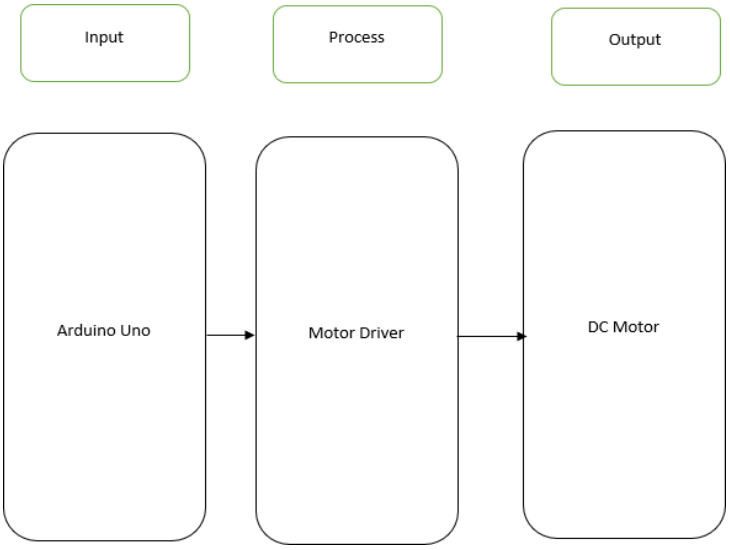
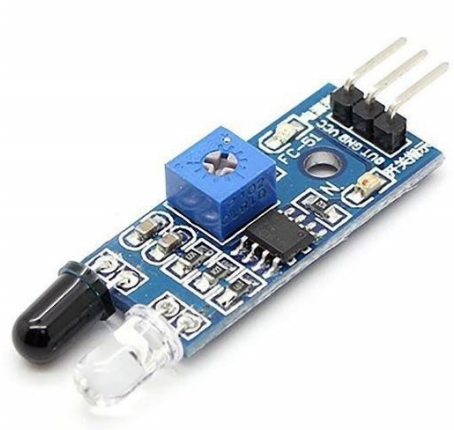
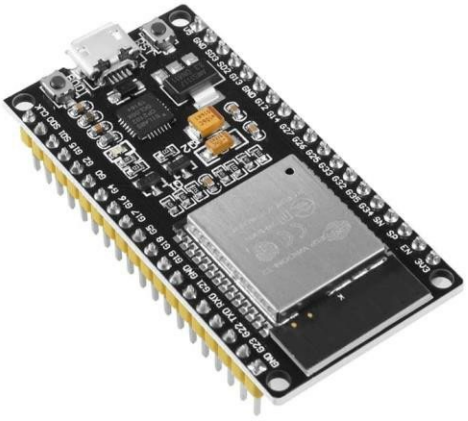


Figure 3.2.1.1 Procedure Diagram

Refer to block diagram above, input-process-output (IPO) is a structured methodology for capturing and visualizing all of the inputs, outputs and processsteps that are required to transform inputs into outputs. Such as, the input of Arduino Uno communicate with a computer, Arduino or either microcontroller. While Process, Motor Driver allows speed and direction of Vacuum. For output, DC Motor operate on alternating current(AC) as well as ondirect current current(DC).

3.2.2 Materials and equipment






TONGLING
5VDC
10A 250VAC
10A 125VAC
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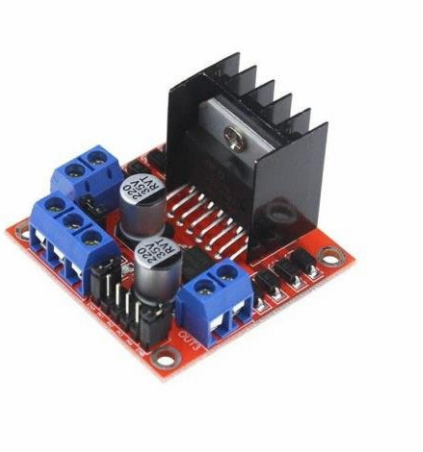
NO COM NC



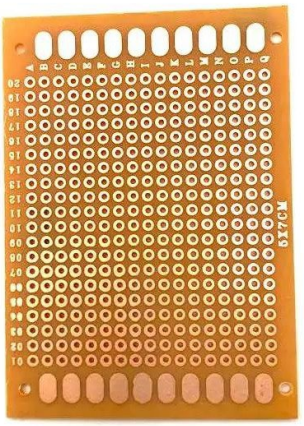
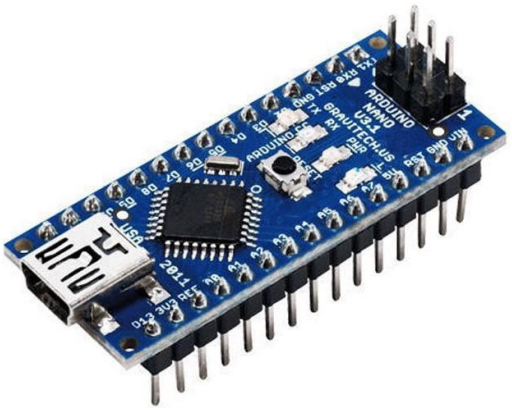


Figure 3.2.2.1 List pictures of components/material

SIGNIFICANCE OF ARDUINO NANO



The Arduino Nano is Arduino's classis breadboard which it is designed board withthe smallest dimensions. This Arduino Nano comes with pin headers that allow foran easy attachment onto a breadboard. Besides, the classis Nano is the oldest member of the Arduino Nano family boards. It is similar to the Arduino Duemilanove but made for the use of a breadboard and has no dedicated power jack. In Arduino:

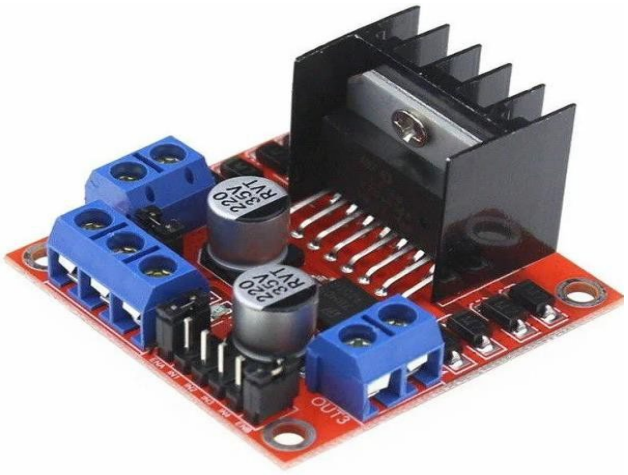
1. **12C Protocol**

   A communication protocol that can be used to set up a communication between twoboards.

2. **Tiny footprint**

   With a length of 45 mm and a width of 18 mm the Nano is Arduino's smallest boardand weighs only 7 grams.

SIGNIFICANCE OF L298N MOTOR DRIVER



This L298N Motor Driver Module is a high power motor driver module for drivingDC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator.L298N Module can control up to a 4 DC motors, or 2 DC motors, even with 2 DC motors with directional and speed control.

L298N Module Pinout Configuration

1.IN1 & IN2

Motor A input pins. It used to control the spinning direction of Motor A

2.IN3&IN4

Motor B input pins. Used to control the spinning direction of Motor B

3.ENA

Enables PWM signal for Motor A

4.ENB

Enables PWM signal for Motor B

5.OUT1&OUT2

Output pins of Motor A

6.12V

12V input from DC power Source

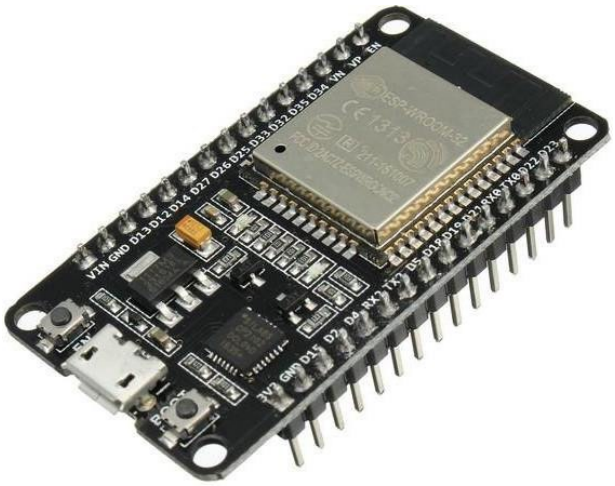
7.GND

Ground Pin

8.5V

Supplies power for the switching logic circuitry inside L298N IC

SIGNIFICANCE OF ESP32



ESP32 is a series of low-cost, low power system on a chip microcontroller with integrated WI-FI and dual mode Bluetooth. The ESP32 series employs either a Tensilica Xtensa LX6 microprocessor in both dual core microprocessor or a single- core RISC0V microprocessor and includes built-in antenna switches, RF balloon, poweramplifier, low-noise receive amplifier, filters, and power-management modules.

ESP32 is created and developed by Espressif Systems, a Shanghai-based Chinese company, and is manufactured by TSMC using their 40 nm process. It is a successor tothe ESP8266 microcontroller. Features of the ESP32 include the following:

i.Processors

ii. Memory:320 KiB RAM,448 KiB ROM

iii.Wireless connectivity:

-Wi-Fi:802.11 b/g/n

-Bluetooth:v4.2 BR/EDR and BLE

iv.Peripheral interfaces

v.Security

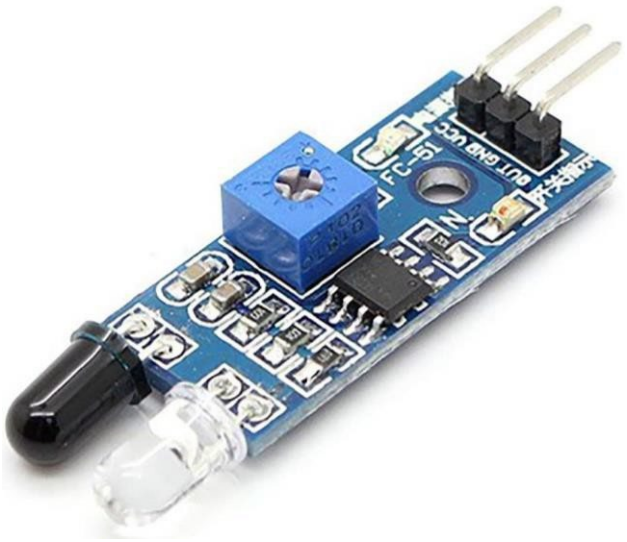
vi.Power Management

SIGNIFICANCE OF ROBOT WHEEL

A wheel is a round device that is able to rotate on its axis and it facilitate movement or transportation. In addition, wheels can also be used while work through machines. Such as, in transportation. More generally, this term is also used for rotating objects or spinninglike the pottery wheel, the power wheel and also the ship wheel.

Mechanically, the wheel is considered as one of the simplest machines and located close to the starting point of human technology, which is advanced in terms of comparison with earlier mechanical innovations, such as knives and stone axes, tension based sliders, scoopsand shovels. But, in the implementation this Smart IOT Vacuum Cleaner I use the wheel tomove it forward, reverse, left and right.

SIGNIFICANCE OF INFRARED SENSOR (IR)



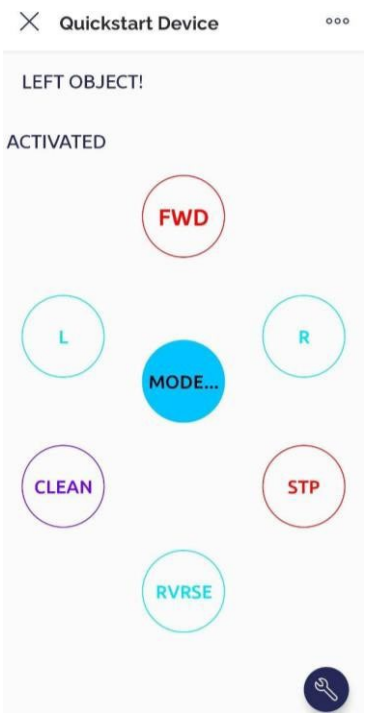
Infrared (IR) Sensor Module is a distance proximity sensor “switch”. When there is an object or obstacles that are close enough to block the view in front of 2 LEDs, it triggers the infrared trans-receiver module. The clear LED is the IR emitter while the black LED isthe IR receiver. It uses the electromagnetic reflection principle where when the reflective surface (object) is closer, the receiver will receive stronger signal from transmitter due to shorter distance traveled of reflected of wave.

When there is a object that is close enough, the IR electromagnetic detection received by the IR receiver is higher than the threshold level (user pre-set level), the sensor will changethe output switch mode so that microprocessor board such as Arduino can execute what is going to do next. IR Sensor Module has only 1 main output signal which is Digital Output.Digital Output either go high (5V or 3.3V depends on the input voltage) or low (0V), thus this module cannot be used as a distance measurement but just as a trigger switch.

When there is no obstacles or object within the detection distance, the output is at HIGH position (5V or 3.3V). When the distance shorter than or equal to the threshold set, the output signal will change to position LOW (0V). The distance threshold can be set by adjusting the potentiometer / trimpot on the board. This sensor module only able to detectdistance between 2cm and 30cm within the view of the IR LED and Photoresistor. The trigger distance is somehow very subjective to object's surface material, color and shape. Practically I would recommend this sensor switch for application less than 10cm distance.Thus this module is suitable for very close range of detection such as obstacle avoidance and virtual touch switch application.

3.2.3 Data Analysis Methods

Analysis is the result of a study I have done on a project to control vacuum cleaner by connecting to a Internal Relay sensor. To analyze the data, I use the blynk application to control vacuum from time to time. The apps of blynk I use will inform on screen an obstaclethe vacuum passes through such as picture shown below it will inform that there's an object on the left side.



3.3 PROJECT DESCRIPTION

The name of this project is Smart IOT Vacuum Cleaner. For more details, this project aims to further develop the way or method Vacuum Cleaner in easier wayand save energy for users. Moreover, using this vacuum with 2 option mode by controlling with apps and using solar will help users in saving energy of electricity. This product is suitable to be recommended to people who like to savetheir time due to their busy schedule timetable in daily life. The cost required alsonot too expensive and the components required also have an affordable price.

3.4 DESCRIPTION OF MAIN COMPONENT

Infrared sensor (IR) is a radiation-sensitive optoelectronic component with its spectral sensitivity in the infrared wavelength range. This IR sensor use in Vacuum Cleaner is to detect the unwelcome guests. In another defined angle range, the sensor elements detect the object such as wall that prevents the vacuumfrom passing through the floor when cleaning work process.

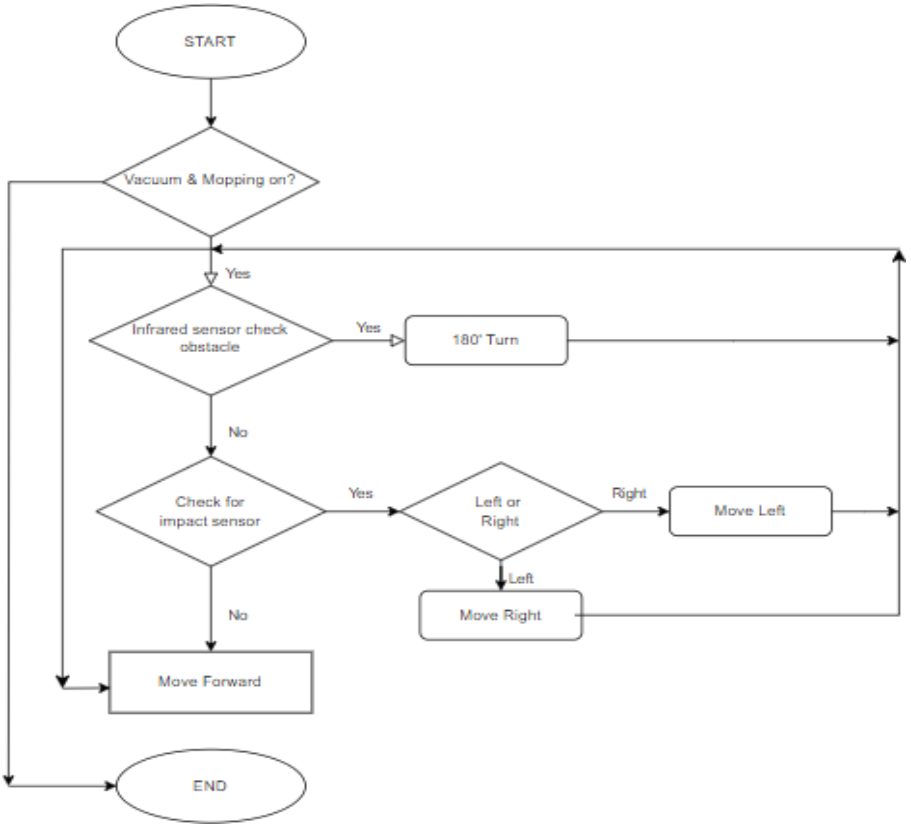
3.4.1 COMPONENT 1

Arduino consist of both a physical programmable circuit board often referredas a microcontroller and a piece of software or IDE (Integrated Development Environment) that runs on the computer, it is used to write and upload computer code to the physical board.

3.4.2 COMPONENT 2

Robot wheel are robot that navigate around the ground using motorized wheelsto propel themselves. This design is simple than using treads or legs. By using this wheels, they are easier to design, build and program for Vacuum Cleaner to move. It also better controlled, but this wheel will not move properly on rough surface such as carpet surface.

3.5 DESCRIPTION OF FLOWCHART



From flowchart, need to push button to turn on the Vacuum Cleaner. In 2 option mode for Solar, the Infrared Sensor (IR) will check the obstacle while make a movement on the floor. If its in a good condition the Smart IOT Vacuum Cleaner will turn 180 degrees. If No, the sensor will check the impact on obstacle and define whether its on the left or right side. Sensor detect Right, the Vacuum Cleaner will move on the Left side, while if its on theLeft, it will move on the right side. It will move Forward and Reverse by its own self.

For Control in apps of blynk by the user, the Vacuum Cleaner will move as the userwanted. If its on the Left side, then the user just need to enter ‘L’ button.

3.6 SUSTAINABILITY ELEMENTS IN THE DESIGN CONCEPT

For design project concept of this Product, it need to fulfill the criteria and social design where it used to clean the dust and dirt on the floor. Moreover, to provide iteasier to use to attract the users. In addition, this product also contributes to the community such as a worker or it can be for a housewife to manage their house chores.

3.7 CHAPTER SUMARRY

At the end of the research I have done, a lot of information provides a reference onthe design concept, flowchart and so on. This information is also very useful as a guide to help facilitate the process of designing and also developing a Smart IOT Vacuum Cleaner product.

CHAPTER 4

RESEARCH FINDINGS AND DISCUSSION

4.1 INTRODUCTION

Regarding the research that has been done, it can help us to know about the project in detail for each component and the function so that this project can work properlyaccording to the purpose of plan.

4.2 TESTING FINDINGS

In order to carry out this project, I need to do a test to find out if it has gone well or not. This testing is done after wiring on each component has been installed and connected to each other.

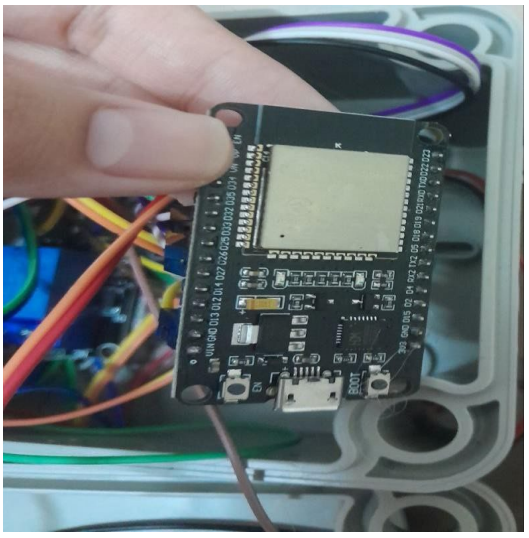


Figure 4.2.1 ESP 32 has connected on Arduino

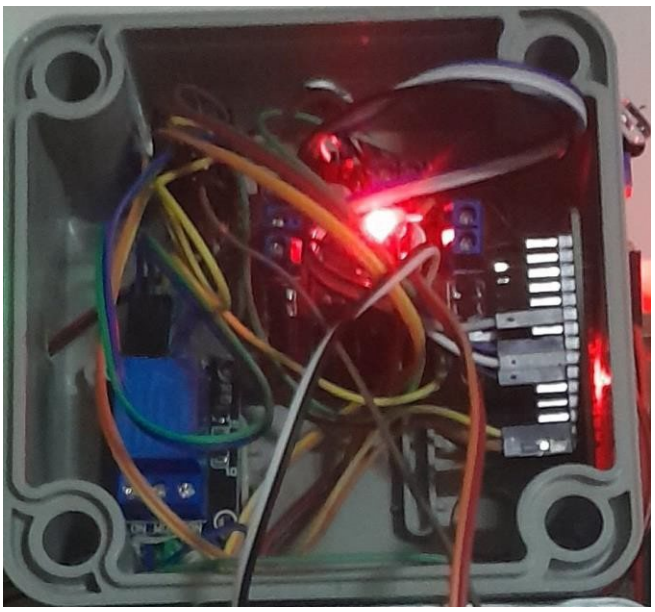


Figure 4.2.2 Wiring is done after entering the casing

4.3 DISCUSSION

As a result of research and testing of this project, I was able to learn that each component has its own role and has a specific function in each part. During the testing session of this project, the error has occur and the thing need to fix is a coding in Arduino IDE which it will have an impact during the testing session onthis project.

4.4 CHAPTER SUMMARY

At the end of the research that I have studied regarding the testing for this project, it gives a new guidance and a picture of how this project has been runningand it will be a convenience for user because of the advantages in Smart IOT Vacuum Cleaner use.

CHAPTER 5 CONCLUSION AND SUGGESTION

5.1 INTRODUCTION

At the end of this project, without proper planning, it is possible that the work results is at a moderate and unsatisfactory level. After discussion and research was done, then a project can be produced which is Smart IOT Vacuum Cleaner. Process in designing this vacuum includes several stages. Among the things and issues that are necessary discussed is in terms of cost, project qualityand the effective way to carry out its manufacture. In addition, daily tasks are arranged to be done every month to ensure the production of the project runs smoothly.

5.2 CONCLUSION

This Smart IOT Vacuum Cleaner project has successfully achieved its objective. The purpose of this project is done to facilitate the users in speeding up and simplify the cleaning process. While in terms of maintenance of this project iseasy to operate, maintain and does not require workforce. In terms of cost, this project is very affordable and cost effective can be reduced if the production is made on a smaller scale. During the manufacturing process of this “Smart IOT Vacuum Cleaner project, there are some of the issues and problems faced, which is the error occur in coding program and the ESP32 did not connected properly with Mobile Hotspot on my phone. To deal with this, I change a few of coding programs and try to change the position on the product.

5.3 SUGGESTION

With the presence of this project in the market, I believe that the Smart IOT Vacuum Cleaner demand in the market can be fulfilled and can be used easily and quickly. Although this project seems simple but it has a high impact on users in cleaning the floor. This innovation is not only able to meet the needs of users but also lightens the burden. With this, can avoid the diseases such as cough. I hope in the future, the project of product can be upgraded such as increasing the power of the battery so that the user does not need to buy new batteries again andagain.

5.4 CHAPTER SUMMARY

In this chapter has explained problems faced during the process of producing this project. While doing the work process, safety and user health is one of the importantaspects need to be taken care of. Each project developed has its own importance and objective, as Smart IOT Vacuum Cleaner project. Even in the beginning there are shortcomings, I managed to achieve the objective. Based on conclusions that have been made, this project will be well received by the user as there are many benefits can be apply on this project of product.

REFERENCES

[1] Amitha, S., Raj, P. N., Sonika, H. P., Urs, S., Tejashwini, B., Kulkarni, Sandhya. A., & Jha, V. (2020). Segregated Waste Collector with Robotic Vacuum Cleaner using Internet ofThings. *2020 IEEE International Symposium on Sustainable Energy, Signal Processing and Cyber Security (ISSSC)*, 1–5. https://doi.org/10.1109/ISSSC50941.2020.9358839

[2] Kwon, S., Kim, J., & Ryu, K. R. (2016). Performance Comparison of Situation-AwareModels for Activating Robot Vacuum Cleaner in a Smart Home. *International Journal ofComputer and Information Engineering*, *10*(2), 312–316. https://doi.org/10.5281/ZENODO.1111568

[3] Asafa, T. B., Afonja, T. M., Olaniyan, E. A., & Alade, H. O. (2018). Development of avacuum cleaner robot. *Alexandria Engineering Journal*, *57*(4), 2911–2920. https://doi.org/10.1016/J.AEJ.2018.07.005

[4] Manoj Bhingare, K., Sanjay Ransing, V., Bhagwan Palve, A., & Mukund Misal, H.(2007). *VACUUM CLEANER USING MICROCONTROLLER*. *3*.

[5] Zhou, H., Deng, L., Xu, W., Yu, W., Dehlinger, J., & Chakraborty, S. (2022). Towards Internet of Things (IoT) Forensics Analysis on Intelligent Robot Vacuum Systems. *2022 IEEE/ACIS 20th International Conference on Software Engineering Research, Managementand Applications, SERA 2022*, 91–98. https://doi.org/10.1109/SERA54885.2022.9806735

[6] Chen, J., Zhang -, T., Zhang, X., Zhan, G., Xu, X., -, al, Adithya, P., Tejas, R., Sai Varun, V., & Prashanth, B. (2019). Design and Development of Automatic Cleaning andMopping Robot. *IOP Conference Series: Materials Science and Engineering*, *577*(1), 012126. https://doi.org/10.1088/1757-899X/577/1/012126

[7] Irawan, Y., Muhardi, Ordila, R., & Diandra, R. (2021). Automatic Floor Cleaning RobotUsing Arduino and Ultrasonic Sensor. *Journal of Robotics and Control (JRC)*, *2*(4), 240– 243. https://doi.org/10.18196/JRC.2485

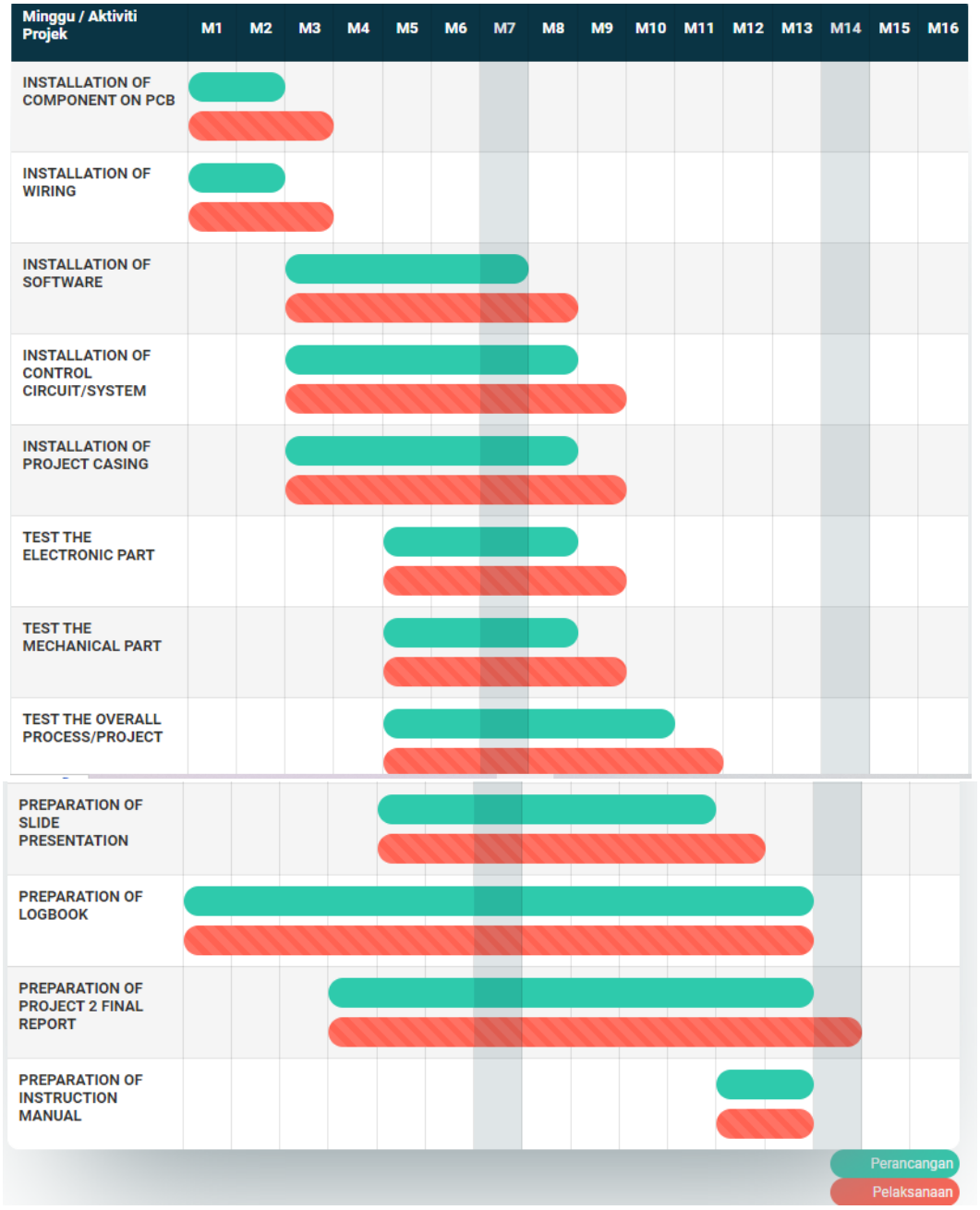
[8] Prabakaran, V., Elara, M. R., Pathmakumar, T., & Nansai, S. (2017). HTetro: A tetris inspired shape shifting floor cleaning robot. *Proceedings - IEEE International Conferenceon Robotics and Automation*, 6105–6112. https://doi.org/10.1109/ICRA.2017.7989725

[9] Yatmono, S., Khairudin, M., Pramono, H. S., & Asmara, A. (2019). Development of Intelligent Floor Cleaning Robot. *Journal of Physics: Conference Series*, *1413*(1), 012014.

APPENDICES

APPENDIX A-GANTT CHART APPENDIX B-
PROJECT COST
APPENDIX C-LIST OF MATERIAL AND EQUIPMENT
APPENDIX D-SKETCHES/CIRCUIT DIAGRAM APPENDIX E-
PROGRAMMING CODING PROJECT

APPENDIX A-GANTT CHART



APPENDIX B - PROJECT COST

Costs related to acquiring materials and components will be incurred throughout project implementation. The Arduino Nano, Infrared Sensor and other parts are on the list of materials that will be utilized in this project. All of these parts are bought through the online buying in order to save time and money. The total gross budget estimate for doingthis project is RM299.27. The project's cost is also consistent with one of the essentialqualities of a component project developer, which is having a cheap cost yet high qualityproject.

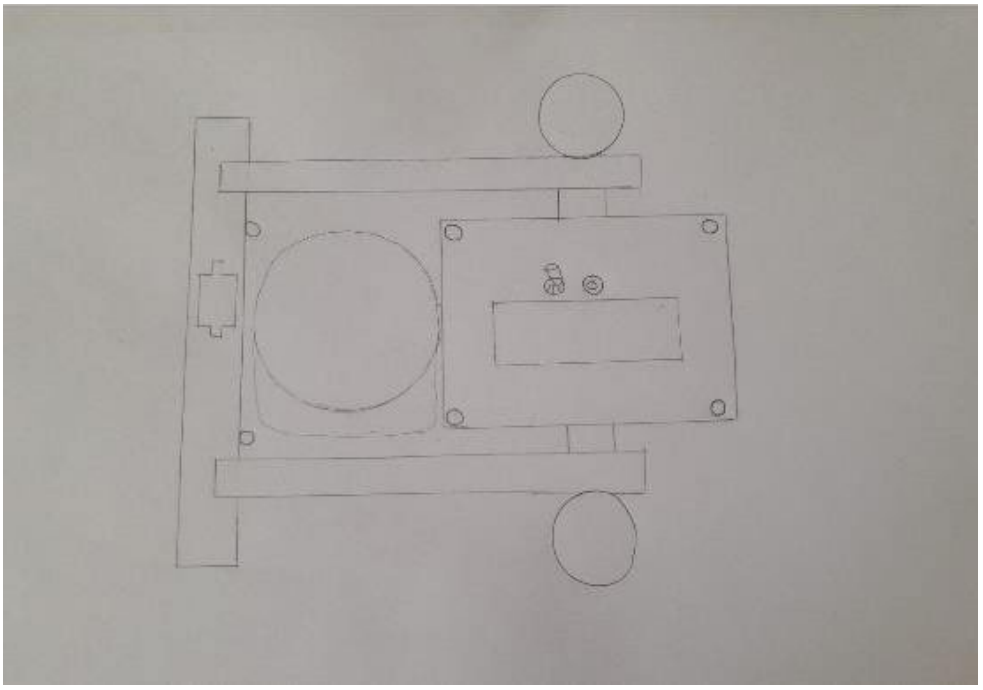
No.	Component and materials	The unit price	Quantity	Total
1	Arduino Nano set	RM 29.50	1	RM 29.50
2	Infrared sensor	RM 5.20	2	RM 10.40
3	PCB board	RM 6.00	1	RM6.00
4	Jumper wire	RM 14.52	1	RM 14.52
5	Relay	RM 9.00	1	RM 9.00
6	ESP32	RM 23.80	1	RM 23.80
7	L298N	RM 17.00	1	RM17.00
8	Push Button	RM 2.50	1	RM2.50
9	Battery (3.7V)	RM 5.00	2	RM10.00
10	Vacuum Mini	RM15.88	1	RM15.88
11	Solar Panel Mini	RM13.50	1	RM13.50
12	Solid Wood	RM9.00	2	RM18.00
13	Robot Chasis	RM16.00	1	RM16.00
14	LED Diode Set	RM8.17	1	RM8.17
Total :				**RM194.27**
	List of other costing			
1	Wiring			**RM55**
2	Casing			**RM50**
Total:				**RM105**
			Overall total	**RM299.27**

APPENDIX C-LIST OF MATERIAL AND EQUIPMENT

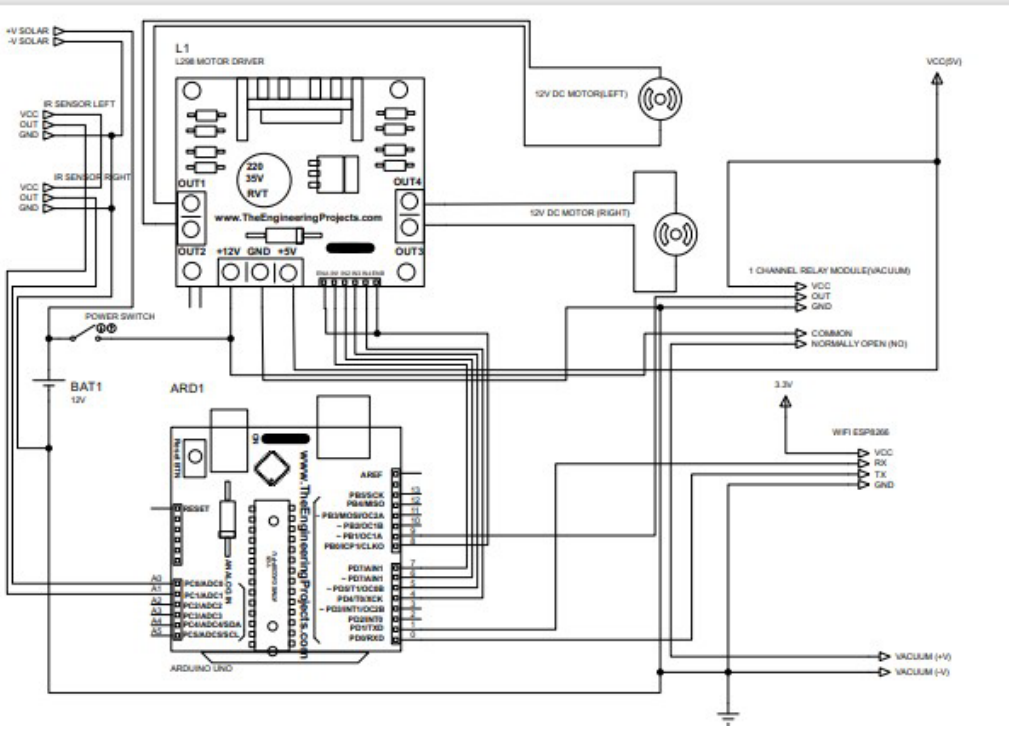
No.	Component and materials
1	Arduino NANO set
2	Infrared sensor
3	Jumper wire
4	Relay
5	ESP32
6	L298N
7	Push Button
8	Battery
9	Vacuum Mini
10	Solar Panel Mini
11	Solid Wood
12	Robot Chasis
13	LED Diode

APPENDIX D-SKETCHES/CIRCUIT DIAGRAMS

SKETCHES



CIRCUIT DIAGRAM



APPENDIX E-PROGRAMMING CODING PROJECT

```
// Template ID, Device Name and Auth Token are provided by the Blynk.Cloud
// See the Device Info tab, or Template settings
#define BLYNK_TEMPLATE_ID           "TMPL-ajkUDL3"
#define BLYNK_TEMPLATE_NAME         "Quickstart Template"
#define BLYNK_AUTH_TOKEN            "TUJKPxZYKeKsPRfFsoF0M2SGYs0uiiwb"


// Comment this out to disable prints and save space
#define BLYNK_PRINT Serial


#include <WiFi.h> #include
<WiFiClient.h>
#include <BlynkSimpleEsp32.h>

#define SCREEN_WIDTH 128 // OLED display width, in pixels#define
SCREEN_HEIGHT 64 // OLED display height, in pixels

#define M1a 25
#define M1b 26
#define M2a 27
#define M2b 32
#define trigPin1 22
#define echoPin1 23
#define IRL 4
#define IRR 5
#define PUMP 18

#define Buzz 19
#define VACUUM 21

// setting PWM properties
```

```
const int freq = 5000; const
int ledChannel = 0; const int
resolution = 8;
int    CHARGE=0;
int OBSC=0;
String OBJECT="NONE";
int   F1Stat=0;
int   F2Stat=0;
int   L1Stat=0;
int   L2Stat=0;
int mode=0;
int SECURITY=0;
int   Counter=0;
int   IR1Stat; int
IR2Stat;        int
Check=0;
int TIMERx=0;

// Potentiometer is connected to GPIO 34 (Analog ADC1_CH6)const
int potPin = 34;
const  int  potPin2  =  35;
const  int  potPin3  =  32;
const  int  potPin4  =  33;
const int potPin5 = 25;


float ADC1,ADC2,ADC3,ADC4;

// variable for storing the potentiometer valueint
potValue = 0;
float        h=0,t=0;
float     hx=0,tx=0;
int PIRSTAT=0;
int BIT=0;
```

```
int ALM1=0,ALM2=0,ALM3=0,ALM4=0;
int   Ready=0;
int Ml=0;
String     MinS="00";
String    HourS="00";
String SecS="00"; int
DataIn=0;        String
DATA="";       String
Temp1x="";
String PHx="";
String Temp2x="";
String Temp1y="";
String PHy="";
String Temp2y="";
String Temp3y="";
String Temp3x="";
String Temp4y="";
String Temp4x="";
String currentTime;
String currentDate;
String TimerGet="00:00:00";int
SelfCharge=0;
int   MODE=0;
int Hour=0; int
Min=0;
int CLEAN=0;
String MD="MANUAL";
int Sec=0;
long duration1x, duration2x, distance2, duration3x, distance3, duration4x, distance4, duration5x,
distance5;
float inch,distance1;
String STAT="ACTIVATED";
//----------------------------------------------------------------------------
int TDIS=0;
```

```
int   Rly1=0;
int    wait=0;
int   Rly2=0;
int   Rly3=0;
int   Rly4=0;
int   Rly5=0;
int   Rly6=0;
int   Rly7=0;
int Rly8=0;
int CONFIRM=0;


//-----------------------------------------------------------------------


char auth[] = BLYNK_AUTH_TOKEN;
```

```
// Your WiFi credentials.
// Set password to "" for open networks.char
ssid[] = "ROBOT";
char  pass[]  =  "12345678";
BlynkTimer timer;
// This function is called every time the Virtual Pin 0 state changes

BLYNK_WRITE(V10)
{
  int pinValue = param.asInt(); // assigning incoming value from pin V1 to a variable
  Rly1=pinValue;
   if (pinValue==1){

    Serial.println("FORWARD");
    F1Stat=1;
    FWD();
    STAT="FORWARD";


  }
  }
BLYNK_WRITE(V11)
{
  int pin2Value = param.asInt(); // assigning incoming value from pin V1 to a variable
  Rly2=pin2Value;
  if                (pin2Value==1){
  Serial.println("REVERSE");
  RVS(); STAT="REVERSE";
  }

  // process received value
}
BLYNK_WRITE(V12)
{
```

```
 int pin3Value = param.asInt(); // assigning incoming value from pin V1 to a variable
 Rly3=pin3Value;
 if (pin3Value==1){
Serial.println("LEFT");
  STAT="LEFT";
  LFT();
 }

 // process received value
}

BLYNK_WRITE(V13)
{
 int pin4Value = param.asInt(); // assigning incoming value from pin V1 to a variable
 Rly4=pin4Value;
 if          (pin4Value==1){
  Serial.println("RIGHT");
  STAT="RIGHT"; RGH();
 }

 // process received value
}

BLYNK_WRITE(V14)
{
 int pin5Value = param.asInt(); // assigning incoming value from pin V1 to a variable
 Rly5=pin5Value;
 if          (pin5Value==1){
  Serial.println("STOP");
  STAT="STOP"; STP();
 }
```

```
  // process received value
}

BLYNK_WRITE(V15)
{
  int pin6Value = param.asInt(); // assigning incoming value from pin V1 to a variable
  Rly6=pin6Value;
  if    (pin6Value==1){
    CLEAN=1;
    digitalWrite(VACUUM,HIGH);
  }
if    (pin6Value==0){
    CLEAN=0;
    digitalWrite(VACUUM,LOW);
  }

} BLYNK_WRITE(V16)
{
  int pin7Value = param.asInt(); // assigning incoming value from pin V1 to a variable
  Rly7=pin7Value;
  if          (pin7Value==1){
   MODE=1;  MD="AUTO
   MOVE";
  }
   if    (pin7Value==0){
   COFF(); MODE=0;
   MD="MANUAL MODE";
  }

}

BLYNK_WRITE(V17)
{
```

```
 int pin8Value = param.asInt(); // assigning incoming value from pin V1 to a variable
 Rly8=pin8Value;
 if   (pin8Value==1){
    CHARGE=1;
    Serial.println("SELF CHARGING ON");
 }
  if   (pin8Value==0){
    CHARGE=0;
    Serial.println("SELF CHARGING OFF");
 }

}
//-------------------------------------------------------------------------------

// This function is called every time the device is connected to the Blynk.Cloud
BLYNK_CONNECTED()
{

}
```

```
// This function sends Arduino's uptime every second to Virtual Pin 2.void
myTimerEvent()
{
  //---------------------------------------------------------------------------
static unsigned long timepoint = millis();
 //ADC1 = analogRead(potPin);
 //  ADC1= (5.0 * ADC1)/1024.0;  //convert the analog data to moisture level


  if (millis() - timepoint > 1000U) //time interval: 1s
  {

  //---------------------------------------------------------------------------

      Serial.println(distance1);    delay(100);
Blynk.virtualWrite(V0,OBJECT);
//Blynk.virtualWrite(V2,MODE);
//Blynk.virtualWrite(V3,MD);
Blynk.virtualWrite(V4,STAT);

  }

  //---------------------------------------------------------------------------
}

void myTimer2Event()
{
  //---------------------------------------------------------------------------
static unsigned long timepoint = millis();


  if (millis() - timepoint > 1000U) //time interval: 1s
  {
```

```
  }


  //-------------------------------------------------------------------
}

void setup()
{

  int i,k;

  pinMode(VACUUM, OUTPUT);
  pinMode(IRL,          INPUT);
  pinMode(IRR,          INPUT);
  pinMode(M1a,      OUTPUT);
  pinMode(M1b,      OUTPUT);
  pinMode(M2a,      OUTPUT);
  pinMode(M2b,      OUTPUT);
  pinMode(Buzz,OUTPUT);




/*
    // configure LED PWM functionalitites
  ledcSetup(ledChannel, freq, resolution);

  // attach the channel to the GPIO to be controlled
  ledcAttachPin(Buzz, ledChannel);

*/

  delay(1000);
```

```
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  // You can also specify server:
  //Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
  //Blynk.begin(auth, ssid, pass, IPAddress(192,168,1,100), 8080);
 // Setup a function to be called every second
  timer.setInterval(1000L,          myTimerEvent);
  timer.setInterval(2000L,        myTimer2Event);
  Blynk.virtualWrite(V5,"88");
}

void loop()
{




if    (MODE==1){//auto
FWD();

if (digitalRead(IRL)==1 && digitalRead(IRR)==1){



FWD();
   STAT="FWD";
}

if   (digitalRead(IRL)==0   &&   digitalRead(IRR)==1){
  RVS();
  delay(400);
  RGH();
}
if   (digitalRead(IRL)==1   &&   digitalRead(IRR)==0){
   RVS();
  delay(400);
```

```
  LFT();
}


}

if  (digitalRead(IRL)==0  &&  digitalRead(IRR)==0){
  digitalWrite(M1a,LOW);
   digitalWrite(M1b,LOW);
  digitalWrite(M2a,LOW);
  digitalWrite(M2b,LOW);
  digitalWrite(Buzz,HIGH);
  OBJECT="OBSTACLE      WARNING!!";
  OBSC=3;
   STAT="EMG STOP!";
}

if  (digitalRead(IRL)==1  &&  digitalRead(IRR)==1){
  digitalWrite(Buzz,LOW);
  OBJECT="NONE";
  OBSC=0;
}
if  (digitalRead(IRL)==0  &&  digitalRead(IRR)==1){
  digitalWrite(Buzz,LOW);
  OBJECT="LEFT     OBJECT!";
  OBSC=2;
}
if  (digitalRead(IRL)==1  &&  digitalRead(IRR)==0){
  digitalWrite(Buzz,LOW);
  OBJECT="RIGHT     OBJECT!";
  OBSC=1;
}

//
```

```
  Blynk.run();
  timer.run();

}

void                    FWD(){
 digitalWrite(M1a,HIGH);
 digitalWrite(M1b,HIGH);
 digitalWrite(M2a,LOW);
 digitalWrite(M2b,LOW);




}
void                    STP(){
   digitalWrite(M1a,LOW);
   digitalWrite(M1b,LOW);
   digitalWrite(M2a,LOW);
   digitalWrite(M2b,LOW);
}
void                    RVS(){
   digitalWrite(M1a,LOW);
   digitalWrite(M1b,LOW);
   digitalWrite(M2a,HIGH);
   digitalWrite(M2b,HIGH);




}
void                    LFT(){
   digitalWrite(M1a,LOW);
   digitalWrite(M1b,HIGH);
   digitalWrite(M2a,LOW);
```

```
   digitalWrite(M2b,HIGH);

}
void RGH(){

    digitalWrite(M1a,HIGH);
   digitalWrite(M1b,LOW);
   digitalWrite(M2a,HIGH);
   digitalWrite(M2b,LOW);

}

void                    CON(){
    digitalWrite(PUMP,HIGH);
}

void COFF(){


  digitalWrite(PUMP,LOW);

}
```

APPENDIX F-POSTER OF PROJECT