Capstone Project Report

Submitted by:

Ashutosh Pandey

Himesh Sutar

Sagar Biswas

Dhruv Mulay

Guided By:

Prof. Pranavkumar Bhadane

In partial fulfilment of

Diploma in Computer Engineering

Department of Diploma in Computer Engineering

A. C. Patil College of Engineering, Kharghar, Navi Mumbai

Academic Year 2020-21

A. C. PATIL COLLEGE OF ENGINEERING,
KHARGHAR,
NAVI MUMBAI

CERTIFICATE

Project On:

SERVICE ROBOT

Submitted By:

Ashutosh Pandey

Sagar Biswas

Dhruv Mulay

Himesh Sutar

This is to certify that the above-mentioned students have successfully completed the project report required at the end of 6th Semester of Diploma in Engineering in Computer from MSBTE during the academic year 2020-21.

Guide | **HOD**

Prof. PranavKumar Bhadane | Prof. PranavKumar Bhadane

Principal

Dr. V. N. Pawar

ACKNOWLEDGEMENT

It is our proud privilege and duty to acknowledge the kind of help and guidance received from several people in preparation of this report. It would not have been possible to prepare this report in this form at without their valuable help, cooperation, and guidance.

First and foremost, we wish to record our sincere gratitude to Prof. **PranavKumar Bhadane** for his constant and support and encouragement in preparation of this report and for making available library and laboratory facilities needed to prepare this report. There were a lot of online resources that we referred to while preparing the book. We want to thank each one of them for their material, and for the time that they devoted for developing the material.

Abstract

In today's world the use of robot is going on increasing. Robots can carry out every work more effectively and efficiently than a man can do. Hence one of such application of robot could be SERVING ROBOT. There are many areas of research that could be done for a serving robot. In this paper we have try to demonstrate a prototype of Autonomous Serving Robot which will take order and serve the food to the customer, and it can also use in hospital to serve food and medicine to patients (EFFECTIVE IN PANDEMIC SITUATION LIKE COVID19). The implementation is done with available resources to reduce the cost of project. The concept and design can be modified for use in the hospitals to assist in the serving of meals and medicine. With the integration of diverse commercial technologies and modular designs, it can be customized for other sectors in the service industry as well. It is an Node MCU esp8266 based robotic design implemented to seek out and detect its required destination and perform its deliberate tasks with precision and accuracy. The serving-Bot consists of simple mechanical design which has simple mechanism with which performing the necessary tasks becomes easier. Due to its design parameters, it also requires less power and draws less current which allows us to work with the robot safely. Moreover, it also adds to the safety to its environment and the people around it. Its light weight builds up allows us to assemble the parts without having the difficulty to carry it anywhere. Once assembled, the entire robot remains light in its weight and can easily be moved around if necessary. Based on its complete set-up and overall parameters, the Serving -bot stands out on its own to become an important aspect to the solution of this thesis project.

Contents

List of Figures

Chapter 1. Introduction

Due to the Pandemic Phase, there raised many of such situations where the Government and the Medical staff were in the need of such machine vehicle where the contact between patients and the medical staff and other co-workers could get to a termination. Here it can be said that the "NECESSITY IS THE MOTHER OF INVENTION". It is truthful if we say this as it denotes that the world is in tremendous need of such of the robotic machines and devices where the human-to-human physical contact could become zero.

1.1 Robots:

A robot is a machine designed to execute one or more tasks repeatedly, with speed and precision. There are as many different types of robots as there are tasks for them to perform. A robot is a mechanical or virtual artificial agent, usually an electro-mechanical machine that is guided by a computer program or electronic circuitry. Robots can be autonomous or semiautonomous. Robots have replaced human in performing repetitive and dangerous tasks which humans prefer not to do, or are unable to do because of size limitations, or which take place in extreme environments.

1.2 About this Project (Based of Robotics):

The robot is a tray machine with wheels. The machine can carry food trays to patients. On a regular basis this robotic tray device can Carry up to 10-15 kgs. Discarding human-human contact and battling COVID-19 with innovative measures is paramount at this hour and hence several new innovations have been initiated in India itself for battling COVID-19. It is a Node MCU esp8266 based robotic design implemented to seek out and detect its required destination and perform its deliberate tasks with precision and accuracy. The serving-Bot consists of simple mechanical design which has simple mechanism with which performing the necessary tasks becomes easier. Due to its design parameters, it also requires less power and draws less current which allows us to work with the robot safely. Moreover, it also adds to the safety to its environment and the people around it. Its light weight builds up allows us to assemble the parts without having the difficulty to carry it anywhere. Once assembled, the entire robot remains light in its weight and can easily be moved around if necessary. Based on its complete set-up and overall parameters, the Serving -bot stands out on its own to become an important aspect to the solution of this thesis project.

Chapter 2. Proposed System

A 12 Volt DC Power Supply has been applied to Microcontroller and Motor Driver. The Microcontroller text input and gives output to the Wi-Fi module. As per the **Figure 2.1,** Here bi-directional arrow has been between the Microcontroller and Wi-Fi module. Motor Driver is the by directional arrow has been used between the Microcontroller and Mobile Control Internet.

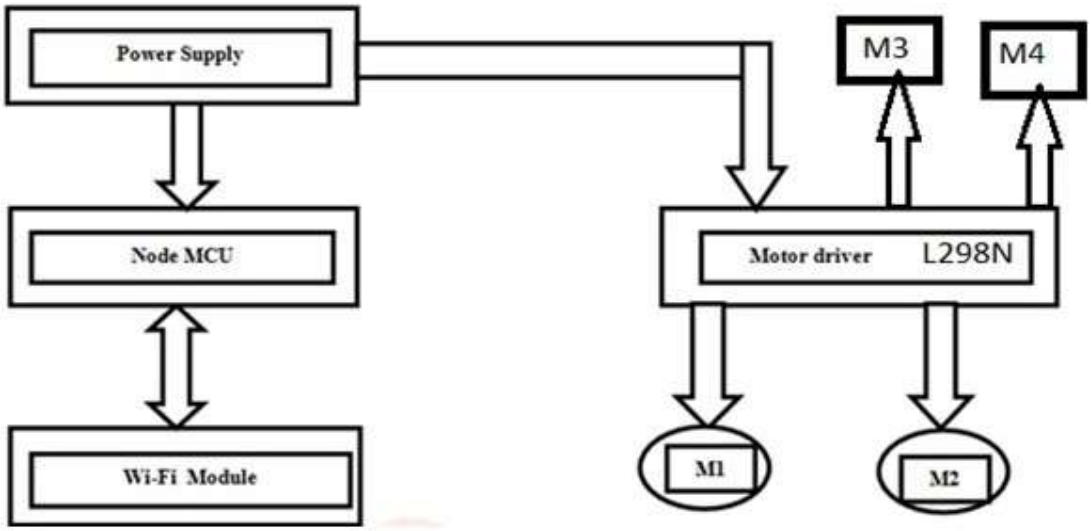


Figure 2. 1- Architecture of the System

Chapter 3. Software/Hardware Requirements

3.1 Hardware Requirements

1) Node MCU ESP8266 (Amica CP2102)
2) L298N Motor Driver
3) 11.1-12.6V (2500MaH) Lithium-ion Battery
4) 4 BO Motors
5) Female DC Jack (For Battery)
6) Voltmeter (3V-30V)
7) 12V (01aH) Battery Charge Adapter
8) Jumper Wires (Female-Female/Male-Female)
9) Robotic Wheels
10) Breadboard (840 points)
11) Wooden Ply
12) Glue Gun
13) Soldering Iron
14) Motor Holder Clamps

3.2 Software Requirements

1) Arduino IDE

Chapter 4. Working Module

4.1 Component Description:

1) Node MCU ESP8266 With Wi-Fi Module:

The Node MCU development board is the main microcontroller that we use in this project. It is based on the ESP8266 Wi-Fi module that generally acts as an added Wi-Fi module to other microcontrollers for imparting Wi-Fi connectivity to them. But the ESP8266 itself possesses some processing power which is sufficient for our project. The Node MCU development board incorporates the ESP8266 with other components like the CH340 USB to serial chip (needed to connect the Node MCU development board to the computer for programming it) and the SPX3819 low voltage LDO voltage regulator (to regulate the input power supply voltage of +5V to +3.3V which is the input voltage of the ESP8266 core) to make it ready for processing purposes. It operates at an input power of +5V and it consists of 30 pins including 11 general purpose input/output pins (GPIO- General Purpose Input/Output pins). Its pin configuration is as follows: **Figure 4.1.**

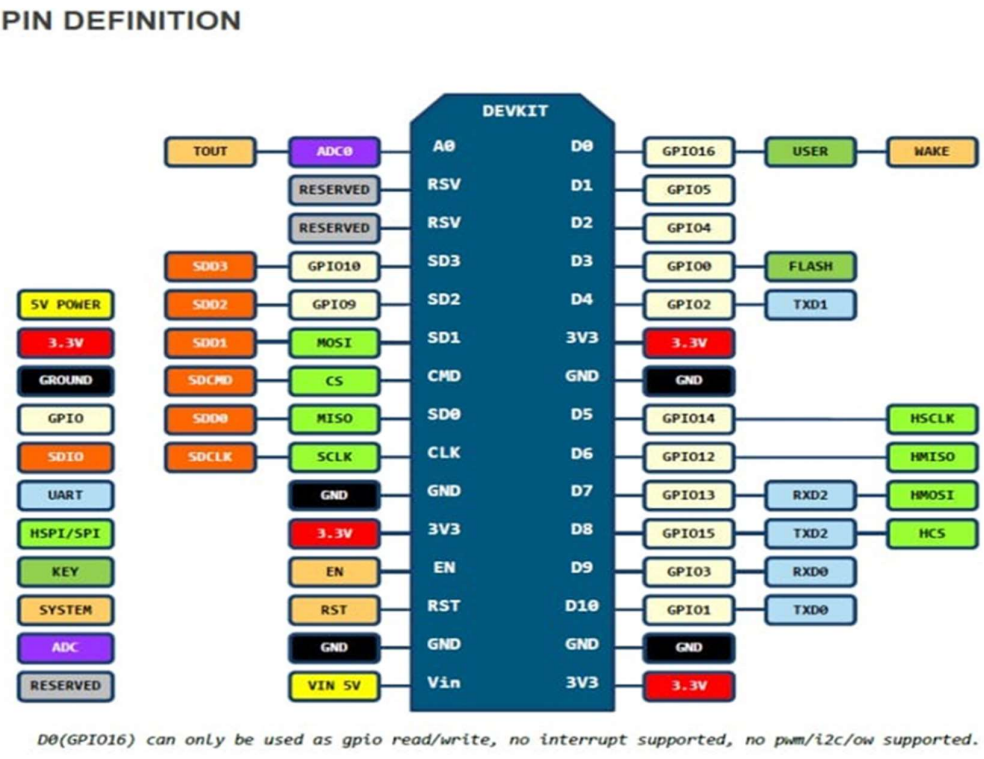


Figure 4. 1- Pin Diagram of Node MCU

2) Motor Driver (L298N):

The motor driver unit used in this project is the L298N motor driver board. The Node MCU cannot provide the amount of current required by the motors to operate. The motors we used required 12V for their operations. So, the operation of the motors was handled by the motor driver. It took the outputs of the Node MCU board as input and accordingly sent power to the motors to operate as per the requirement specifications passed to it from the Node MCU development board.

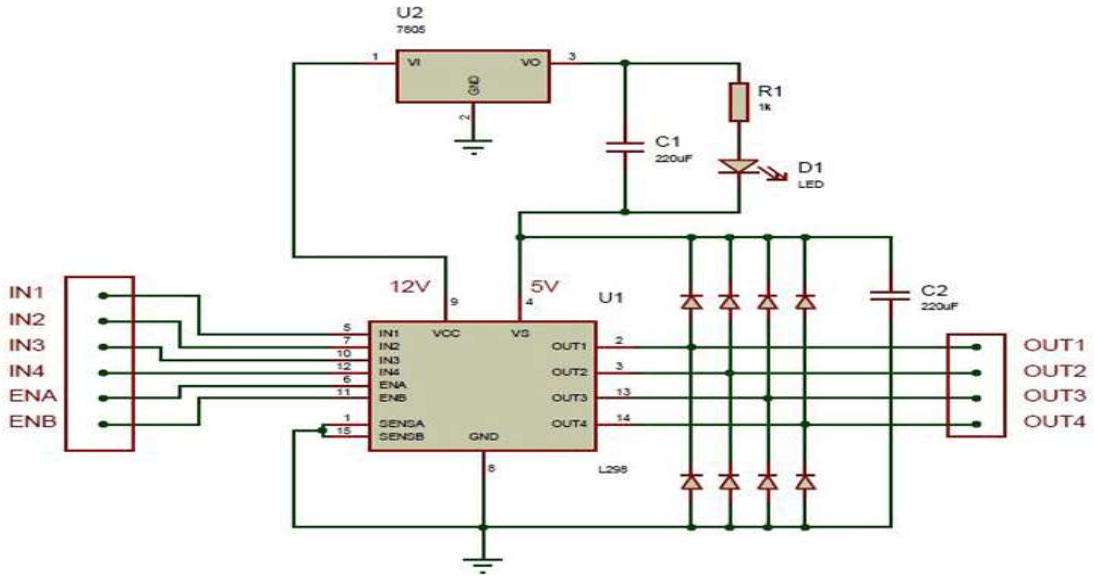


Figure 4. 2- Architecture of pins in Motor Driver (L298N)

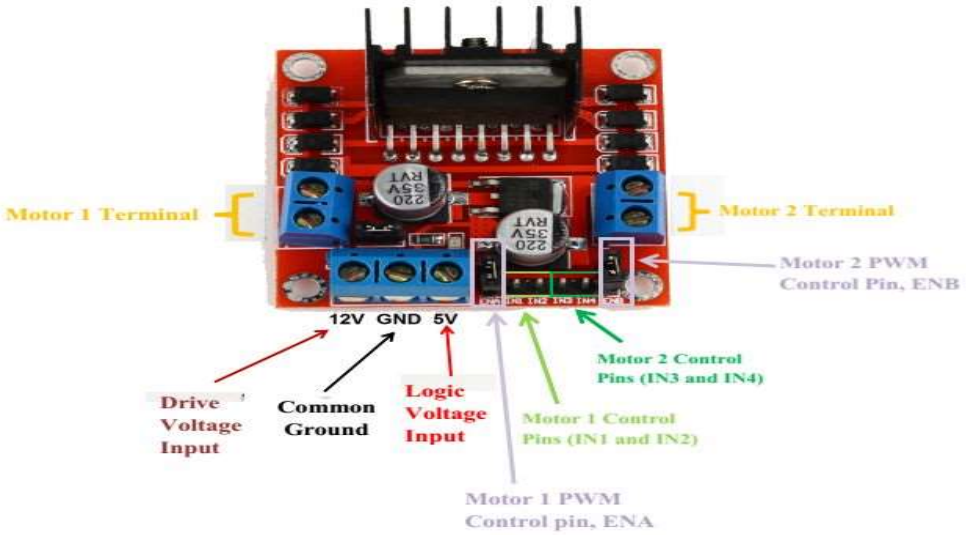


Figure 4. 3- Pin Description

3) BO Motor with Wheels:

The BO Motor can be used in variety of robotics applications and is available with range of 150 RPM and Torque. The **BO motor** is a machine that transforms electric energy into mechanical energy in form of rotation.

4) Breadboard:

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an

early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode).

5) Lithium-ion Battery:

A lithium-ion battery or Li-ion battery is a type of rechargeable battery. Lithium-ion batteries are commonly used for portable electronics and electric vehicles and are growing in popularity for military and aerospace applications.

6) Voltmeter:

A voltmeter is an instrument used for measuring electric potential difference between two points in an electric circuit. It is connected in parallel. It usually has a high resistance so that it takes negligible current from the circuit.

7) Female DC Jack:

The female barrel connector, or "jack", can be purchased in several varieties: PCB mounted (surface mount or through hole), cable mount, or panel mount. Some of these connectors will have an additional contact that allows the application to detect whether a power supply is plugged into the barrel jack or not, thus allowing the device to bypass batteries and save battery life when running on external power.

8) Jumper Wire:

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools to make it easy to change a circuit as needed.

9) Power Adapter for Charging Battery:

The brand-new multipurpose Orange 12V 1A Power supply series adapter.

Orange 12V 1A Power Supply with 5.5mm DC Plug Adapter is 2 pin EU plug type adapter and 1.2 meters long connecting cable. These adapters are designed to meet all types of power requirements of tablet pc, notebook, and other electronic gadgets.

This adapter is compatible to handle up to 1A current so applications like Routers, Small table lamp, TV Box, tablet PC, 2.5-inch mobile hard disk, mobile DVD, Power Tools, Wireless Devices etc. are compatible with this adapter.

Features:

The adapter is easy to use.

It comes with a long wire.

Wide input voltage range (100VAC-270VAC).

Very low no-load power consumption.

Very low ripple & noise output for device safety.

Protections against- under-over voltage/ overload/ short circuit with auto-restart on fault removal.

Soft start & low inrush current.

Isolation up to 3kv for 5sec. time.

High operating ambient temperature up to 60°C.

Highly efficient, compact, durable, and long life.

10) Wooden Ply:

Wooden Ply was used for the Robot Chassis and Structure.

11) Soldering Iron:

A soldering iron is a hand tool used in soldering. It supplies heat to melt solder so that it can flow into the joint between two workpieces.

A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current (supplied through an electrical cord or battery cables) through a resistive heating element. Cordless irons can be heated by combustion of gas stored in a small tank, often using a catalytic heater rather than a flame. Simple irons, less commonly used today than in the past, were simply a large copper bit on a handle, heated in a flame.

Solder melts at approximately 185 °C (365 °F). Soldering irons are designed to reach a temperature range of 200 to 480 °C (392 to 896 °F).

12) Glue Gun:

To ensure the best bonding results, a compatible hot melt adhesive is essential for each glue gun and application and these are usually made into sticks that fit into a slot in the glue gun. Hot melts vary in width and length and are generally in the form of waxes, resins, and a variation of thermoplastic polymers. The chemical composition of hot melts varies because they may produce soft or hard glue product.

13) Motor Holder Clamp:

It is a Mounting Clamp for BO Motor. This is used for fixing the motor to the chassis. It is made from MS steel and has a thickness of 1mm.

Specification

Material	Mild Steel
Length (mm)	27
Width (mm)	22.5
Height (mm)	1
Weight (gm)	5 (each)

4.2 Software Used:

Arduino IDE:

The open-source Arduino environment allows user to write code and upload it to the I/O board. The environment is written in Java. The Arduino development environment contains a text editor for writing code, message area, text console, and toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Arduino programs are written in C or C++. Arduino features, capable of compiling and uploading programs to the Board with a single click. Software written using Arduino is called sketches.

Steps to Work with Arduino IDE:

- Installing Arduino IDE

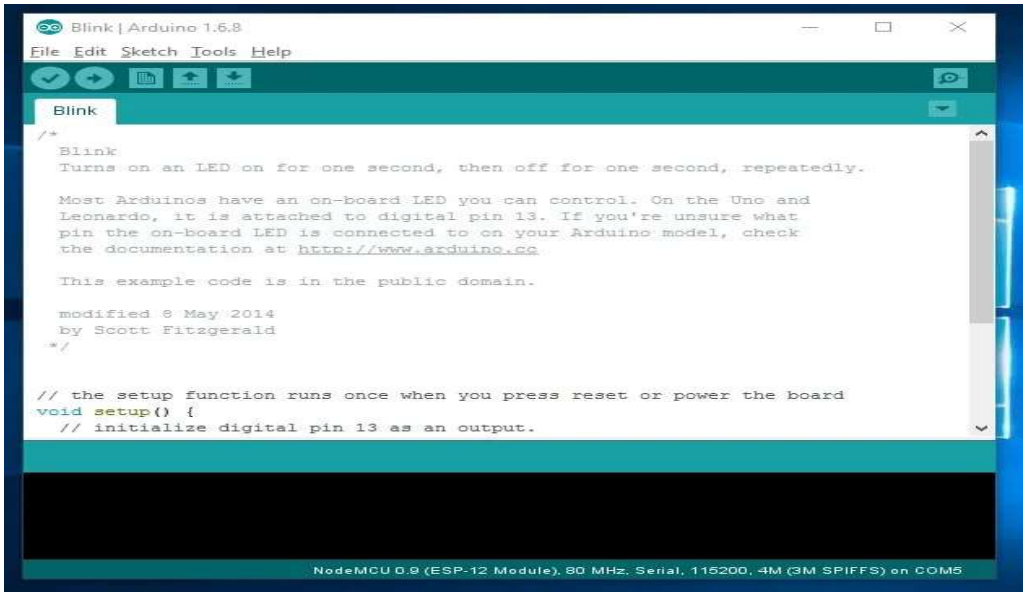
  Install Arduino IDE software from the link http://www.arduino.cc/en/main/software.

- Arduino IDE icon

  After installing Arduino IDE icon is created on the Desktop.

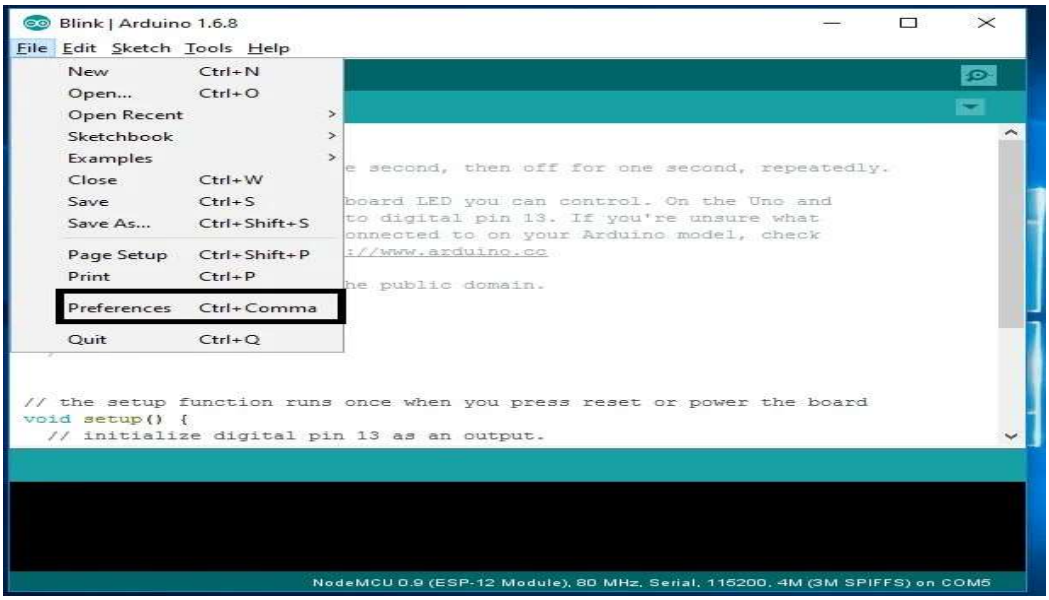
- Opening Arduino IDE

  Click on the Icon to open the Arduino window as shown in the figure.



- Preferences

  Open the File and click on the Preferences as shown in the figure.

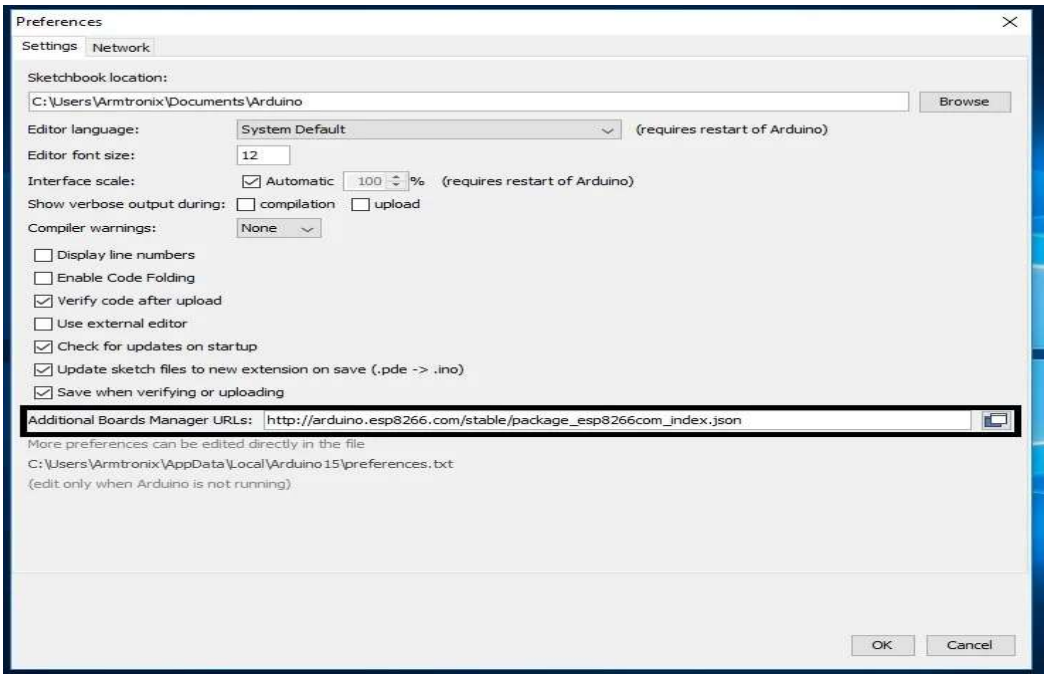


- Adding ESP8266 Board Manager

  In the Additional Boards Manager enter below URL.

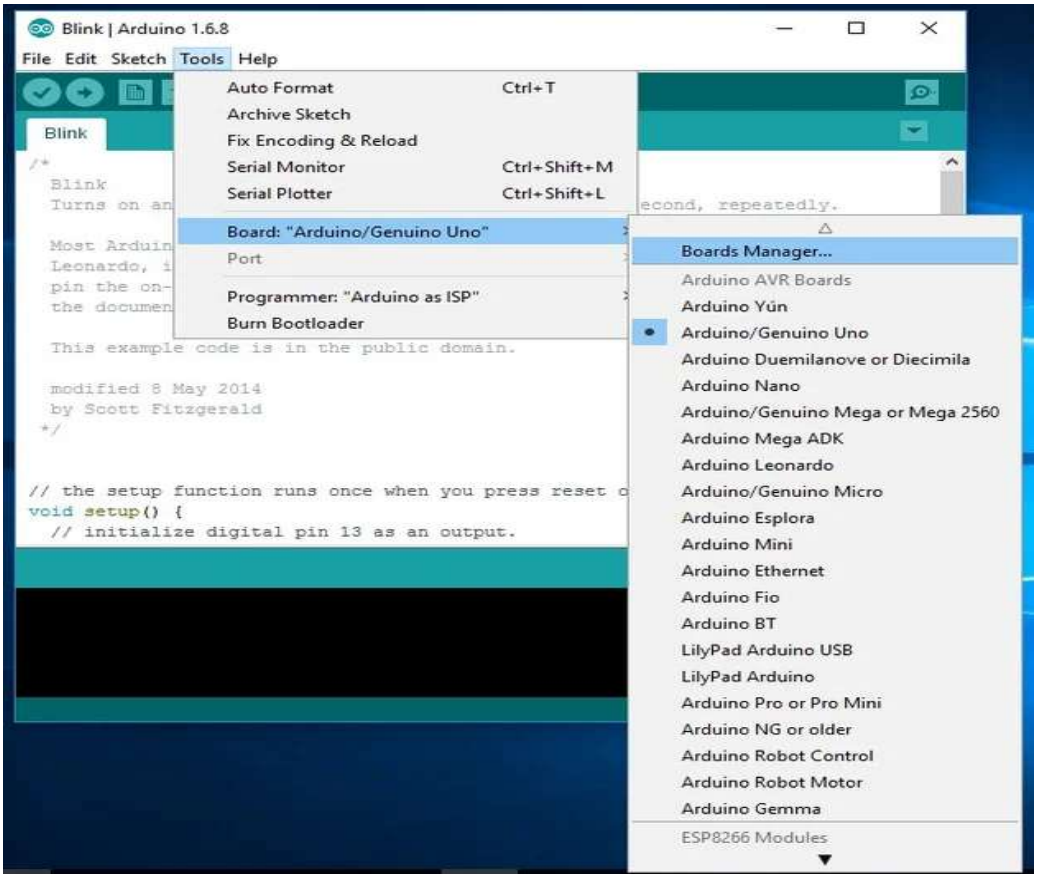
  http://arduino.esp8266.com/stable/package_esp8266com_index.json

  As highlighted in the figure and enter OK.



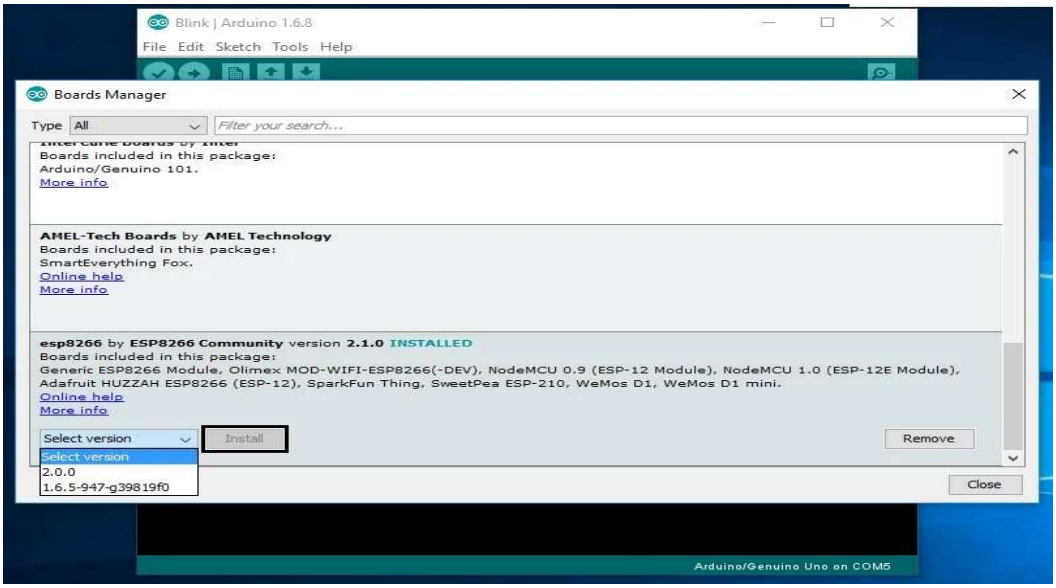
- Selecting Board

  Now open the tools in that select Board: “Arduino/Genuino Uno” and click on the Boards Manager as shown in the figure.



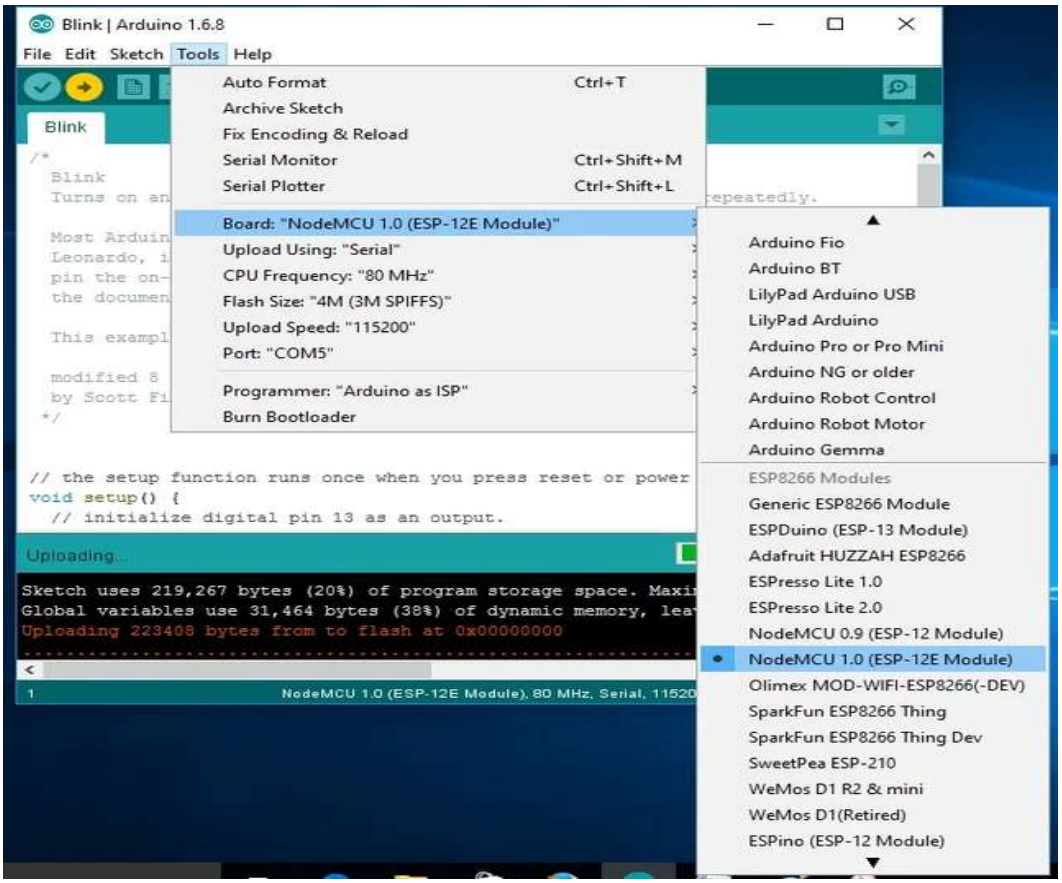
- ESP8266 Board Package

The Boards Manager window opens, scroll the window page to bottom till you see the module with the name ESP8266. Once we get it, select that module and select version and click on the Install button. When it is installed it shows Installed in the module as shown in the figure and then close the window.



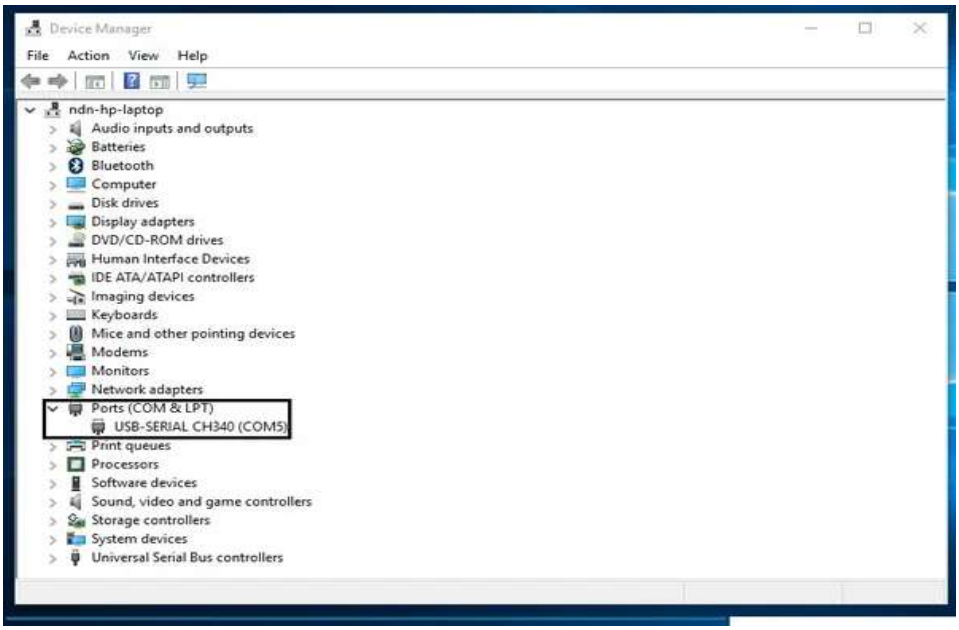
- Selecting ESP8266 Arduino Board

  To run the esp8266 with Arduino we have to select the Board: “Arduino/Genuino Uno” and then change it to Node MCU 1.0 (ESP-12E Module) or other esp8266 modules depending on what you have .This can be done by scrolling down, as shown in the figure.



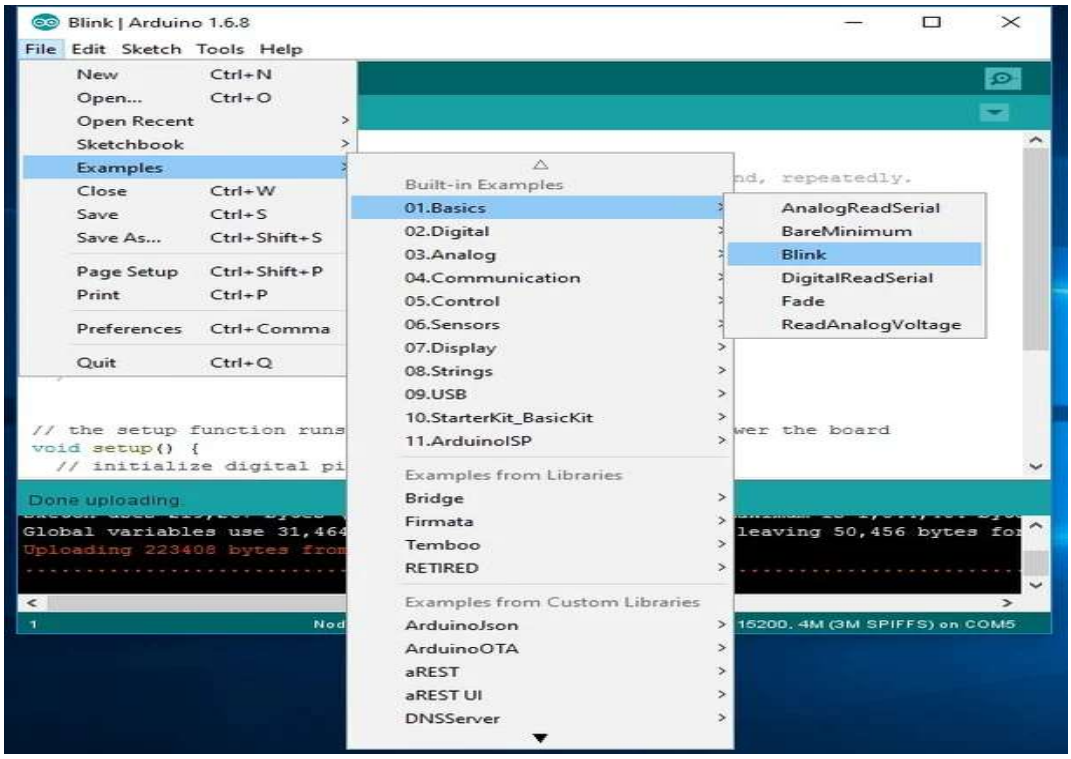
- Connecting ESP8266 to the PC

  Now Let’s connect the ESP8266 module to your computer through USB cable as shown in the figure. When module is connected to the USB, COM port is detected eg: here COM5 is shown in the figure.



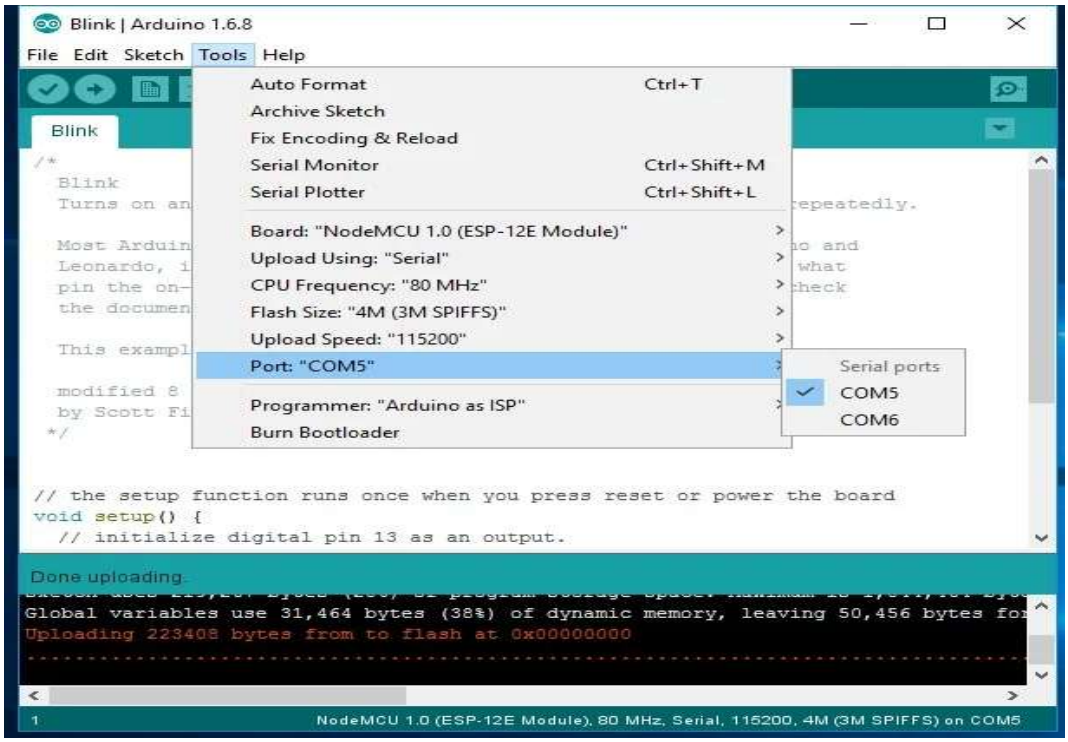
- Selecting Example program in Arduino IDE

  Now open the File tab in that go to the Examples in that enter into Built-in example, go to 01.Basics and click on Blink to open the window.

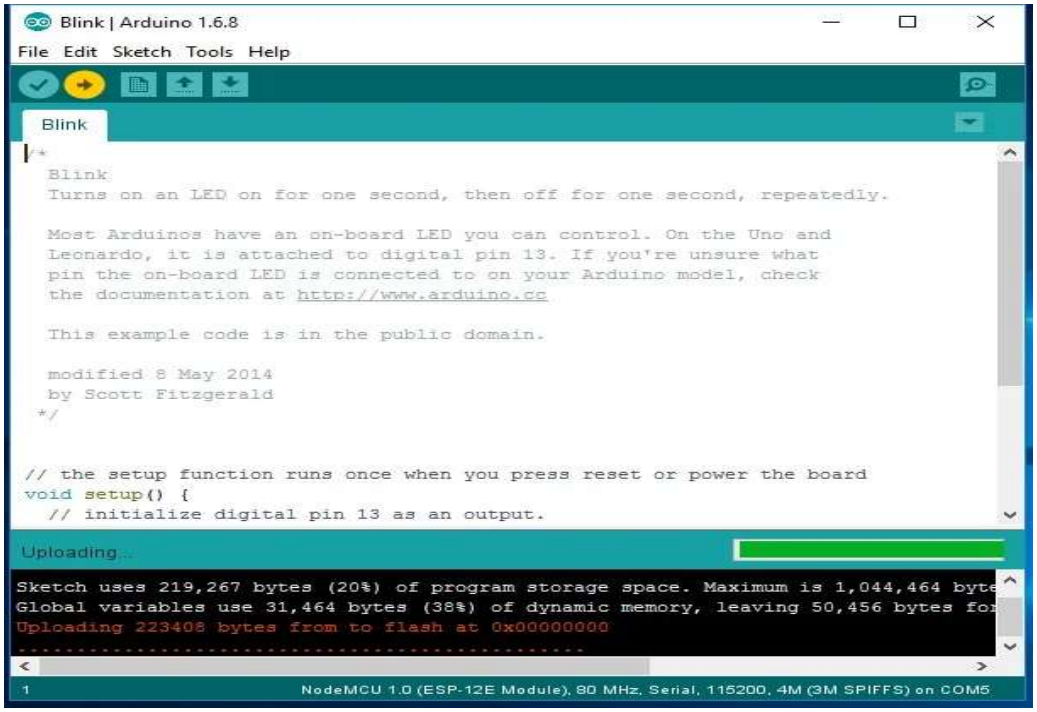


- Selecting COM Port

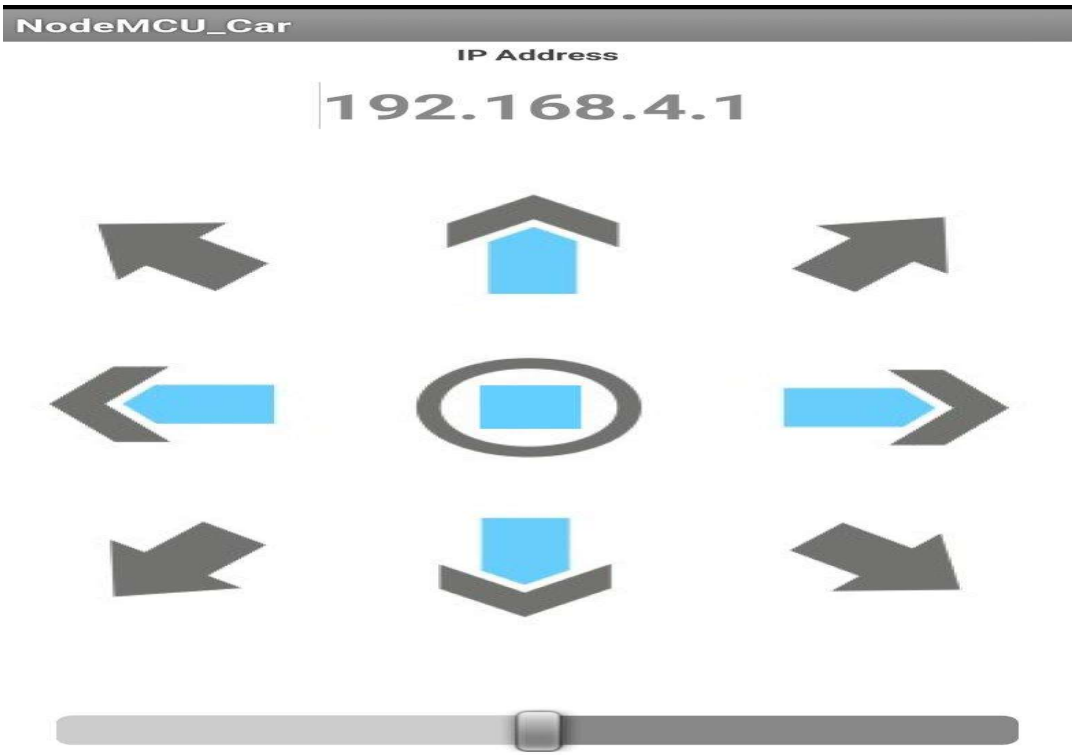
The Blink example will open on a new window, click on tools to select the port: "COM" based on which esp8266 module is connected to your respected COM port of the computer. To select COM port, refer previous steps.



- Uploading the Program to ESP8266 Module



Node MCU Car Operating Control Software (.apk):



4.3 Overall Working Section:

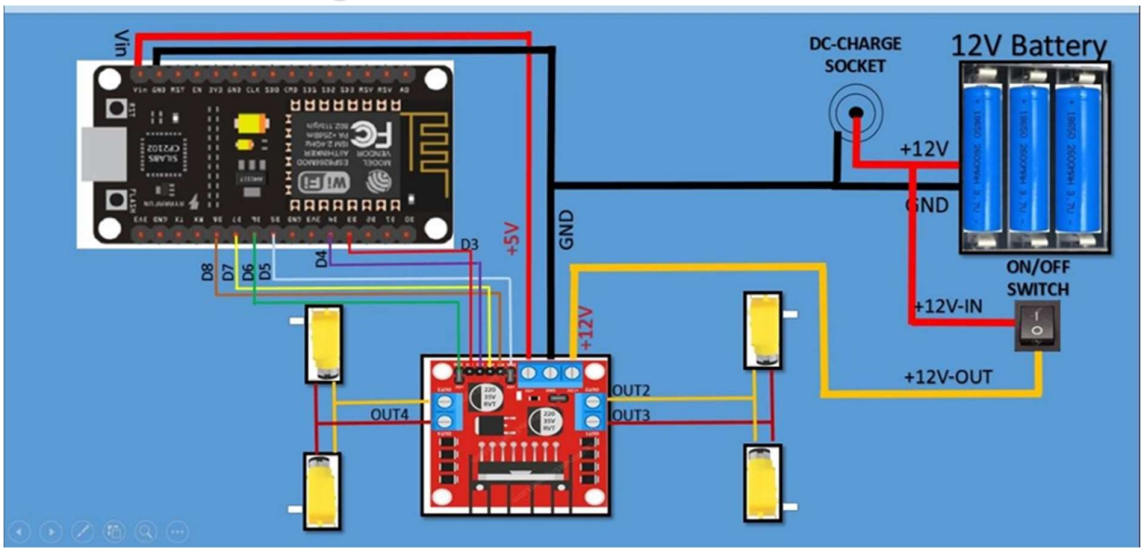


Figure 4. 4- Circuit Diagram (Referred)

- The circuit is built around a Node MCU board, ultrasonic transceiver module, ESP8266 Wi-Fi module, motor driver, DC motors FR, FL, BR and BL, and a few common components.
- The circuit uses 11.1 V Lithium-ion Battery (Max 12.6 V). Regulated 5V supply for rest of the circuit is provided by the Node MCU board itself. LED on the board indicates presence of power supply.
- Wi-Fi Module can be installed in the robot to overcome the con of network disturbance and to have a safe and strong signal from the transmitter to the receiver. This has been shown in the **Figure 4.4** which explains all the working and basic architecture of the proposed system.
- To give instructions to the robot as per requirement we are going to program the robot using node MCU Development board which has in-built Wi-Fi Module (ESP-8266).

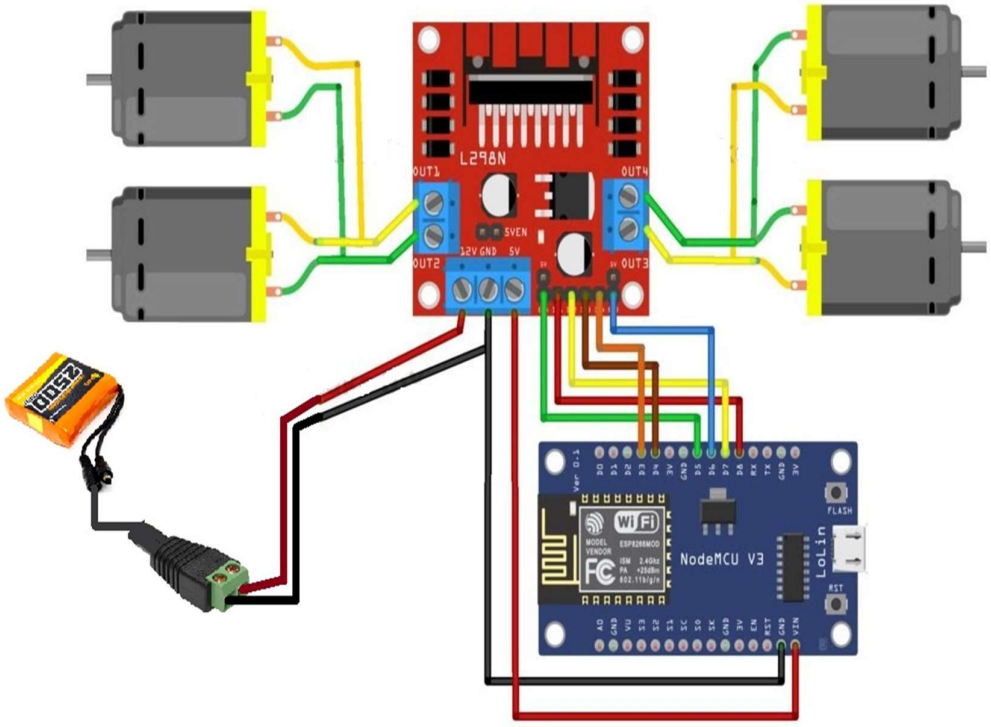


Figure 4. 5- Circuit Diagram Created by the Group

Chapter 5. Purpose of Robot in Various Fields

This Service Robot can be used in Various fields with respect to Nature of the Service Robot, which can be helpful in service-based works. It can also be stated as that this Robotic device can be very useful in the places where the specific work can really need the human resources and can replace them based on one controller and another person as an operator. We can use these Robots as it is considered as Mobility Free which is one of the main Pros of this Robot.

So let us see where and which fields this robot can be useful, here are some of the Examples:

5.1 In Restaurant:

These service Robots are very useful in the Restaurants, as it can help the owner to have better servers of the ordered Food. It could help the owner of the Restaurant to have a less expenses towards the Human Work Resources. These Robotic Device just need an Operator to control the Robot and helps it to fulfil the Demands from the Customers in an Innovative Way. It is also accompanied with the smart device (which has POS based app) that helps the customers to help in choosing their orders which takes orders from the Customers and can fulfil it without getting and touch and connections with the other humans such as waiters, and other workers who work in a restaurant.

Here is the way that how it works:

(1) At first the costumers come in a Restaurant, and asks for Menu-Card, but despite Menu-Card the customers can access the Smart Device which is Installed on the robot.
(2) Here customers can access with the Smart Device (having Restaurant POS based app) which can help the customers viewing the list of food items with its prices same as Menu card.
(3) So as the Customer Chooses the food item, the record of the chosen food item has been stored in the restaurants system, that the specific customer has chosen a specific dish.
(4) So, the robot returns with the order and by the time the Chef of the restaurant is ready with the Chosen dish by the Customer.
(5) At the end, the Robot has been sent with the dish by the Customers at a specific table which can help with the discarding of Human-to-Human touch and lets the customers to be happy with the Innovative service.

(6) This innovative service can help the restaurant with their Positive customer Reviews and with the Restaurant rating.

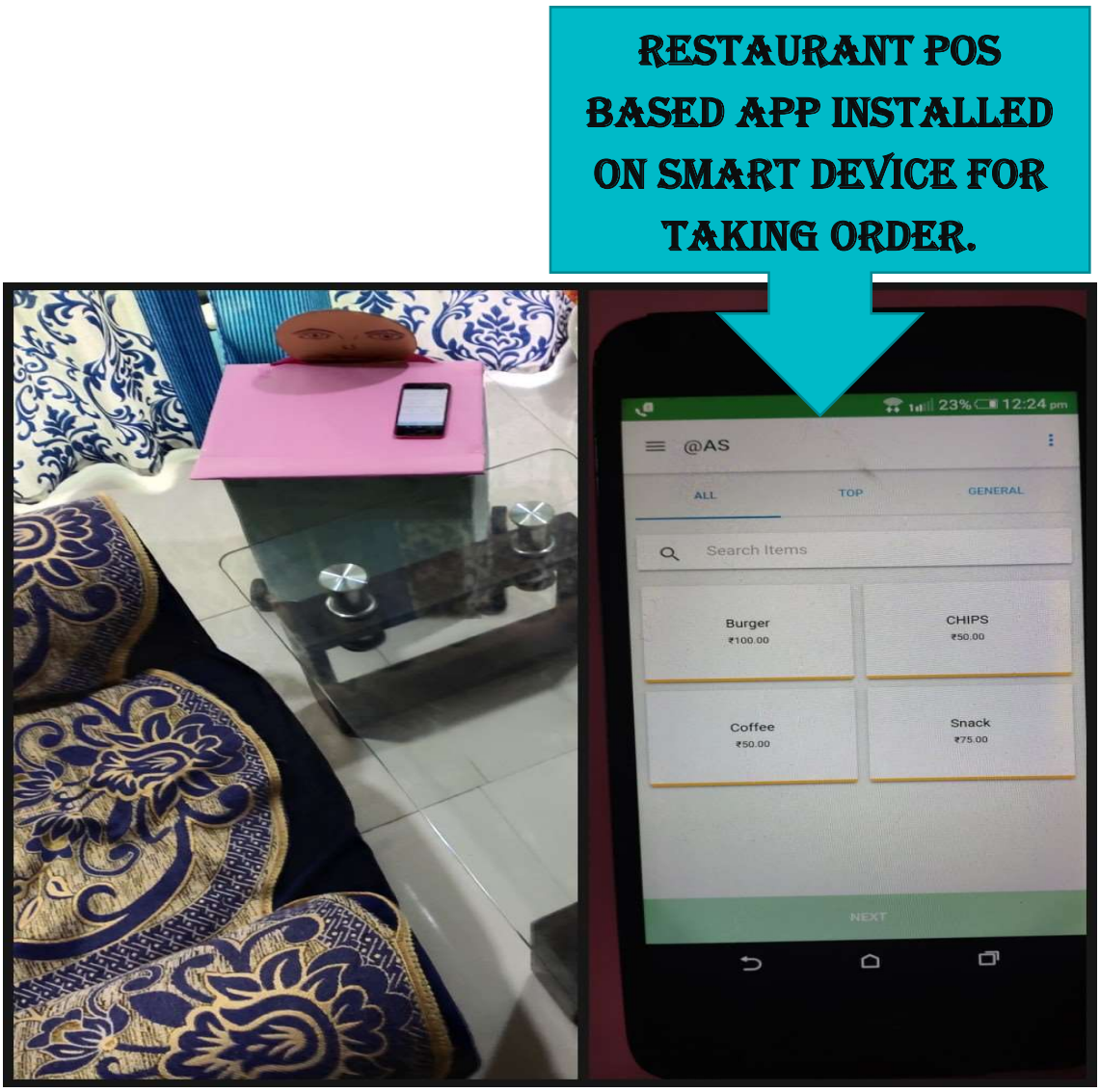


Figure 5. 1- Hotel Purpose

5.2 In Hospitals:

In Hospitals these Service Robotic Devices are very useful in case of any prevention for Human-to-Human contact and in case of any Pandemics and epidemics these type of Robotic Devices can be Proven as an Important aspect.

Currently, as we all know there is a Pandemic situation in the world i.e., Covid 19. Such diseases can be prevented to spread by using these types of Robotic devices. These Service Robots can be used in form of Suppliers of Medicines to the Patient, who is been infected with

the Covid virus. As we all know that this virus can spread through the Contact of the Infected person with the non-infected person. In this case if we want to let the Medicines reach to the infected person, we can use these types of Robotic devices. As these Robotic Devices can be easily sanitized and there will be no person-to-person contact. It can also help in preventing this disease to spread to other People in the Hospitals.

Here is the way that how it works:

(1) The Diseased Patient will be kept in a specific ward as the Patient has to prevent his contact with other people.
(2) Next the Robotic Device will work as an instructor and Medicine supplier as per the Prescription made by the Doctor.
(3) This Robotic Device can be used as a Medicine Tray Machine to supply the prescribed Medicines to the Patients in their Specific Wards.
(4) Hence, this can help to prevent the Human-to-Human contact as well as protects other Hospital staff from encountering the Patient who is having contagious Disease.

Figure 5. 2- Hospital Purpose

Chapter 6. Existing System and its Disadvantages

- Bluetooth Module Based Service Robot:

  The Bluetooth module-based service robot is based on the HC-05 which is the Bluetooth Module operating board.

  Disadvantages:

  (a) Speed: All the wireless technologies have relatively slow transmission of data. Moreover, Bluetooth cannot be compared with Wi-Fi direct which has significantly faster transfer rates.

  (b) Range: Maximum range offered by a Bluetooth connection is of 100m. Generally, Bluetooth has a small range of communication (typically lower than a Wi-Fi connection). Depending on the version and the nature of the devices, the range of a Bluetooth connection varies. Devices that need to be connected has to be in this range.

  (c) Security: Even though Bluetooth implements various security mechanisms. Since it uses Radio frequencies, the security level of Bluetooth is considerably lower. Hackers can easily acquire your personal information using Bluetooth. Only under the condition of being in the allocated range. Hence, it should not be used for transferring critical information.

  (d) Compatibility: Even though most Bluetooth implementations are based on the standard, there are still compatibility issues with Bluetooth. Numerous reasons such as profiles, drivers, and versions account for this.

Figure 6. 1- Bluetooth Serving Robot

- Line Following Based Service Robot:
  (a) It may not move properly if the black/white line drawn is of low intensity.
  (b) The IR sensors may sometimes absorb IR rays from surroundings also.
  (c) As a result, robots may move in improper way.

Figure 6. 2- Line Following Robot

Chapter 7. Advantages of Developed System

Here we are using Wi-Fi Module which will remove short coverage area cons. The best advantage of this project is Node MCU.

 Node MCU is based on the Esperessif ESP8266-12E Wi-Fi System-On-Chip, loaded with an open-source, Lua-based firmware.

 It is perfect for IoT applications, and other situations where wireless connectivity is required.

 This chip has a great deal in common with the Arduino – they are both microcontrollers.

Equipped prototyping boards which can be programmed using the Arduino IDE. If you are familiar with Arduino, using Node MCU is a logical next step if you are looking for a more compact, Wi-Fi-equipped alternative. In this, we will look at the node MCU pinout, and show you how you can integrate Node MCU into your next project.

 So, why would you choose to use a Node MCU when the more widely documented. Arduino is around? Well, the Node MCU has several distinct advantages. Before we detail them, however, we should state that the Node MCU, technically, is not a device, but rather the firmware that loads onto one.

 In practice, you will see the Node MCU firmware available for sale pre-loaded onto the board. If you already have an ESP8266, all the connectivity options we will run through. here will still apply.

 There have been many different ESP modules over the years, each with their own. advantages and drawbacks. There have been just two types of Node MCU boards, however: versions 0.9 and 1.0. The 0.9 version is blue and comes loaded with the ESP.

12 chip, while the 1.0 is black, and comes with the ESP-12E (which stands for ‘enhanced’).

 There are several key differences between the two chips, the most notable being that. the later version comes with 22 pins and the earlier one comes with just 16.

Given that the ESP8266 is a more recent release than the Arduino, it is not surprising that it has stronger specs. There is a 32-bit RISC processor clocked at 80MHz, along with a

generous RAM complement and support for up to 16mb of external flash storage. The device is especially useful for IoT applications, thanks to its tiny footprint and built-in Wi-Fi support.

In all other aspects, however, the ESP is pretty much like the Arduino. There is an onboard voltage regulator that ensures the cleanest possible power to the MCU itself, as well as a push-button reset and a USB connection for easy interface with your computer.

Overall Advantages of the System:

- This Robotic tray machine can be used in hotels and hospitals discarding Human- to Human contact.
- Next advantage is, here in this robotic machine we are using wi-fi module, which is better than using Bluetooth or wired system based on connectivity.
- This is one time investment robot which reduces the cost of labor and consume less time than human.

Chapter 8. Code Setup

Following is the Code on which all the controls of our Robotic Machine is Working on:

It Contains:

- Movement Controls
- Speed Controls
- Speed Coefficient
- Wi-fi Module Controls

```
#define ENA   14          // Enable/speed motors Right
GPIO14(D5)

#define ENB   12          // Enable/speed motors Left
GPIO12(D6)

#define IN_1  15          // L298N in1 motors Rightx
GPIO15(D8)

#define IN_2  13          // L298N in2 motors Right
GPIO13(D7)

#define IN_3  2           // L298N in3 motors Left
GPIO2(D4)

#define IN_4  0           // L298N in4 motors Left
GPIO0(D3)



#include <ESP8266WiFi.h>

#include <WiFiClient.h>

#include <ESP8266WebServer.h>

String command;             //String to store app command state.

int speedCar = 800;         // 400 - 1023.

int speed_Coeff = 3;
```

```
const char* ssid = "Make DIY";

ESP8266WebServer server(80);


void setup() {


 pinMode(ENA, OUTPUT);

 pinMode(ENB, OUTPUT);

 pinMode(IN_1, OUTPUT);

 pinMode(IN_2, OUTPUT);

 pinMode(IN_3, OUTPUT);

 pinMode(IN_4, OUTPUT);


  Serial.begin(115200);


// Connecting WiFi


  WiFi.mode(WIFI_AP);

  WiFi.softAP(ssid);


  IPAddress myIP = WiFi.softAPIP();

  Serial.print("AP IP address: ");

  Serial.println(myIP);
```

```
 // Starting WEB-server
     server.on ( "/", HTTP_handleRoot );
     server.onNotFound ( HTTP_handleRoot );
     server.begin();
}


void goAhead(){


      digitalWrite(IN_1, LOW);
      digitalWrite(IN_2, HIGH);
      analogWrite(ENA, speedCar);


      digitalWrite(IN_3, LOW);
      digitalWrite(IN_4, HIGH);
      analogWrite(ENB, speedCar);
  }


void goBack(){


      digitalWrite(IN_1, HIGH);
      digitalWrite(IN_2, LOW);
      analogWrite(ENA, speedCar);
```

```
      digitalWrite(IN_3, HIGH);
      digitalWrite(IN_4, LOW);
      analogWrite(ENB, speedCar);
  }

void goRight(){

      digitalWrite(IN_1, HIGH);
      digitalWrite(IN_2, LOW);
      analogWrite(ENA, speedCar);

      digitalWrite(IN_3, LOW);
      digitalWrite(IN_4, HIGH);
      analogWrite(ENB, speedCar);
  }

void goLeft(){

      digitalWrite(IN_1, LOW);
      digitalWrite(IN_2, HIGH);
      analogWrite(ENA, speedCar);

      digitalWrite(IN_3, HIGH);
```

```
      digitalWrite(IN_4, LOW);
      analogWrite(ENB, speedCar);
  }

void goAheadRight(){

      digitalWrite(IN_1, LOW);
      digitalWrite(IN_2, HIGH);
      analogWrite(ENA, speedCar/speed_Coeff);

      digitalWrite(IN_3, LOW);
      digitalWrite(IN_4, HIGH);
      analogWrite(ENB, speedCar);
   }

void goAheadLeft(){

      digitalWrite(IN_1, LOW);
      digitalWrite(IN_2, HIGH);
      analogWrite(ENA, speedCar);

      digitalWrite(IN_3, LOW);
      digitalWrite(IN_4, HIGH);
```

```
      analogWrite(ENB, speedCar/speed_Coeff);
  }

void goBackRight(){

      digitalWrite(IN_1, HIGH);
      digitalWrite(IN_2, LOW);
      analogWrite(ENA, speedCar/speed_Coeff);

      digitalWrite(IN_3, HIGH);
      digitalWrite(IN_4, LOW);
      analogWrite(ENB, speedCar);
  }

void goBackLeft(){

      digitalWrite(IN_1, HIGH);
      digitalWrite(IN_2, LOW);
      analogWrite(ENA, speedCar);

      digitalWrite(IN_3, HIGH);
      digitalWrite(IN_4, LOW);
      analogWrite(ENB, speedCar/speed_Coeff);
```

```
  }


void stopRobot(){


      digitalWrite(IN_1, LOW);

      digitalWrite(IN_2, LOW);

      analogWrite(ENA, speedCar);


      digitalWrite(IN_3, LOW);

      digitalWrite(IN_4, LOW);

      analogWrite(ENB, speedCar);

 }


void loop() {

    server.handleClient();


      command = server.arg("State");

      if (command == "F") goAhead();

      else if (command == "B") goBack();

      else if (command == "L") goLeft();

      else if (command == "R") goRight();

      else if (command == "I") goAheadRight();

      else if (command == "G") goAheadLeft();
```

```
      else if (command == "J") goBackRight();
      else if (command == "H") goBackLeft();
      else if (command == "0") speedCar = 400;
      else if (command == "1") speedCar = 470;
      else if (command == "2") speedCar = 540;
      else if (command == "3") speedCar = 610;
      else if (command == "4") speedCar = 680;
      else if (command == "5") speedCar = 750;
      else if (command == "6") speedCar = 820;
      else if (command == "7") speedCar = 890;
      else if (command == "8") speedCar = 960;
      else if (command == "9") speedCar = 1023;
      else if (command == "S") stopRobot();
}


void HTTP_handleRoot(void) {


if( server.hasArg("State") ){
       Serial.println(server.arg("State"));
  }
  server.send ( 200, "text/html", "" );
  delay(1);
}
```

Chapter 9. Conclusion

The project carried out by using the node mc and motor drive in the field of mechatronics department. New things and new technology are being invented. As the technology grows day by day, it can imagine about the future in which thing may occupy every place. User friendly and less complex, which can readily be used to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, hospital, and restaurant, it can extend for other purposes such as commercial and research application.

The chassis of robot made by Cardboard & Ply it gives the efficiency and more speed to robot. The command coding is entered in robot it is very easy to understand. Though it is designed keeping in mind about the need for industry, it can extend for other purposes such as commercial and research application.

Chapter 10. Reference

- https://components101.com/development-boards/nodemcu-esp8266-pinout-features-and-datasheet
- https://components101.com/modules/l293n-motor-driver-module
- https://en.m.wikipedia.org/wiki/Breadboard
- https://en.m.wikipedia.org/wiki/ESP8266
- https://en.m.wikipedia.org/wiki/Jump_wire
- https://www.javatpoint.com/embedded-system-c-programming
- https://www.edureka.co/blog/embedded-c-programming/
- https://electronicsmaker.com/bluetooth-controlled-robot-using-android-mobile
- https://slickpos.com/
- https://circuitbest.com/arduino-smartphone-controlled-wifi-car-using-nodemcu-esp8266/