

ROBOTICS BOOT CAMP

ELECTRONIC COMMUNICATION AND ENGINEERING(ECE) THE ROCK STARS

Team Leader: N. Naga Madhuri (23KE1A0478)

Team Members:

V. Sravani (23KE1A04C5)

V. Jahnavi (23KE1A04C7)

N. Yusha Sri (23KE1A0479)

E. Hima Bindu (24KE5A0406)

CH. Alekhya Gayatri(24KE5A0404)

From:- ECE



LINE FOLLOWER ROBOT

❖ INTRODUCTION OF LINE FOLLOWER ROBOT:-

A line-following robot is a type of autonomous robot designed to follow a predetermined path, usually marked by a visible line on the floor.

This line is typically black on a white surface, or white on a black surface, though other color combinations can be used. Line-following robots are commonly used in educational robotics to teach basic concepts of electronics, sensors, and programming

❖ REQUIREMENTS OF LINE FOLLOWER ROBOT:-

- CHASSIS
- WHEELS
- MOTOR DRIVER(L298)
- MOTOR (ACTUATORS)
- JUMPER WIRES
- BATTERY
- ESP32 CHIP
- IR SENSOR
- GENERAL PCB (PRINTED CIRCUIT BOARD)

❖ METALLIC CHASSIS:-

- ✧ A robot chassis, also known as its frame, is a structural component of the robot that provides a foundation for the robot and other components allows it to move the robot.



❖ MOTORS:-

- ✧ A motor is an electrical device that converts electrical energy into mechanical energy, producing motion or torque.

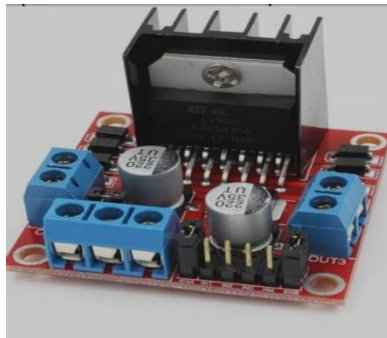


❖ MOTOR DRIVER(L298N):-

A motor driver(L298N) is an electronic device, which can amplify the current's upto 2A. Motor drivers act as an interface between a micro controller and the motor.

Key functions of a motor driver:

- ✧ Direction control: Switches motor rotation between clockwise and counterclockwise.
- ✧ Speed control: Regulates motor speed, often using Pulse Width Modulation (PWM).
- ✧ Current limiting: Prevents excessive current draw, protecting the motor and driver.
- ✧ Overheat protection: Shuts down the driver if it overheats.



❖ WHEELS:-

Wheels play a crucial role in robots, enabling mobility, navigate around the ground, and interaction with the environment.

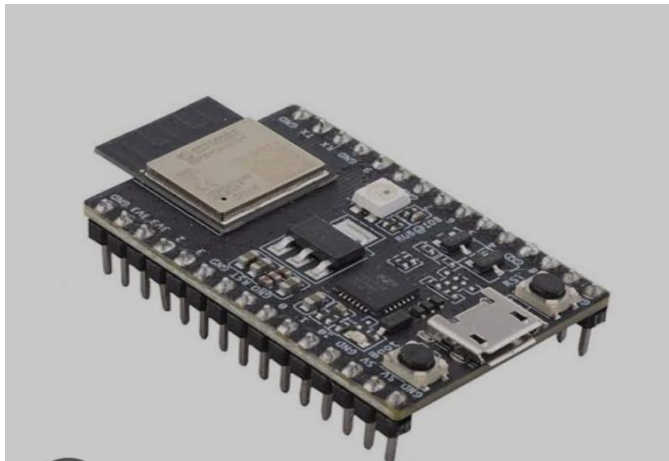


❖ ESP32 CHIP:-

The ESP32 chip can be used as the control unit in robotics project to provide wireless control and communication capabilities to robot. ESP32 is a micro controller with integrated Wi-Fi and Bluetooth capabilities. It's widely used in robotics for its versatility, ease of use, and connectivity features.

Here are some examples of how the ESP32 can be used for wireless robot:

- ❖ Bluetooth game pad controller
- ❖ Wi-Fi remote controller
- ❖ PS3 controller



❖ JUMPER WIRES:-

Jumper wires are used for these connections:

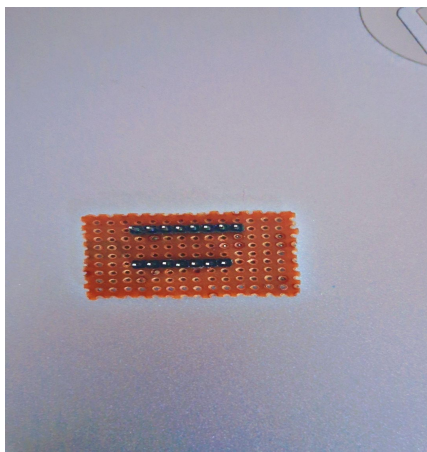
- ❖ Connect sensors and actuators to micro controllers.
- ❖ Link modules and components in robotic systems.
- ❖ Prototype and test robotic circuits.
- ❖ Debug and troubleshoot robotic systems.



- Where the black body is a absorber and white body is a emitter which emits light.In these minimum of 2 IR sensors are required.
- IR rays are not penetrates it reflects the light rays
- When the surface is white then the IR sensors reflects the rays black.
- When the surface is black then the IR sensors reflects the rays white.
- IR sensor BLACK-1
- IR sensor WHITE-0

❖ **GENARAL PCB(PRINTED CIRCUIT BOARD):-**

The common terminal of +5V and GND terminal are connected in general PCB



❖ PROCEDURE:-

- ✓ Design the chassis of your robot whether it will plastic or metallic chassis.
- ✓ First check positive and negative terminals of the motors, by connecting the motors to the battery positive to positive and negative to negative to the battery then motor moves clock wise direction and also fix the motors left and right to the chassis.
- ✓ Motor is a polarized component then we have connect the left motors and right motors in parallel connection between positive and negative terminals.
- ✓ In Parallel connection the voltage passes equally to the motors of left and right then the all motors moves equally.
- ✓ Where the equation is

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- ✓ Connect the four wheels to the four motors
- ✓ After that we have connect the connections between motors, L298N(motor driver), ESP32 chip then the connections are
 - Then connect the motor left(ML) positive to L298N(out1 pin) and negative terminals to L298N(out2 pin).
 - After that connect motor right(MR)positive to L298N (out3 pin) and negative terminals to L298N (out4 pin).
 - In L298N (Vcc pin) is for positive terminal of a battery.
 - In L298N two wires across the (GND pin) one wire is for negative terminal of battery and another wire of female end of jumper wire is connected to the one side of the general PCB.

- L298N (+5V pin) is connected to another side of the general PCB it is considered as +5V
- ESP32(Vin pin) is connected to the common +5V of the general PCB
- ESP32(GND pin) is connected to the common GND of the general PCB
- The two IR sensors are attached left and right at the front of the chassis.
- First IR sensor (VCC pin)is connected to the common +5V of the general PCB
- Second IR sensor (VCC pin) is connected to the common +5V of the general PCB
- First IR sensor (GND pin) is connected to the common GND of the general PCB
- Second IR sensor (GND pin) is connected to the common GND of the general PCB
- L298N (IN1 pin) is connected to the ESP32 (D14 pin).
- L298N (IN2 pin) is connected to the ESP32(D27 pin).
- L298N (IN3 pin) is connected to the ESP32 (D26 pin).
- L298N (IN4 pin) is connected to the ESP32 (D25 pin).
- L298N (ena pin) is connected to the ESP32 (D33 pin).
- L298N (enb pin)is connected to the ESP32 (D32 pin).
- ✧ We have to write a program for line follower robot in arduino software in the laptop.

❖ Program:-

```
int in1=14;
int in2=27;
int in3=26;
int in4=25;
int ena=33;
```

```
int enb=32;  
int irleft=12;  
int irright=13;
```

```
#define pM(a,b) pinMode(a,b)  
#define dW(a,b) digitalWrite(a,b)  
#define aW(a,b) analogWrite(a,b)  
#define OUT OUTPUT  
#define IN INPUT
```

```
void setup() {  
  // put your setup code here, to run once:  
  pM(in1,OUT);  
  pM(in2,OUT);  
  pM(in3,OUT);  
  pM(in4,OUT);  
  pM(ena,OUT);  
  pM(enb,OUT);  
  pM(irleft,IN);  
  pM(irright,IN);  
}
```

```
void loop() {  
  // put your main code here, to run repeatedly:  
  if(digitalRead(irleft)==0 && digitalRead(irright)==0){  
    dW(in1,1);  
    dW(in2,0);  
    aW(ena,150);  
    dW(in3,1);  
    dW(in4,0);  
    aW(enb,150);  
  } else if (digitalRead(irleft)==0 && digitalRead(irright)==1){  
    dW(in1,1);  
    dW(in2,0);
```

```

dW(in3,0);
  dW(in4,0);
  aW(enb,150);
} else if (digitalRead(irleft)==1 && digitalRead(irright)==0){
  dW(in1,0);
  dW(in2,0);
  aW(ena,150);
  dW(in3,1);
  dW(in4,0);
} else {
  dW(in1,0);
  dW(in2,0);
  dW(in3,0);
  dW(in4,0);
}
}

```

- ✓ After writing the program we have to compile the program .
- ✓ Then upload the program in ESP32 chip after the uploading then the IOT robot is connected to battery.

❖ RESULT:-

