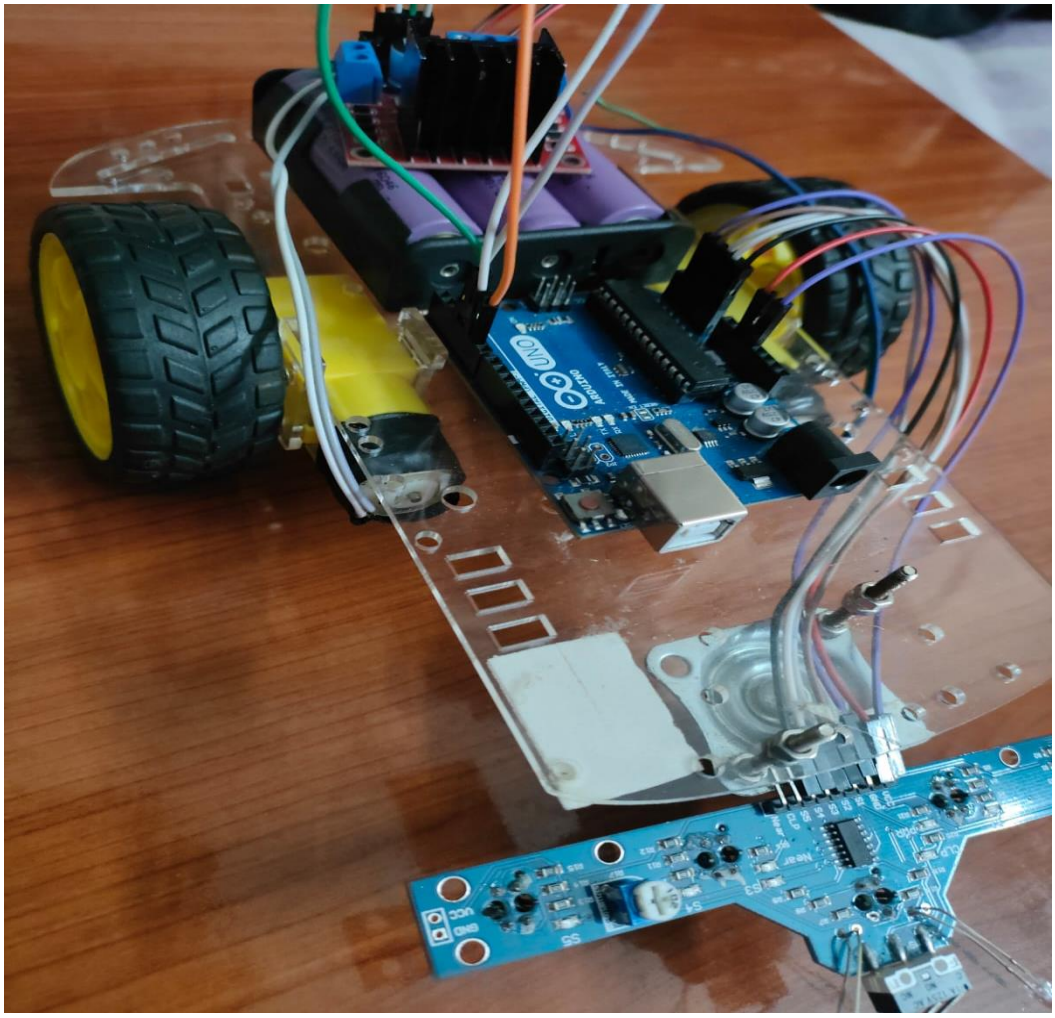
MINI PROJECT

LINE FOLLOWER ROBOT



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The Line follower robot is a mobile machine that can detect and follow the line drawn on the floor. Generally, the path is predefined and can be either visible like a black line on a white surface with a high contrasted color or it can be invisible like a magnetic field. Therefore, this kind of Robot should sense the line with its Infrared Ray (IR) sensors that installed under the robot. After that, the data is transmitted to the processor by specific transition buses. Hence, the processor is going to decide the proper commands and then it sends them to the driver and thus the path will be followed by the line follower robot.

This kind of robot can be used for military purposes, delivery services, transportation systems, blind assistive applications. Moreover, there are many annual line follower robots competitions organized by universities or industries around the world. They usually ask robotic teams for building a small robot with specific dimensions and weight according to the competition rules.

Our Line follower Robot MCQUEEN was made to compete in Races. It'll be ready for Upcoming Competitions.

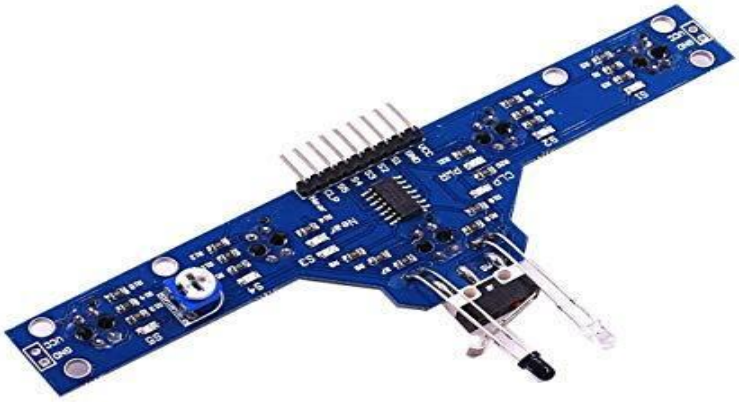
This robot can be divided into several parts:

- Sensor Array
- Arduino UNO
- Driver Board
- Actuators (Motors and wheels)

•Chassis and body structure

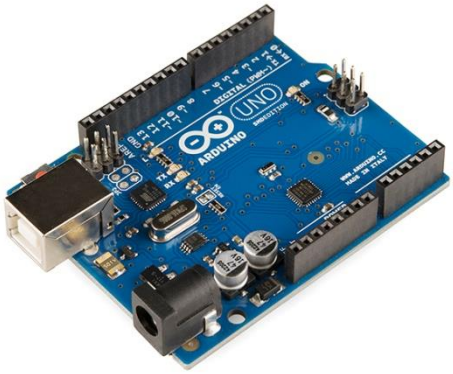
•Batteries

SENSOR ARRAY:



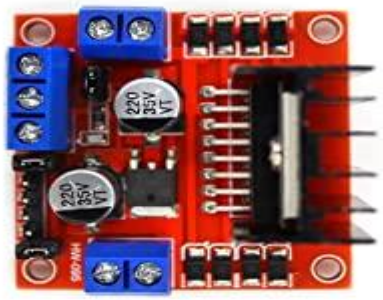
An IR sensor reflects and transmits IR radiation to detect color. This is used in Line Followers to detect the single colored line. An array of 5 IR sensors is used to increase precision and range of the sensors. This makes the robot more responsive and less prone to errors.

ARDUINO UNO BOARD:



Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button.

MOTOR DRIVER BOARD:



We use motor drivers to give high power to the motor by using a small voltage signal from a microcontroller or a control system. If the microprocessor transmits a HIGH input to the motor driver, The driver will rotate the motor in one direction keeping the one pin as HIGH and one pin as LOW.

BO MOTOR :

Bo motor (Battery Operated) is a lightweight DC geared motor that produces high torque and rpm at low voltages. Excellent for battery-powered lightweight robots.

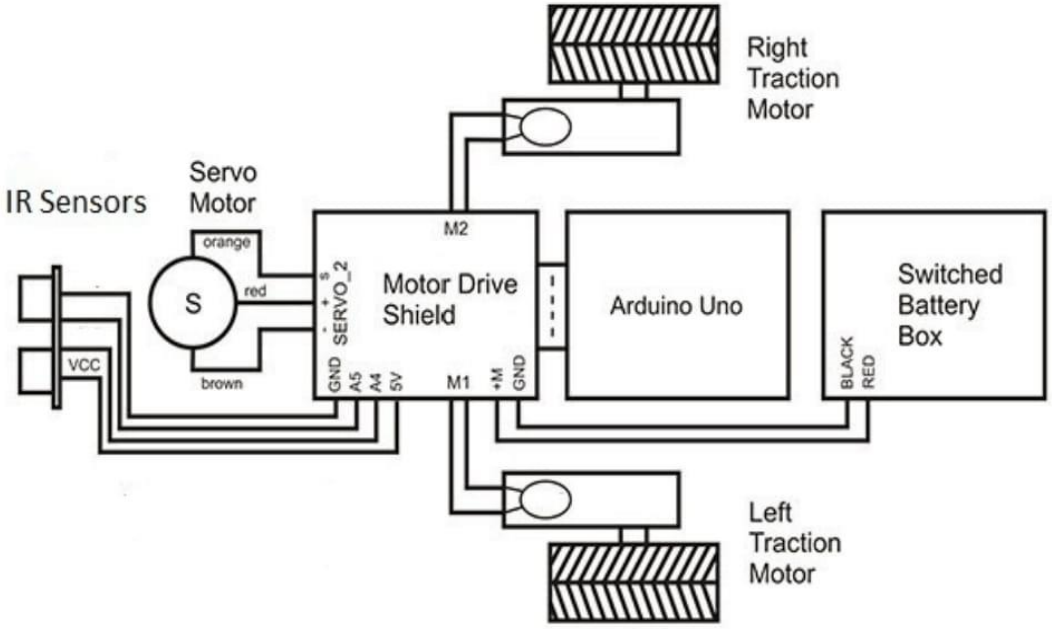
BODY OF THE ROBOT:

The Body of the Robot is made up of Acrylic ,a type of Plastic which has high tensile strength and can be cut to required measurements. All the Components are attached to the Acrylic Body.

LI ion BATTERIES:

You can put more energy into a lithium-Ion battery than lead acid batteries, and they last much longer. Every single component of a Li-ion battery is essential as it cannot function when one of the components is missing

WORKING:



Block diagram of a line follower robot

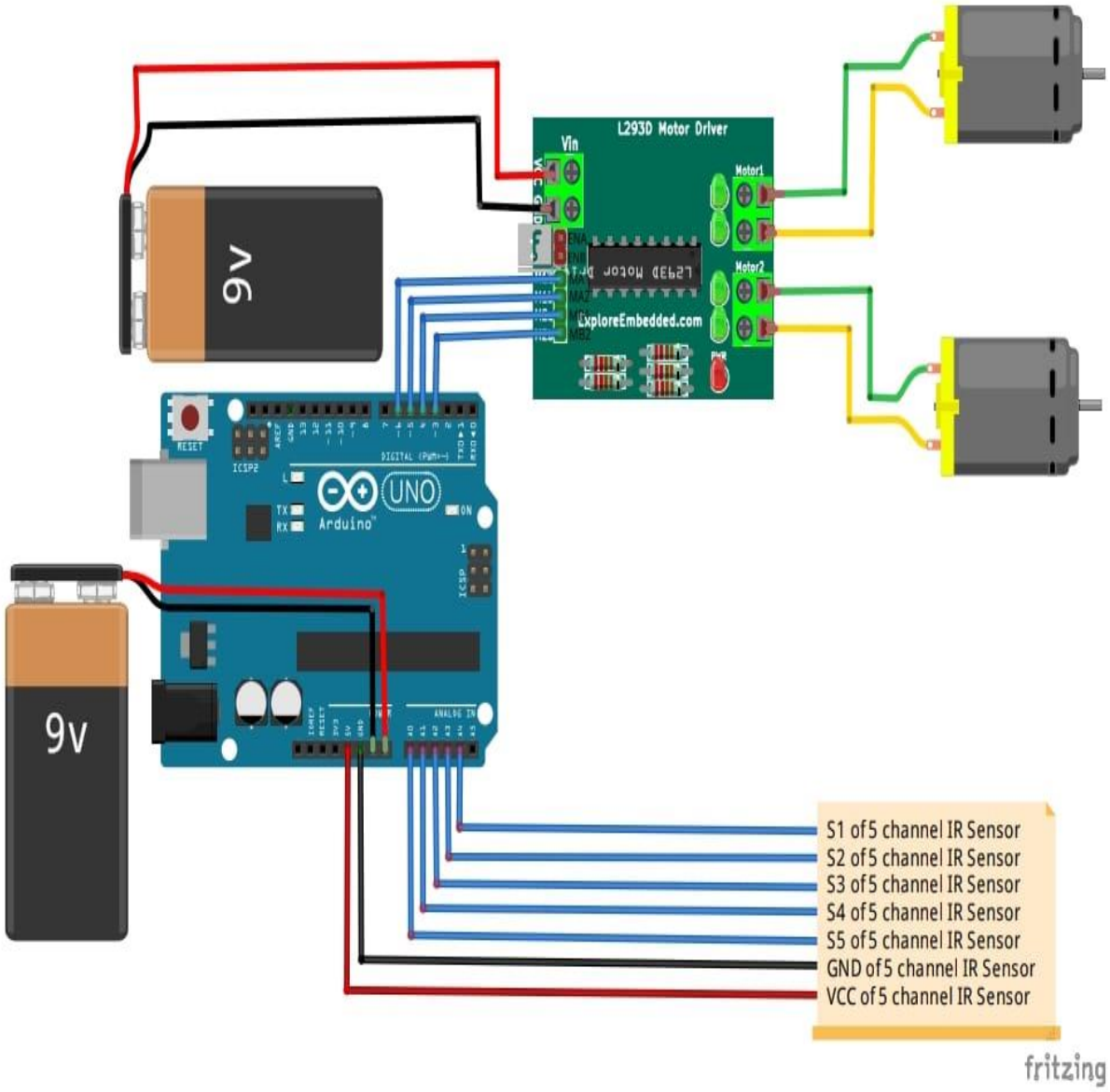
Sensor detects and will send the output to Arduino and Arduino gives Command based on the given conditions of Code. Motor Driver Board will make the

motor to rotate based on the condition. LI ion Batteries provide sufficient Power Supply to all Components.

CONNECTIONS:

1. Vout of IR Sensor 1 —--> A0 of Arduino
2. Vout of IR Sensor 2 —--> A1 of Arduino
3. Vout of IR Sensor 3 —--> A2 of Arduino
4. Vout of IR Sensor 4 —--> A3 of Arduino
5. Vout of IR Sensor 5 —--> A4 of Arduino
6. Motor1 -→ M1 of Motor Driver Board
7. Motor2 --→M2 of Motor Driver Board
8. Motor Driver Board IN1 --→ 3 of Arduino
9. Motor Driver Board IN2 --→ 4 of Arduino
10. Motor Driver Board IN3 --→ 5 of Arduino
11. Motor Driver Board IN4 --→ 6 of Arduino
12. Vin of Arduino --→ 12v of Motor Driver Board
13. GND of Arduino --→GND of Motor Driver Board
14. Li ion Batteries --→ Vin & GND of Motor Driver Board

CIRCUIT DIAGRAM:



ARDUINO CODE:

```
#define m1 4  //Right Motor MA1
#define m2 5  //Right Motor MA2
#define m3 2  //Left Motor MB1
#define m4 3  //Left Motor MB2
#define e1 9  //Right Motor Enable Pin EA
#define e2 10 //Left Motor Enable Pin EB
//**********5
```

```
Channel IR Sensor Connection**********//
#define ir1 A0
#define ir2 A1
#define ir3 A2
#define ir4 A3
#define ir5 A4
//***********************************************//

void setup() {
  pinMode(m1, OUTPUT);
  pinMode(m2, OUTPUT);
  pinMode(m3, OUTPUT);
  pinMode(m4, OUTPUT);
  pinMode(e1, OUTPUT);
  pinMode(e2, OUTPUT);
  pinMode(ir1, INPUT);
  pinMode(ir2, INPUT);
  pinMode(ir3, INPUT);
  pinMode(ir4, INPUT);
  pinMode(ir5, INPUT);
}

void loop() {
  //Reading Sensor Values
  int s1 = digitalRead(ir1);  //Left Most Sensor
  int s2 = digitalRead(ir2);  //Left Sensor
  int s3 = digitalRead(ir3);  //Middle Sensor
  int s4 = digitalRead(ir4);  //Right Sensor
  int s5 = digitalRead(ir5);  //Right Most Sensor

  //if only middle sensor detects black line
  if((s1 == 1) && (s2 == 1) && (s3 == 0) && (s4 == 1) && (s5 == 1))
  {
    //going forward with full speed
    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255
    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255
    digitalWrite(m1, HIGH);
    digitalWrite(m2, LOW);
    digitalWrite(m3, HIGH);
    digitalWrite(m4, LOW);
  }

  //if only left sensor detects black line
  if((s1 == 1) && (s2 == 0) && (s3 == 1) && (s4 == 1) && (s5 == 1))
  {
    //going right with full speed
    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255
    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255
    digitalWrite(m1, HIGH);
    digitalWrite(m2, LOW);
    digitalWrite(m3, LOW);
    digitalWrite(m4, LOW);
  }

  //if only left most sensor detects black line
```

```
  if((s1 == 0) && (s2 == 1) && (s3 == 1) && (s4 == 1) && (s5 == 1))

  {

    //going right with full speed

    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255

    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255

    digitalWrite(m1, HIGH);

    digitalWrite(m2, LOW);

    digitalWrite(m3, LOW);

    digitalWrite(m4, HIGH);

  }



  //if only right sensor detects black line

  if((s1 == 1) && (s2 == 1) && (s3 == 1) && (s4 == 0) && (s5 == 1))

  {

    //going left with full speed

    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255

    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255

    digitalWrite(m1, LOW);

    digitalWrite(m2, LOW);

    digitalWrite(m3, HIGH);

    digitalWrite(m4, LOW);

  }



  //if only right most sensor detects black line

  if((s1 == 1) && (s2 == 1) && (s3 == 1) && (s4 == 1) && (s5 == 0))

  {

    //going left with full speed

    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255

    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255

    digitalWrite(m1, LOW);

    digitalWrite(m2, HIGH);

    digitalWrite(m3, HIGH);

    digitalWrite(m4, LOW);

  }



  //if middle and right sensor detects black line

  if((s1 == 1) && (s2 == 1) && (s3 == 0) && (s4 == 0) && (s5 == 1))

  {

    //going left with full speed

    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255

    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255

    digitalWrite(m1, LOW);

    digitalWrite(m2, LOW);

    digitalWrite(m3, HIGH);

    digitalWrite(m4, LOW);

  }



  //if middle and left sensor detects black line

  if((s1 == 1) && (s2 == 0) && (s3 == 0) && (s4 == 1) && (s5 == 1))

  {

    //going right with full speed
```

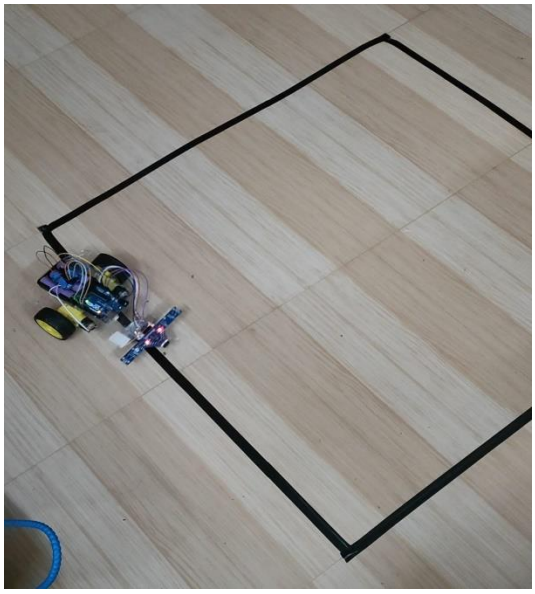
```
    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255
    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255
    digitalWrite(m1, HIGH);
    digitalWrite(m2, LOW);
    digitalWrite(m3, LOW);
    digitalWrite(m4, LOW);
  }

  //if middle, left and left most sensor detects black line
  if((s1 == 0) && (s2 == 0) && (s3 == 0) && (s4 == 1) && (s5 == 1))
  {
    //going right with full speed
    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255
    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255
    digitalWrite(m1, HIGH);
    digitalWrite(m2, LOW);
    digitalWrite(m3, LOW);
    digitalWrite(m4, LOW);
  }

  //if middle, right and right most sensor detects black line
  if((s1 == 1) && (s2 == 1) && (s3 == 0) && (s4 == 0) && (s5 == 0))
  {
    //going left with full speed
    analogWrite(e1, 255); //you can adjust the speed of the motors from 0-255
    analogWrite(e2, 255); //you can adjust the speed of the motors from 0-255
    digitalWrite(m1, LOW);
    digitalWrite(m2, LOW);
    digitalWrite(m3, HIGH);
    digitalWrite(m4, LOW);
  }

  //if all sensors are on a black line
  if((s1 == 0) && (s2 == 0) && (s3 == 0) && (s4 == 0) && (s5 == 0))
  {
    //stop
    digitalWrite(m1, LOW);
    digitalWrite(m2, LOW);
    digitalWrite(m3, LOW);
    digitalWrite(m4, LOW);
  }
}
```

OUTPUT:



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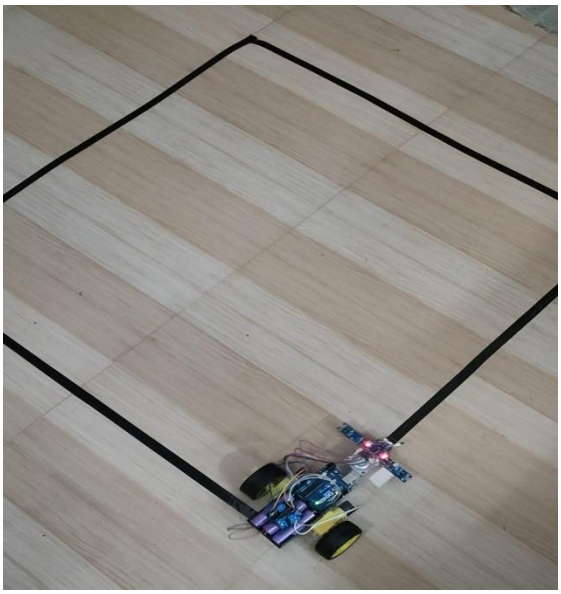

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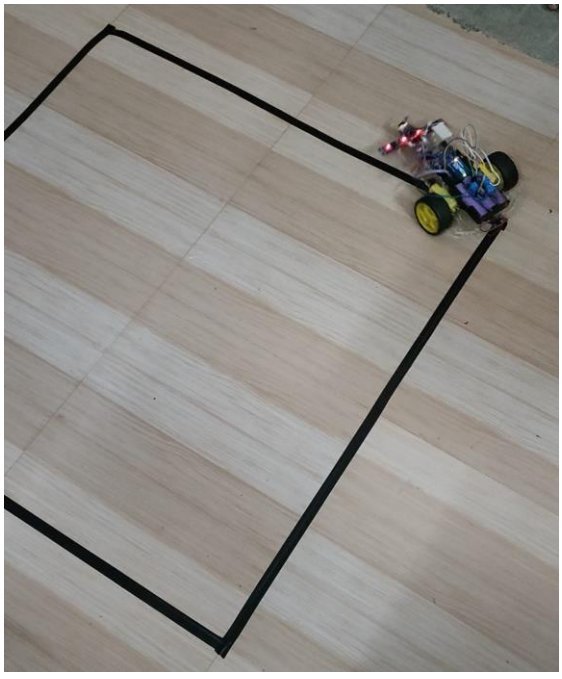

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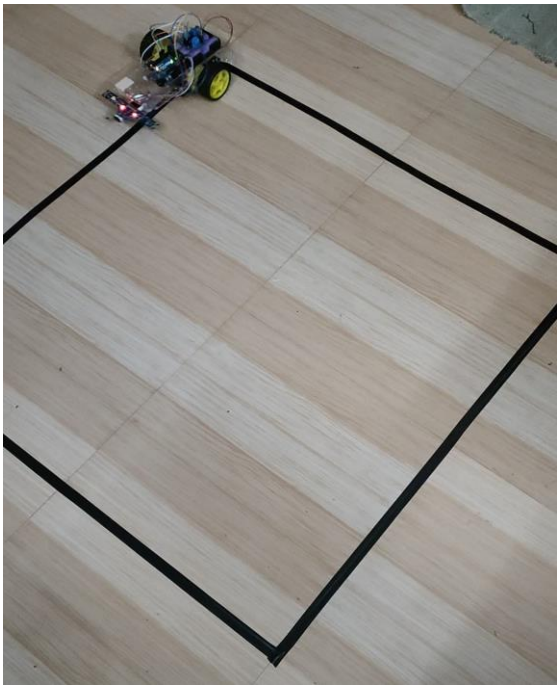

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