

INDIAN INSTITUTE OF TECHNOLOGY MANDI



PROJECT REPORT

LINE FOLLOWER ROBOT (CURVED LINES)

By:

Anand Kishore (B22002) - Bio Engineering

Prathmesh Chourasiya (B22063) - Civil Engineering

Priyanshi Agrawal (B22064) - Civil Engineering

Vaibhav Gupta (B22077) - Civil Engineering

Abhay Raj Gautam (B22078) - Computer Science Engineering

Prasad Khushi Gurudayal (B22312) - Mechanical Engineering

Tutors:

Hemank Soni

Vasu Jain

INTRODUCTION

Line follower prototype is an Arduino Uno based robot that chase the black strip path on a white surface. The path can be visible like a black line. Sensing a line and maneuvering the robot to stay on course, while constantly correcting wrong moves using feedback from the sensor forms a simple yet effective system.

OBJECTIVE

The objectives of this project are:

- The robot must be capable of following a line.
- It should be capable of taking various degrees of turns.
- The robot must be insensitive to environmental factors such as lighting and noise.
- It must allow calibration of the lines's darkness threshold.
- Scalability must be a primary concern in the design.

APPLICATION

- Industrial application : The line followers can be used to carry/deliver packages in warehouses,airports,restaurants etc.
- Automobile Industries : It can also be used in cars, taxis and buses to create an autonomous transport system. In real life Bullet Train is the best example of it.

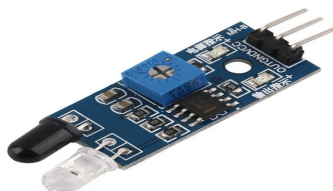
HARDWARE REQUIRED

Input System

The detail of each component is discussed below:

- IR Sensors

IR sensor is an electronic device, that emits the infrared radiations with longer wavelengths than visible light in order to detect some object in the surroundings. It works by detecting the heat emitted by an object.



- **Processing Unit**

Processing system acts as the brain of robot, generating desired output for corresponding inputs, in which microcontrollers are used.

- **Microcontroller**

A microcontroller is designed to perform the specific tasks of embedded systems like displaying microwave's information, receiving remote signals, etc. There are various types of microcontroller like Node MCU, Arduino Uno.

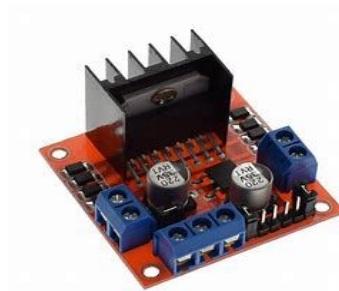


Output System

The output system is designed with the function of the following components:

- **L298 Motor driver**

L298 is a high current and high voltage IC. It receives TTL logic signals and operates different loads like motors, solenoid, relays etc. It is mostly used in motor driver's designing.



- **DC motor**

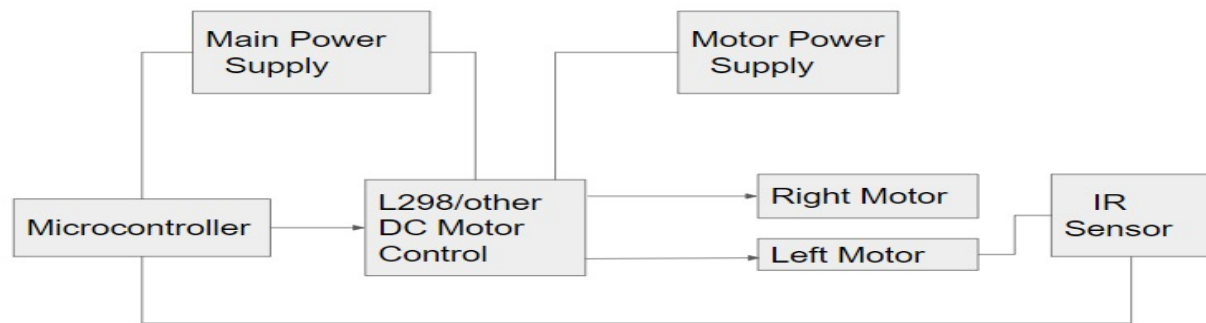
Motor is a device that converts any form of energy into mechanical energy or imparts motion. In construction of robot, it plays an important role by giving movement to the robot.



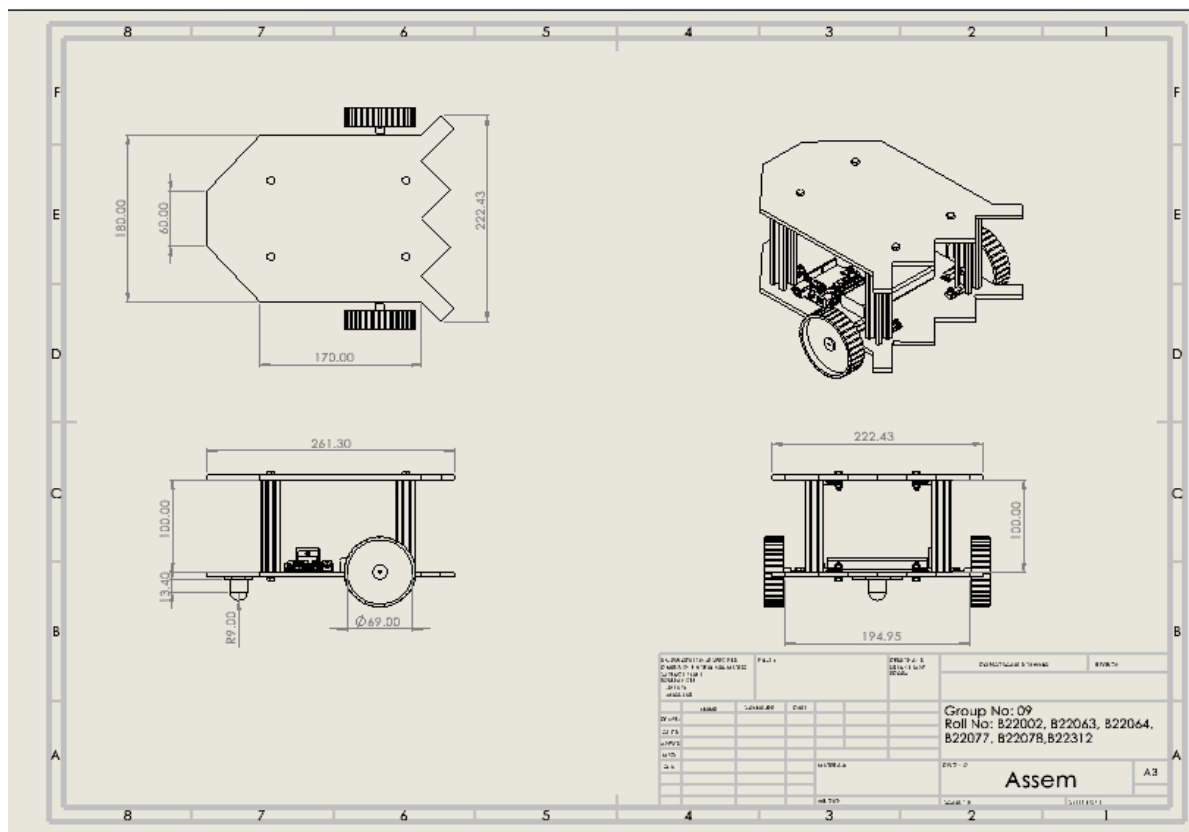
Component used for Prototype

S.No.	Item
1	Acrylic Sheet 5MM (2x2 feet)
2	6-12 V Geared-Encoder Motor 60 RPM
3	Microcontroller Board (Node MCU/ Arduino Board with Cable)
4	75mm Rubber Wheels
5	Castor Wheel
6	Jumper Wire M-M, M-F, F-F
7	Buck Converter
8	XT 60 M-F Connector
9	Copper Clad (1x1 feet)
10	IR Sensor
11	Battery 12V LIPO
12	M2, M4 Nut & Bolt
13	L Bracket (20x20 profile)
14	Motor Driver L298/other
15	Aluminum Profile (20x20 mm)
16	Glossy paper
17	Allen Bolt/Screws

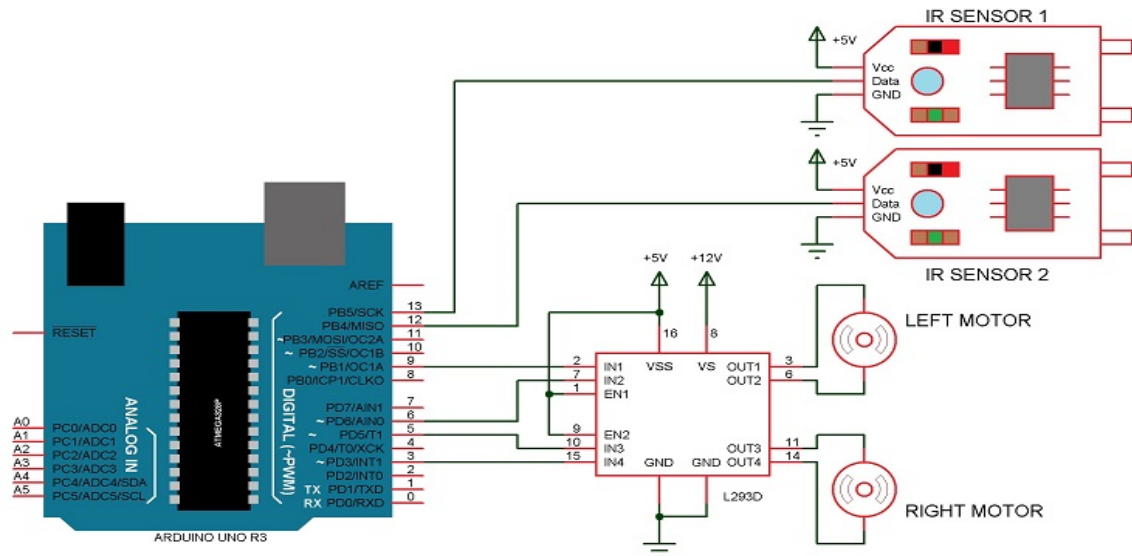
BLOCK DIAGRAM



DESIGN OF LINE FOLLOWER ROBOT



PCB SCHEMATIC



WHY ARE WE USING THIS DESIGN?

Here are some reasons why design is important for a line follower robot:

- **Optimal performance:** By designing the robot appropriately, it can be optimized for performance such as speed, stability, and accuracy.
- **Adaptability:** Designing a line follower robot that is adaptable, by selecting the appropriate sensors and algorithms, the robot can adjust its behavior and response according to the line it is following.
- **Reliability:** The design of a line follower robot should ensure that it is robust and reliable, with minimal chances of failure or malfunction.
- **Cost-effectiveness:** By selecting components that are affordable and readily available, the robot can be built and maintained at a lower cost. It will be accessible to the individuals with limited budgets.

Overall, a well-designed line follower robot can improve its performance, adaptability, reliability, and cost-effectiveness, making it an effective solution for various applications.

LIMITATIONS

- The path should be plane and obstacle free.
- Few curves are not made efficiently, and must be avoided.
- Calibration is difficult, and it is not easy to set a perfect value.
- The turning radius should be of minimum 100 m to take smooth U-turning of robot.
- Choice of line is made in the hardware abstraction and cannot be changed by software.

CONCLUSION

The line following robot is automobile system that has ability to recognize its path, move and change the robot's position toward the line in the best way to remain in track.

The main criteria of the mechanical design is mainly depends upon the differential steering mechanism, turning radius.

This project help us to enhanced our communication skills as well as our better understanding of the topic.

CONTRIBUTIONS: Each and every member of our group has contributed their 100%.