

# FDP PROJECT

## LINE FOLLOWER ROBOT

### Project by Group 6

#### Team Members:

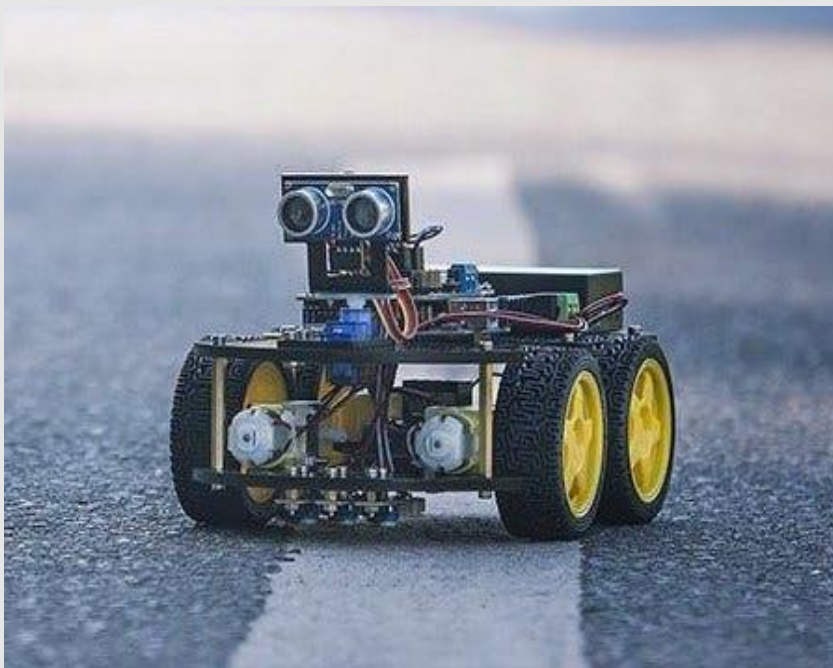
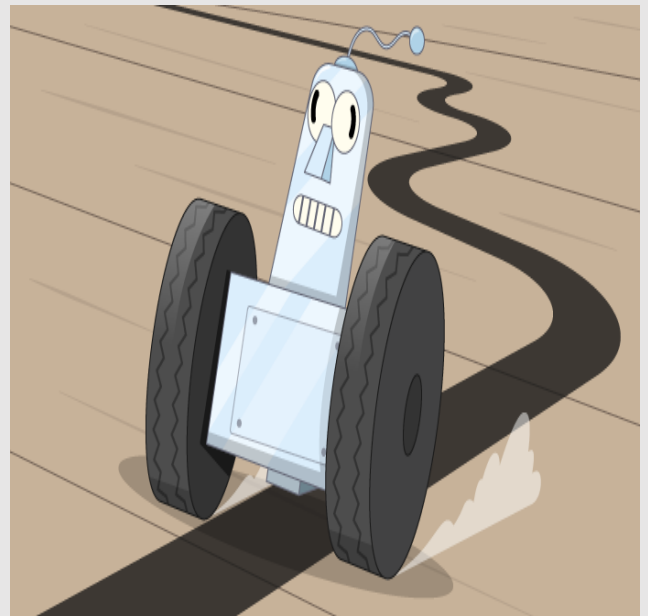
Bhavesh Goyal (B22154)

Tejinder Sethi (B22334)

Sameer Gupta (B22127)

Aditi Singh (B22187)

Daksh Lamba (B22204)



#### Mentors:

Dhruv

Sachin Ruhela

# Introduction

Robots are designed to reduce human efforts and perform specific tasks with high speed, precision and endurance.

These actions are controlled by using advanced programming, manipulators and sensors etc. The sensor-based line follower robot is one of the most basic designs that can follow black line on a white background and vice versa.

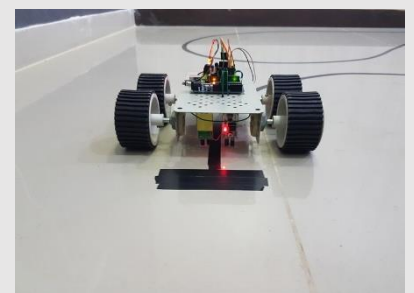
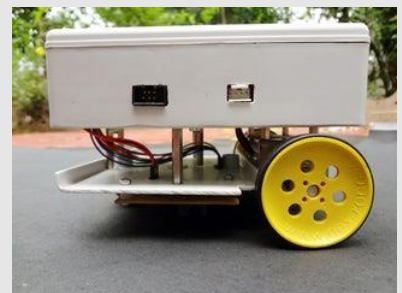
It decides its own path or projectory based on the line it follows. The path is already defined and is generally a black line as we need a high contrasting colour which is easy to detect.

## Applications

A simple design for a line follower robot has many applications in the now automating industry at a very justifiable cost.

Some of its main applications are:

- Carrying Goods
- Delivery purposes
- Cleaning floors
- Used in agriculture to plant seeds
- Material handling



# Requirements

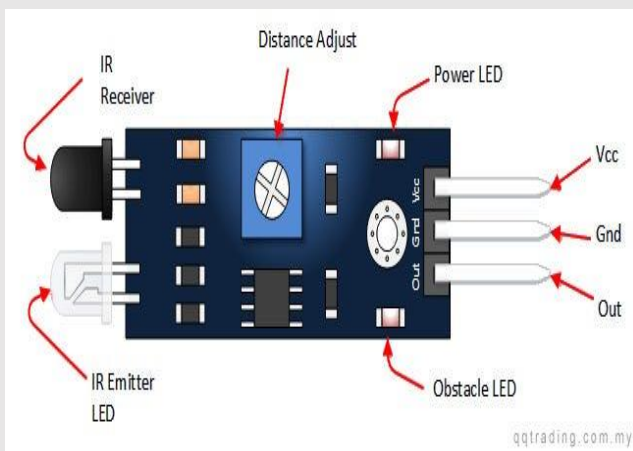
## 1. ARDUINO UNO

It is an easy-to-use programmable microcontroller which can easily be accommodated in projects. Arduino is inexpensive, can be used across numerous platforms, has a simple and clear programming interface, open source and extensible software and hardware.



## 2. IR SENSORS

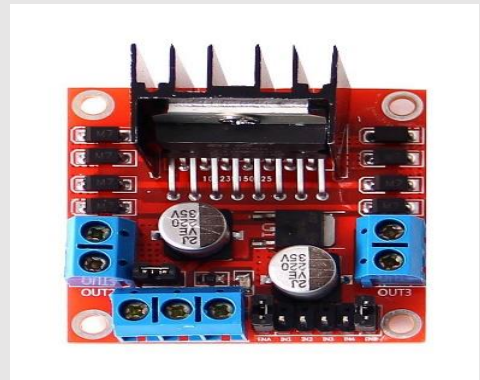
This kind of a robot uses infrared sensors to find the path and direction. Infrared sensors contain matched infrared transmitter and infrared receiver pairs. It works on the principle that



black surfaces reflect poorly and white surfaces reflect well. If the robot receives reflection, it implies that it is on white surface and if it can't, it implies that it is on black surface. The distance between sensors and ground should be 2 to 10 mm and the distance between each sensor is dependent on the line width.

### **3. L298N Motor Driver Module**

It is a high-power motor driver, perfect for DC step motors. We use such motor drivers to give high power to the motor using small voltage signals from a microcontroller or a control system. This allows control over speed, acceleration, deceleration, etc.

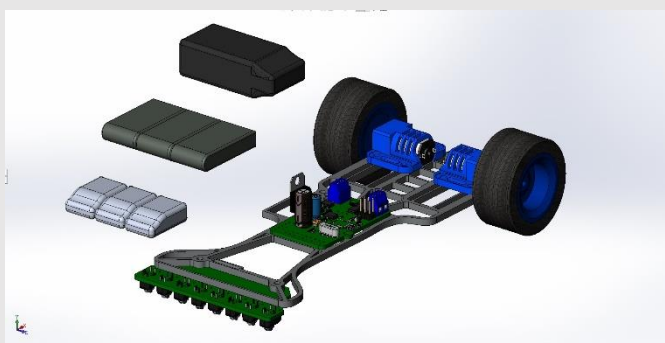


**Some other Requirements are:**



**Driver (Power Supply)**

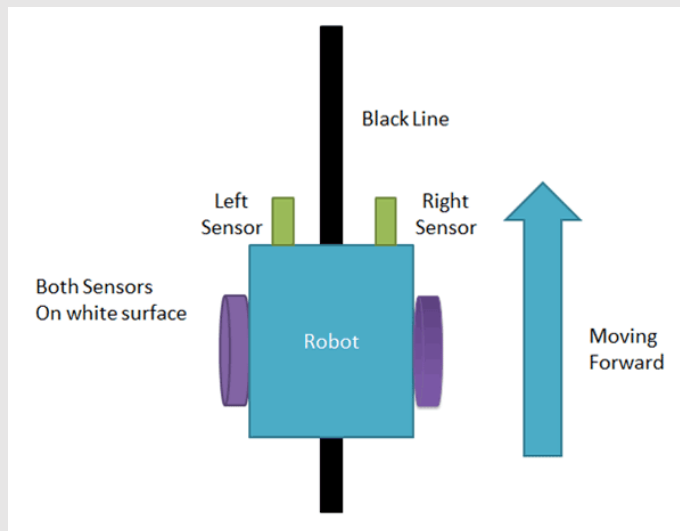
**Actuators (Motors and Wheels)**



**Chassis  
(Body Structure)**

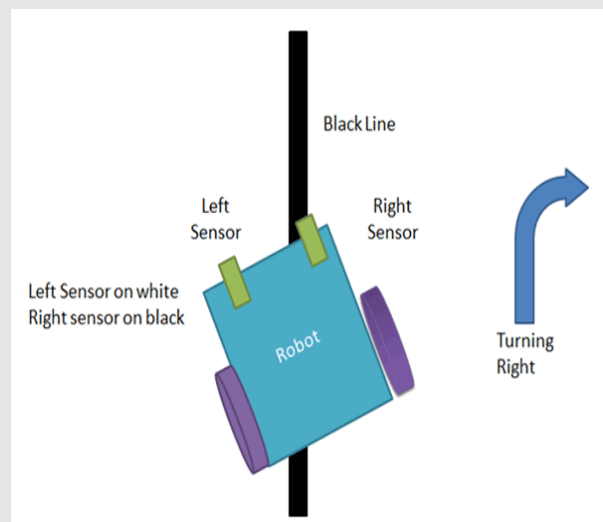
# Working

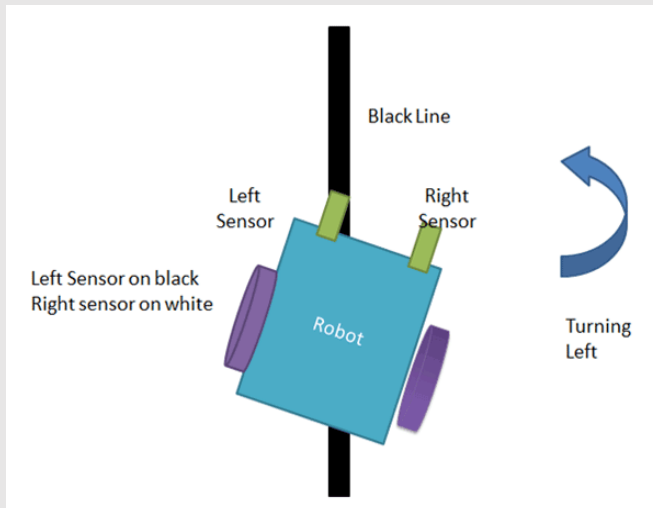
When the robot needs to move forward, it is compulsory that both the IR sensors are facing the white surface. This detection



of white surface makes the robot comprehend that it is following the black line orderly. In order to do so both the motors rotate in sync and hence are able to make the bot move without changing the direction.

When the right sensor detects black surface, it implies that the robot is about to over cross the line by turning to the left and hence it is needed for it to turn to the right. The right sensor sends the signal to the microcontroller which causes the right motor to rotate backward and the left motor to rotate in the forward direction, which makes the robot turn to the right.

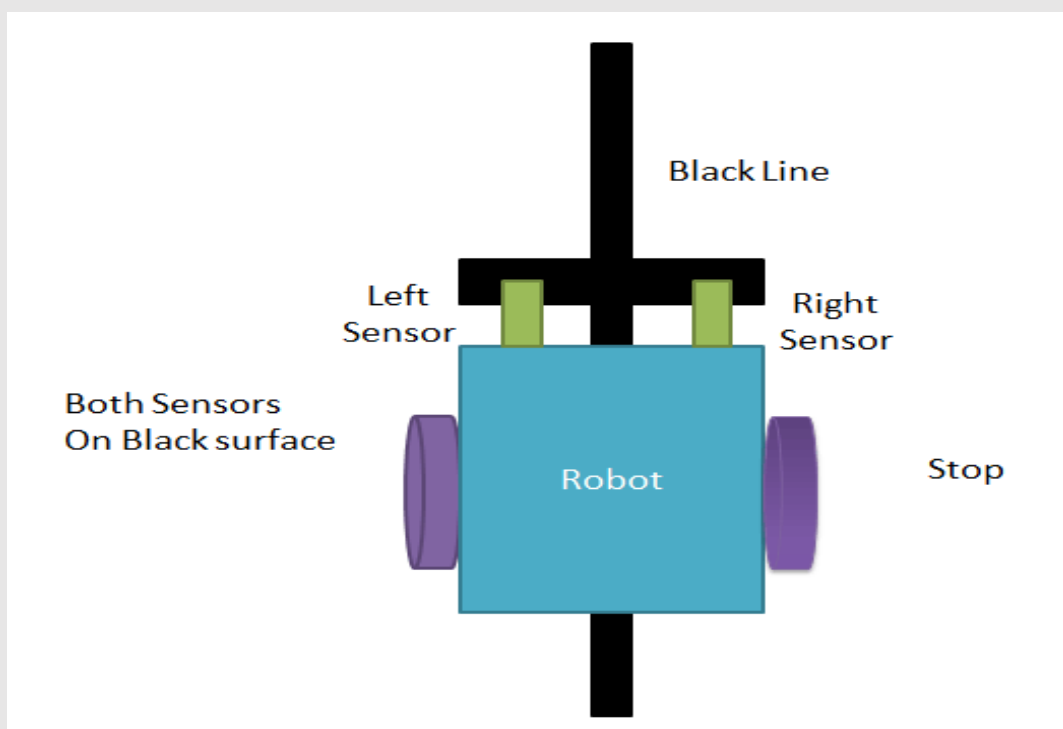




If the left sensors enter the region of black surface, the IR sensor on the left send the signal to the microcontroller which makes the left motor to rotate reverse and the right motor to rotate in

forward direction in order to make the robot turn towards the left, as the detection of black surface came from the left sensor.

To stop the robot, both the sensors are on top of the line and they can detect the black line simultaneously and the microcontroller is fed to consider this situation as a process for halt. Hence, both the motors are stopped, which causes the robot to stop moving.





# Circuit Diagram

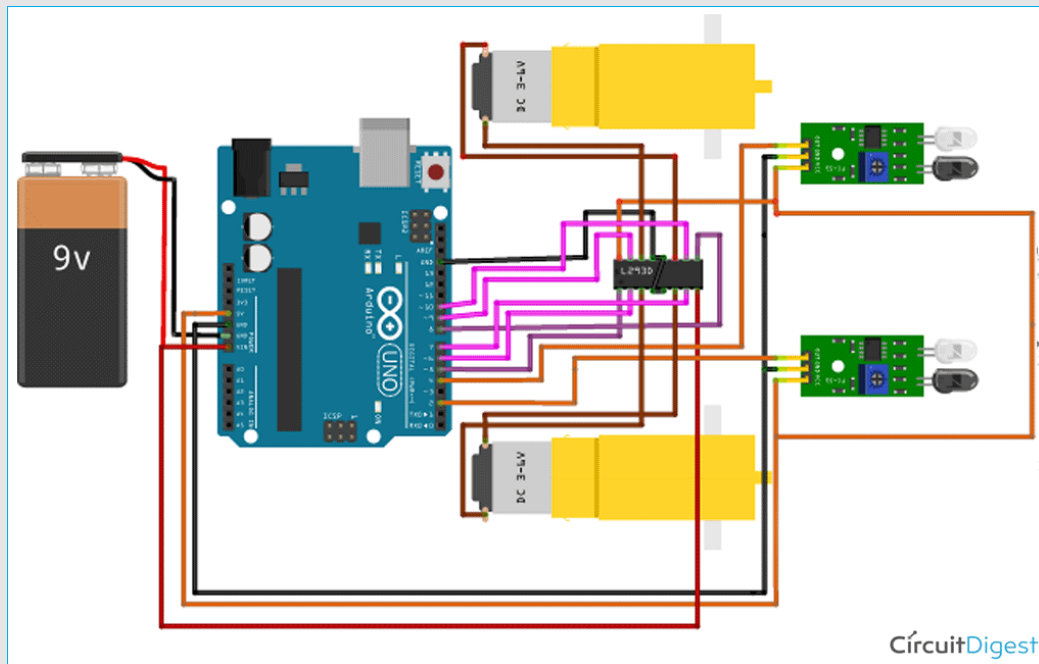


Fig.1

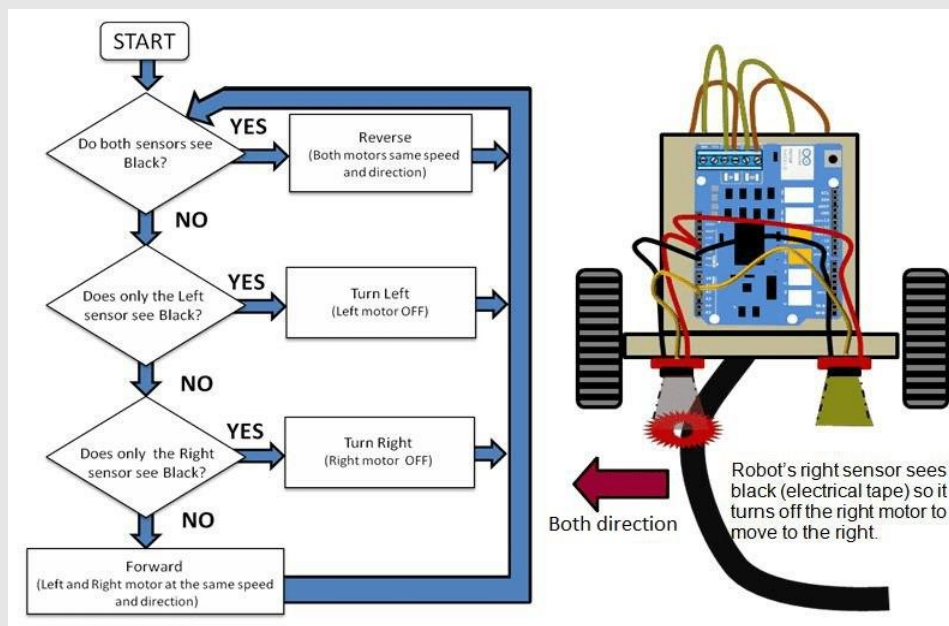
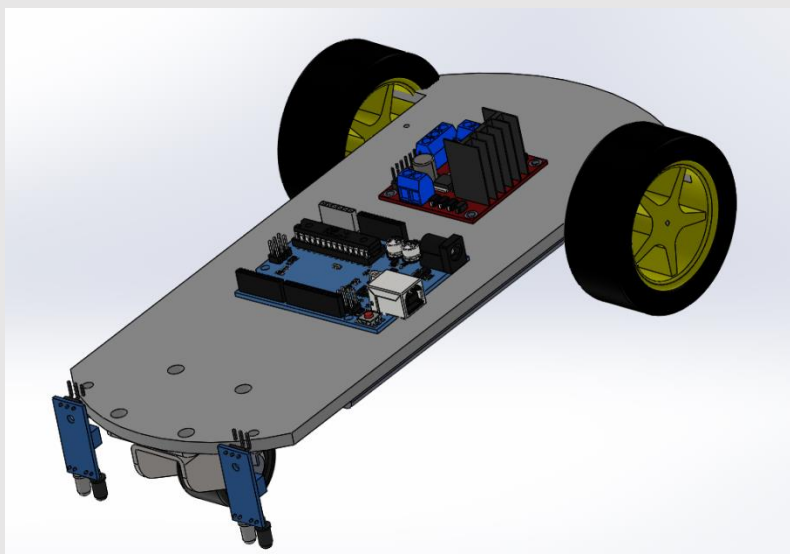
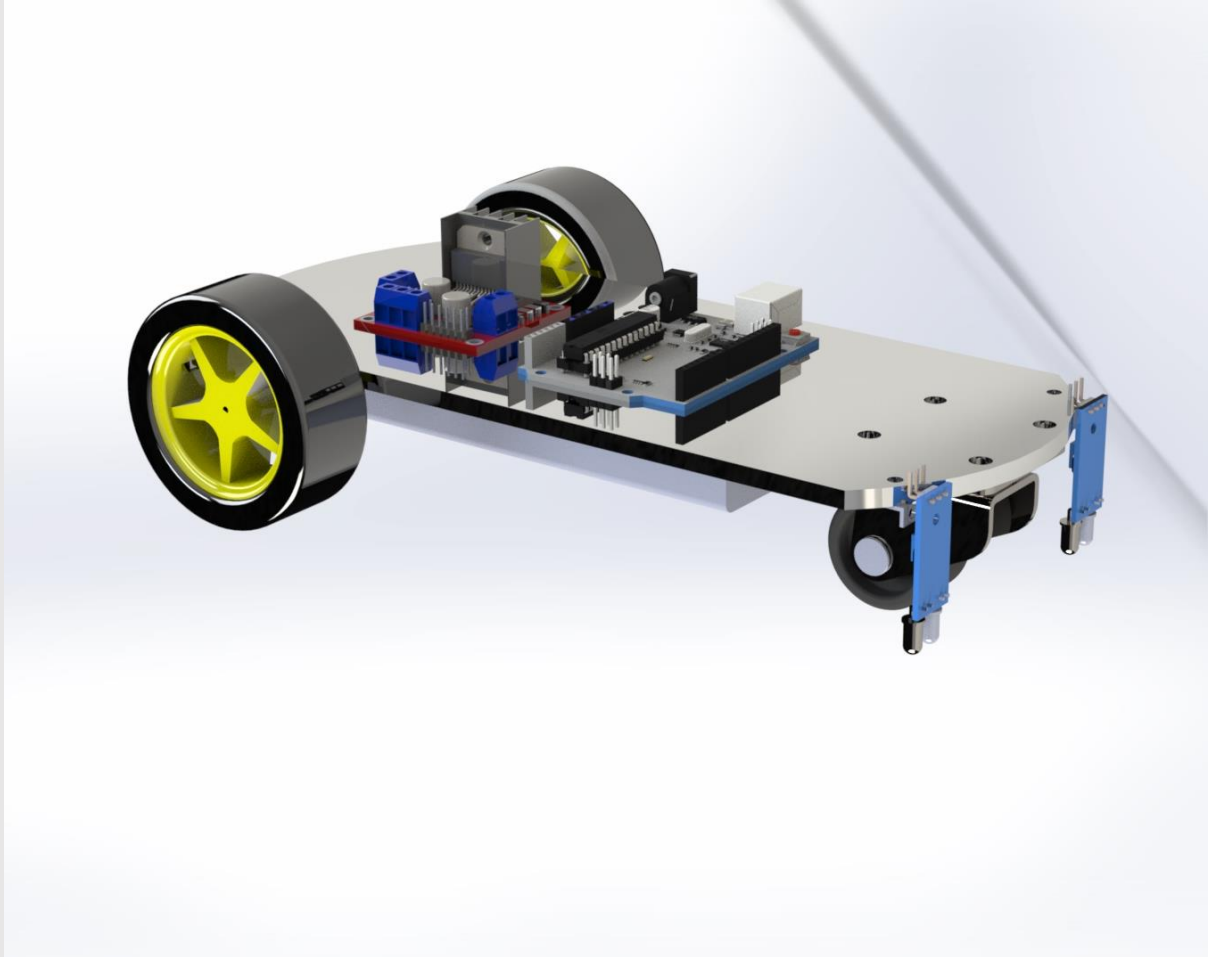


Fig.2

# Our CAD Model



This is a rough model on which our actual robot will be based.



# Limitations

Though this robot can be used for many purposes, it does come with a lot of problems. Some of the major ones being:

- It requires a broad black line around 2-3 inches.
- The black line should be of high intensity as it will not work properly for black line of low intensity.
- The IR sensors may detect some IR rays from the surroundings, as a result of which robot may not move in proper way.

## References:

1. <https://circuitdigest.com/microcontroller-projects/arduino-uno-line-follower-robot>
2. [https://www.researchgate.net/publication/224132741\\_A\\_line\\_follower\\_robot\\_from\\_design\\_to\\_implementation\\_Technical\\_issues\\_and\\_problems](https://www.researchgate.net/publication/224132741_A_line_follower_robot_from_design_to_implementation_Technical_issues_and_problems)
3. <https://www.youtube.com/watch?v=5jh-5HGvC-I&t=319s>
4. [grabcad.com/library](http://grabcad.com/library) (For Arduino UNO, L298 Module, IR Sensor Models)