

# **AUTONOMOUS WORKSHOP MANUAL**

AOT Robo Club | TechFiesta 2019

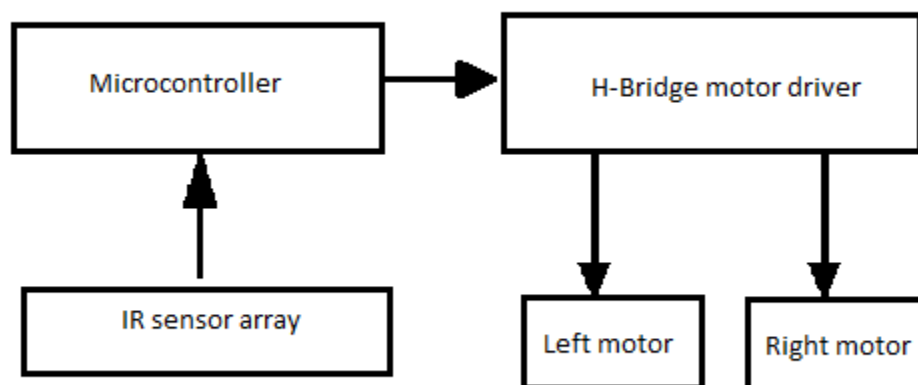
# **LINE FOLLOWER ROBOTICS MANUAL**

## **Introduction**

A line follower robot is a robot which follows a certain path controlled by a feedback mechanism.

## **CONCEPT**

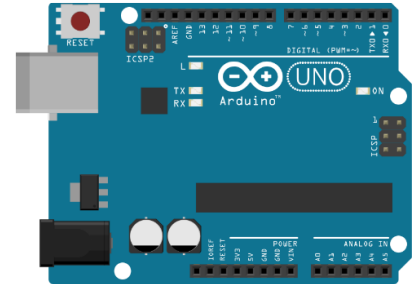
The line following robot is one of the self-operating robots. That detects and follows a line drawn on the area. The system must be sensed by the bot. This application depends upon the sensors. Here, we are using IR sensor array for path detection purpose. The IR sensor array used for path detection. These sensors mounted at front end of the robot. The whole system is controlled by the microcontroller.



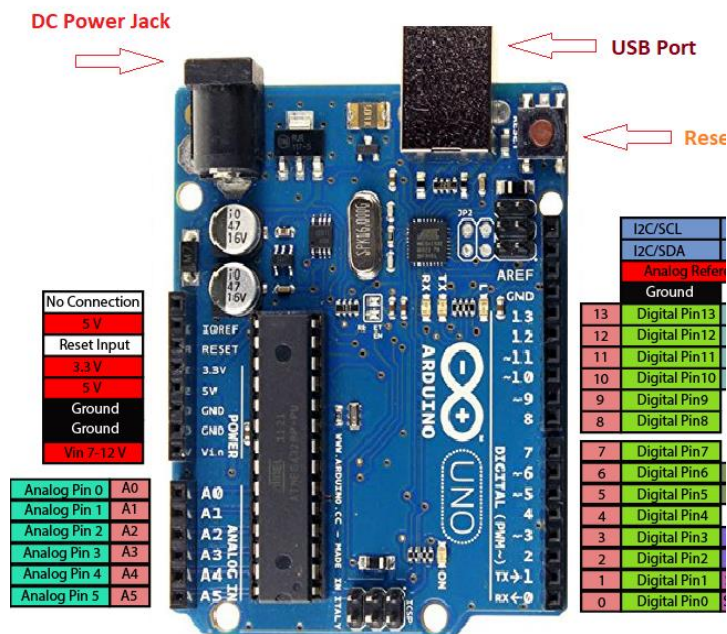
## A basic overview of the main components used:

- Arduino Uno

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.

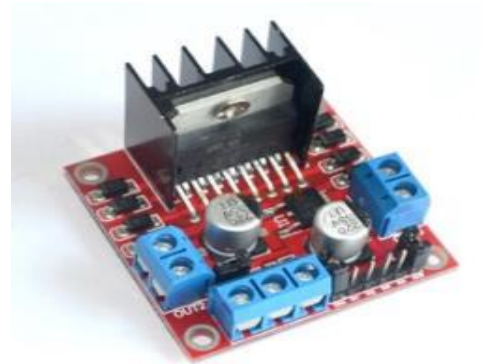


### Pin diagram of Arduino UNO

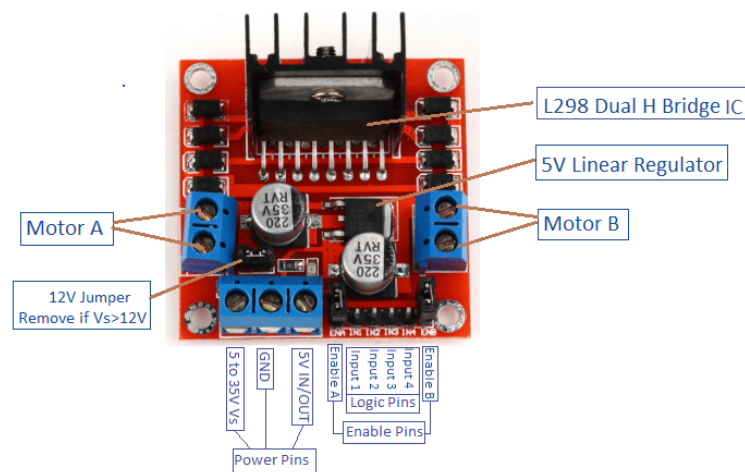


- **L298n Motor Driver**

The L298N Motor Driver Module is a high voltage Dual H-Bridge. H-bridge drivers are used to drive inductive loads that requires forward and reverse function with speed control such as DC Motors, and Stepper Motors. This Dual H-Bridge driver is capable of driving voltages up to 46V and continuous current up to 2A in each channels.



**Pin Diagram:**



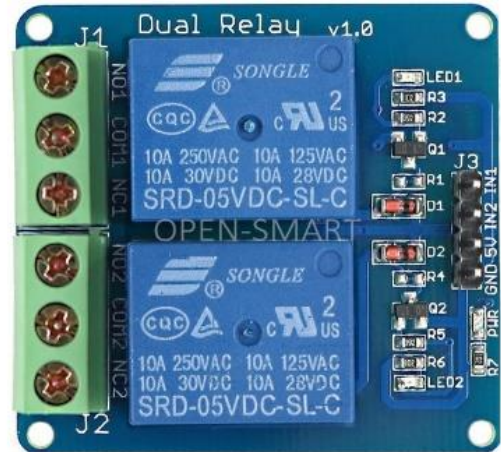
- **8 Sensor Line Array**

This is an infrared based sensor array which can be used in advanced line following and grid navigation robots. The array has 8 individual sensors placed next to each other. Each sensor has its own digital output and can sense the presence of a line and indicate it with a 5V logic output. On reading the digital state of the eight sensors, the user can not only detect the line but also get to know how far the center of the robot is from the line. When all sensors sense the line, the robot is on an intersection.



- **Relay Module**

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity flows through it). You can think of a relay as a kind of electric lever: switch it on with a tiny current and it switches on ("leverages") another appliance using a much bigger current. Why is that useful? As the name suggests, many sensors are incredibly sensitive pieces of electronic equipment and produce only small electric currents. But often we need them to drive bigger pieces of apparatus that use bigger currents. Relays bridge the gap, making it possible for small currents to activate larger ones.

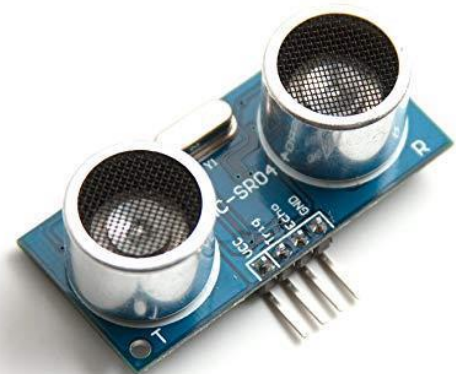


- **Ultrasonic Module**

The HC-SR04 ultrasonic sensor uses SONAR to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm.

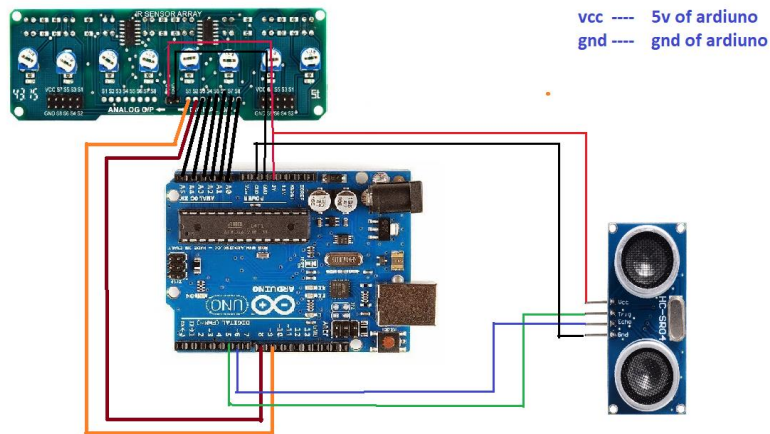
For better understanding visit the link below

<http://www.electronicwings.com/sensors-modules/ultrasonic-module-hc-sr04>

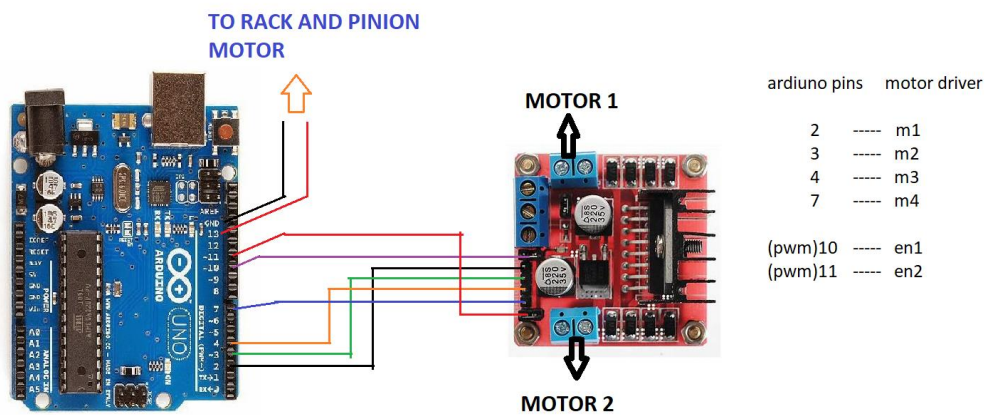


## **Circuit Diagram**

Circuit Diagram for IR sensor array and Ultrasonic module

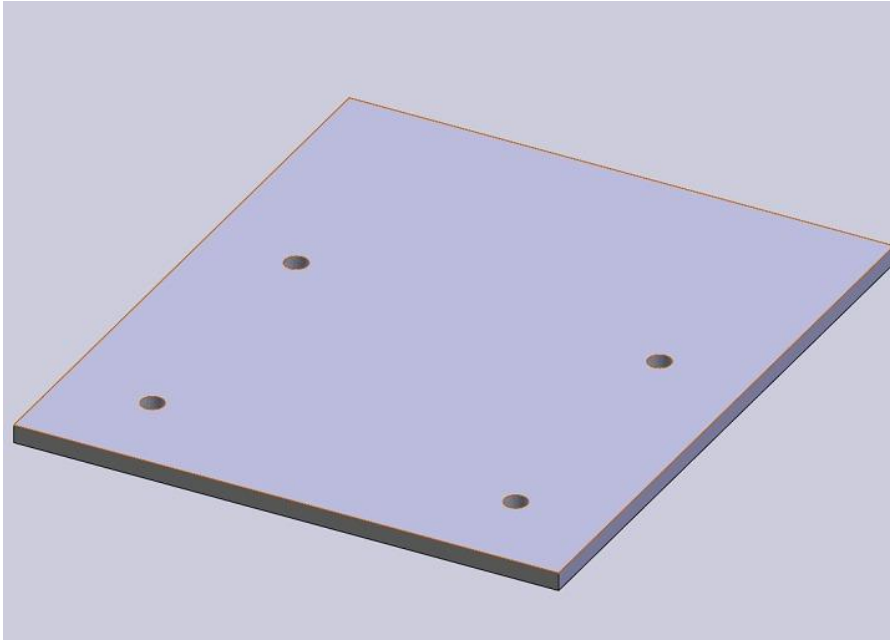


## Circuit Diagram for Motor driver and Rack & Pinion

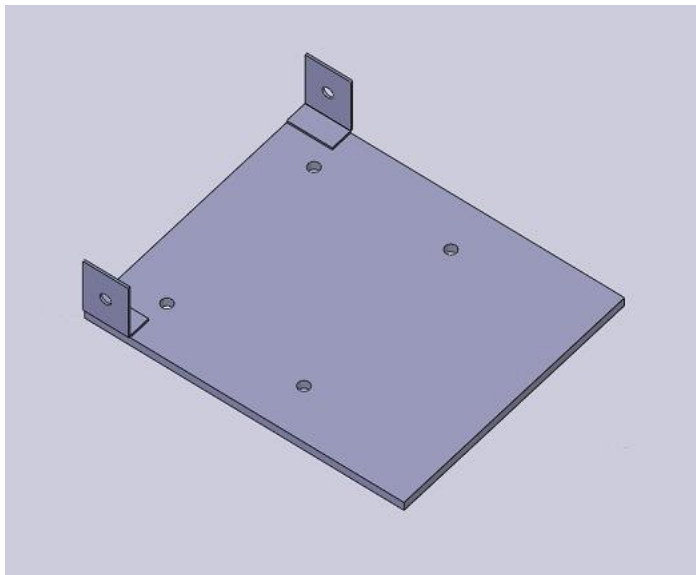


## STEP BY STEP ASSEMBLY

Step 1: First you need to make chassis which will act as the base of the bot.

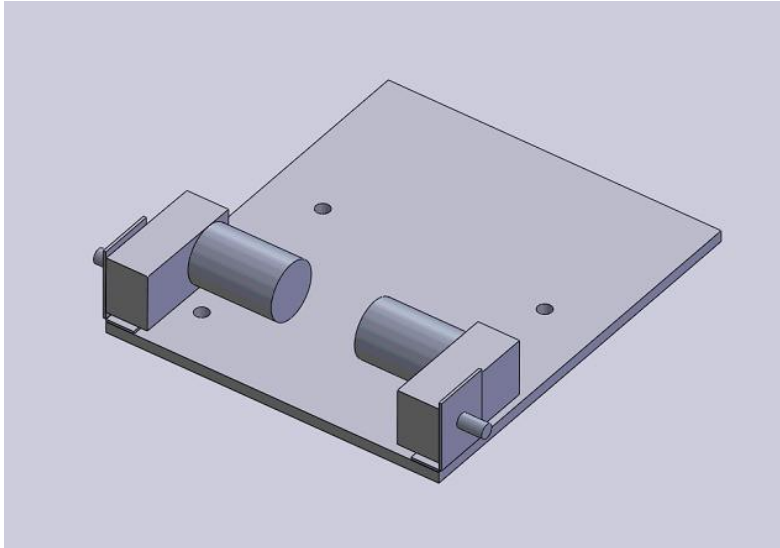


Step 2: Now attach the motor clamps as shown in the figure below.

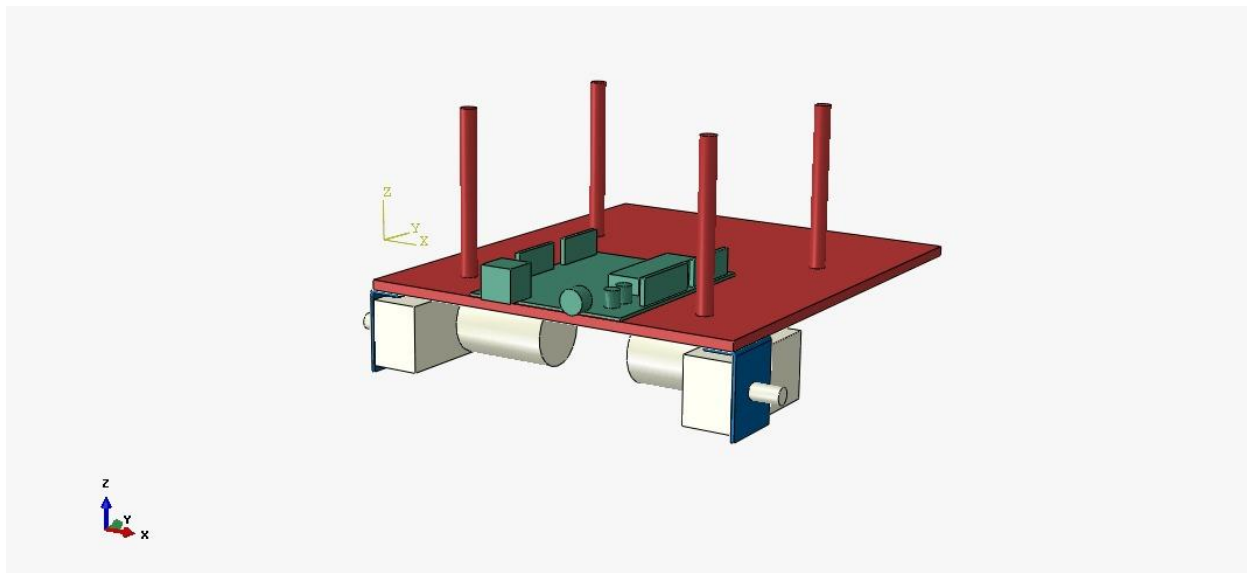




Step 3: Make sure that the clamps are tight and secure. Now attach the motors and align them in a straight line.

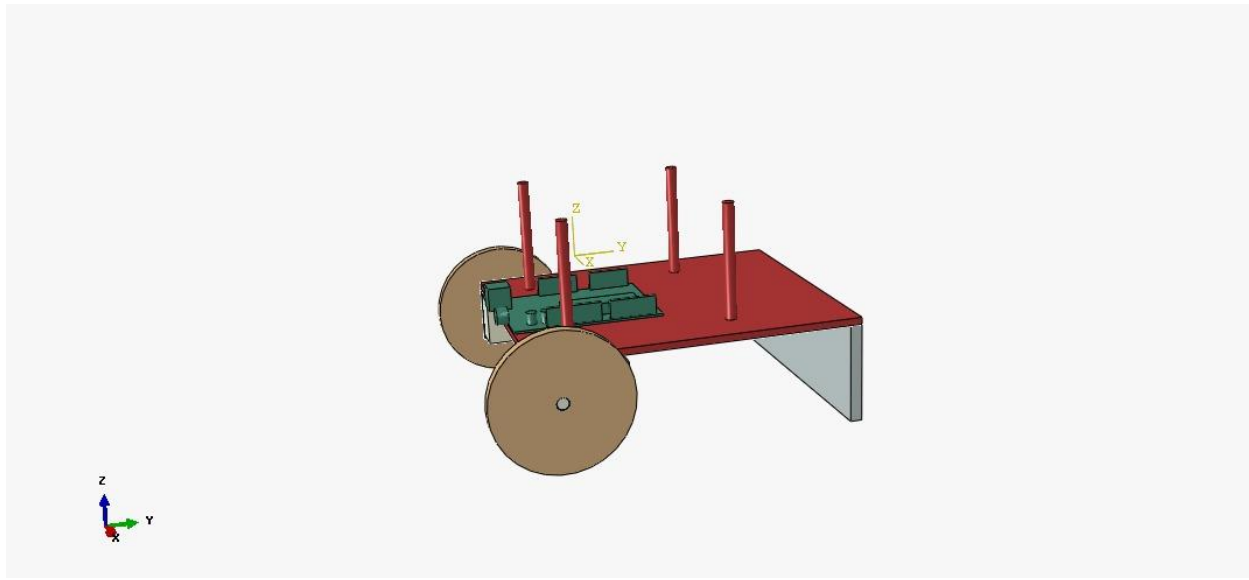


Step 4: Now attach the screws which will hold the next platform in place. And place the Arduino on the base appropriately.

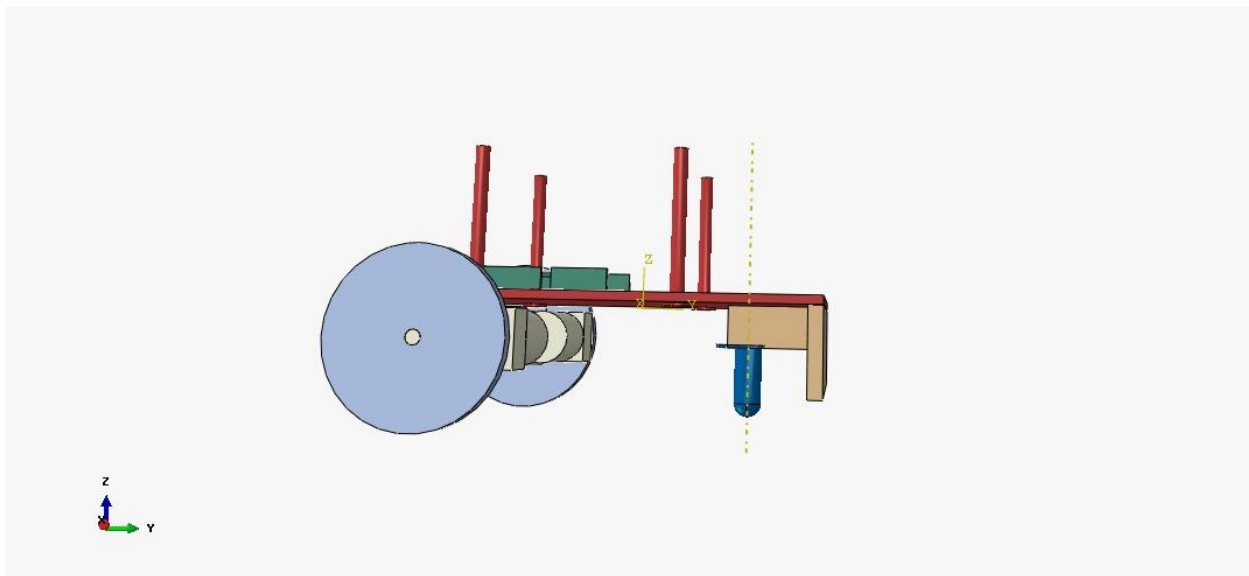




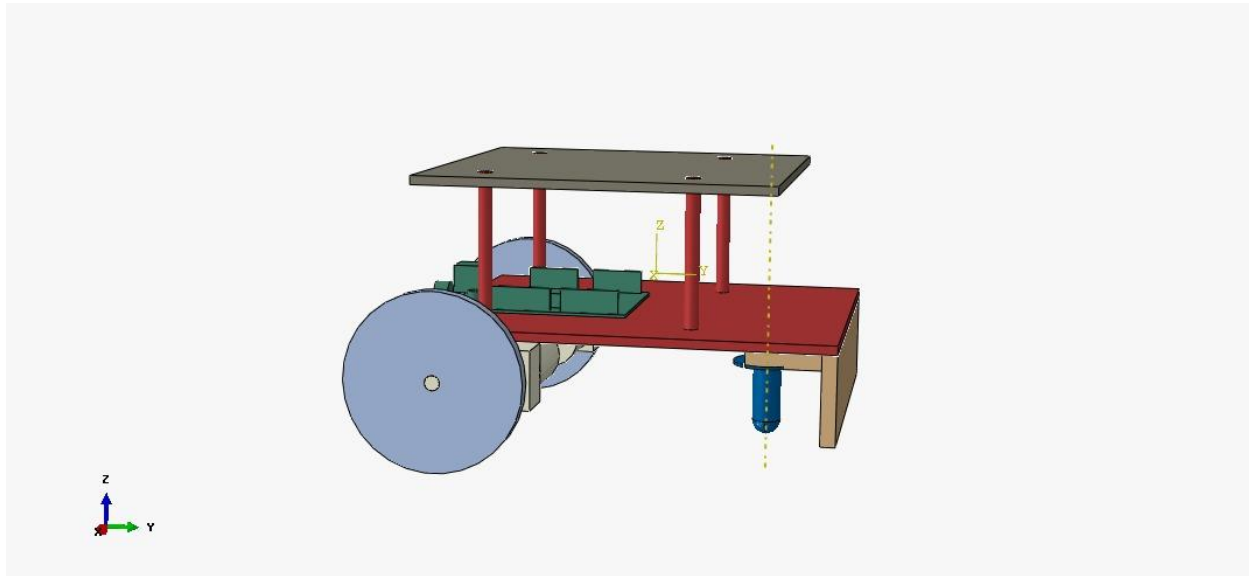
Step 5: Now you shall be attaching the 8 array sensor module as shown in the figure below, attach the wheels as well.



Step 6: Next in line is the castor wheel which will balance the whole bot. make sure that the height of the bot and the wheels are properly aligned.

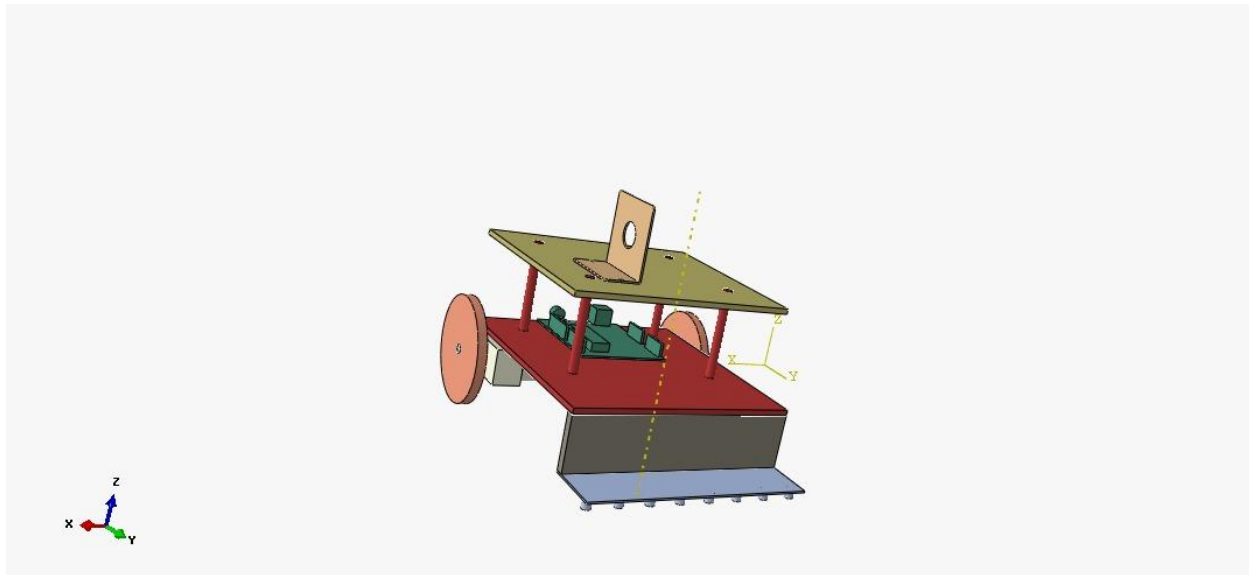


Step 7: Now attach the second base for the rack and pinion arrangement.

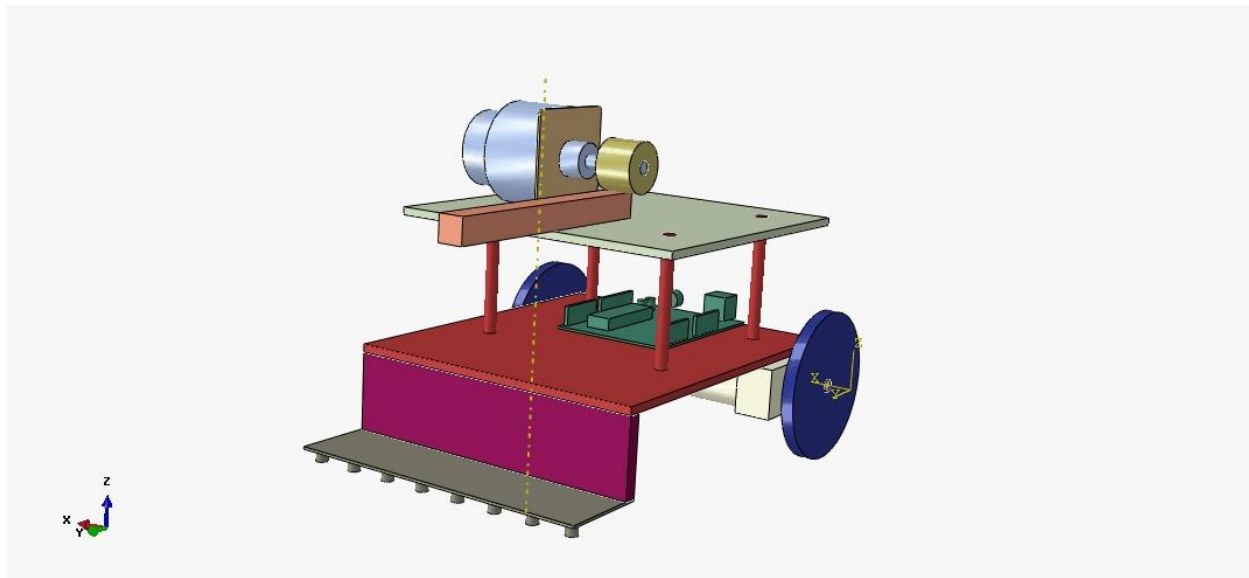


Step 8: Next will be the motor clamp for the motor that we will be using for attaching the pinion to it.

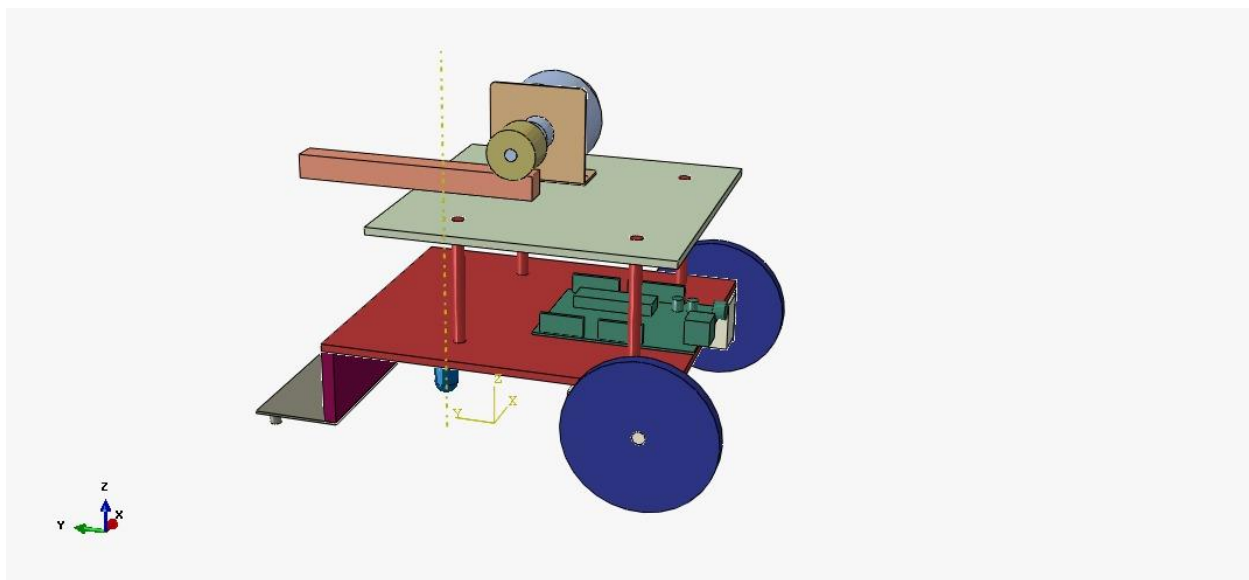
\*the rpm of this motor must be between 15 to 30 rpm.



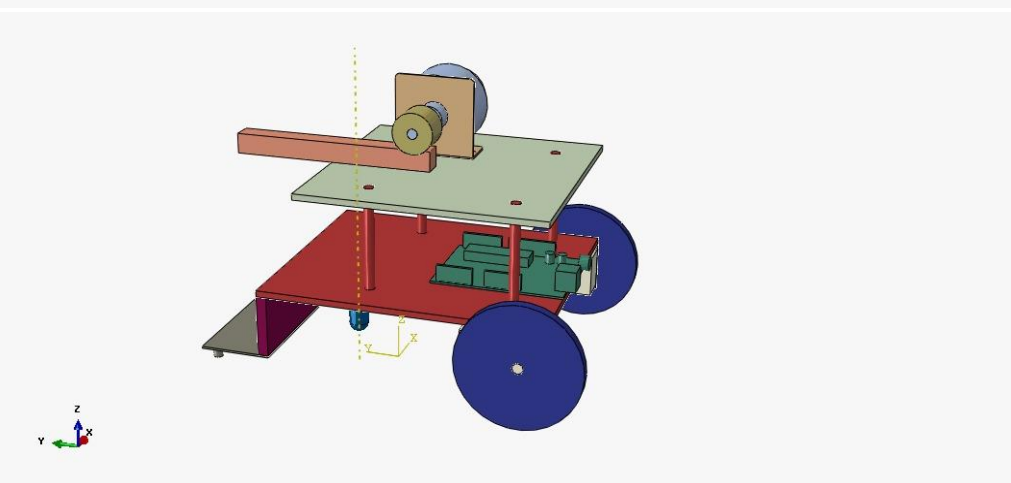
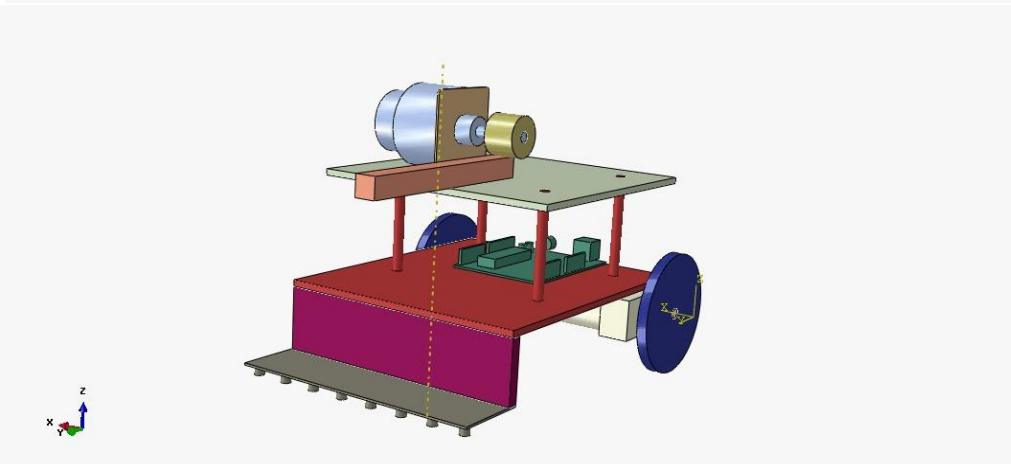
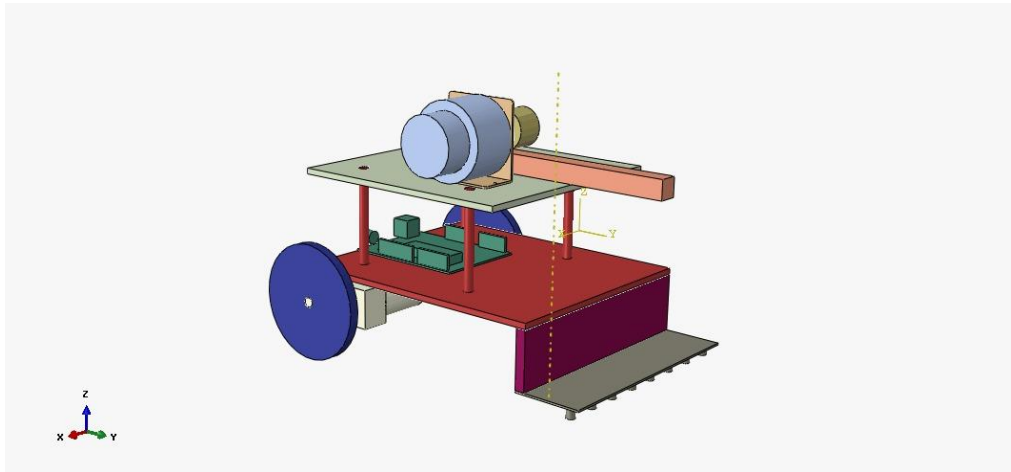
Step 9: Attach the motor and the pinion wheel.



Step 10: You need to attach the rack and make appropriate adjustments to it.



## THE FINAL LOOK



## **Calibration of IR Sensor Array**

The IR brightness control and indicator can be adjusted with the on-board potentiometer and is capable of showing you the strength of the IR LEDs. Adjust the potentiometer in such a way that it change its output logic level in white and black color.