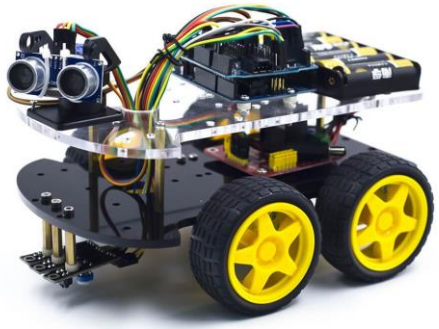
NSDC – Junior Skills Championship Mobile robotics



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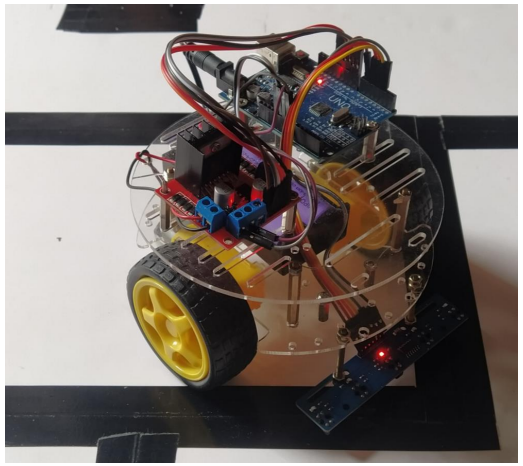
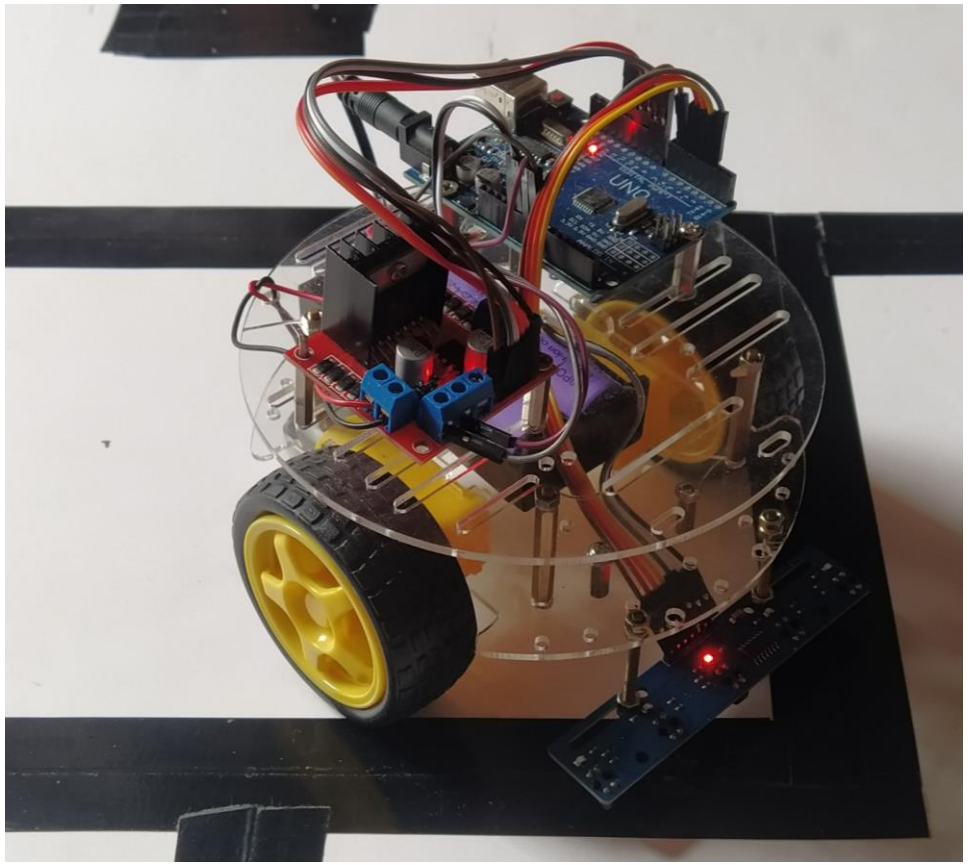


Round 4 - Topics Covered

- Physical wheeled mobile robot assembly with Arduino & sensors
- Building Line follower robot & Obstacle avoidance Robot
- Maze solving algorithm, Maze solving Robot

Agenda – Day 1

- Robot Assembly
  - Components
  - Building up the chassis
  - Assembly the circuitry
  - Programming the robot
  - Simple line-follower



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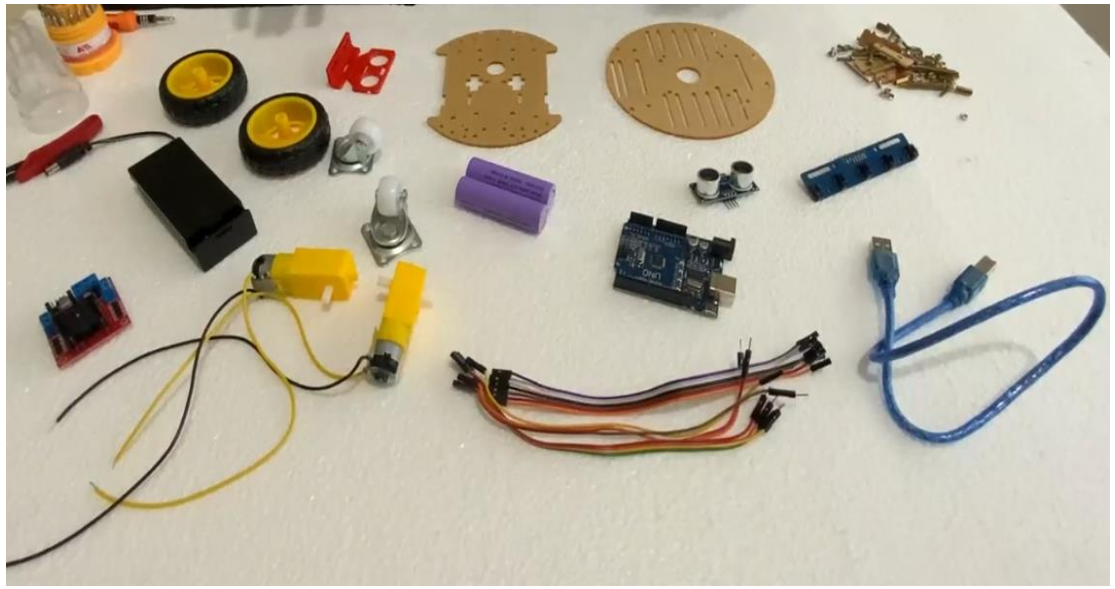
Robotic kit Components

This robotic kit comes with these many parts

- 2-layer chassis with fasteners
- Ultrasound sensor
- Line sensor array
- Programming cable
- Microcontroller
- Jumper wires
- Two motors
- Two batteries
- Two caster wheels
- Two wheels
- Battery holder
- Motor driver
- Ultrasound sensor holder
- Battery holder cover



Robot assembly kit Description

Material	High Quality imported acrylic board
Size	15*15*3CM
Voltage	3~10V for motor
Current	0.5~2A for motor

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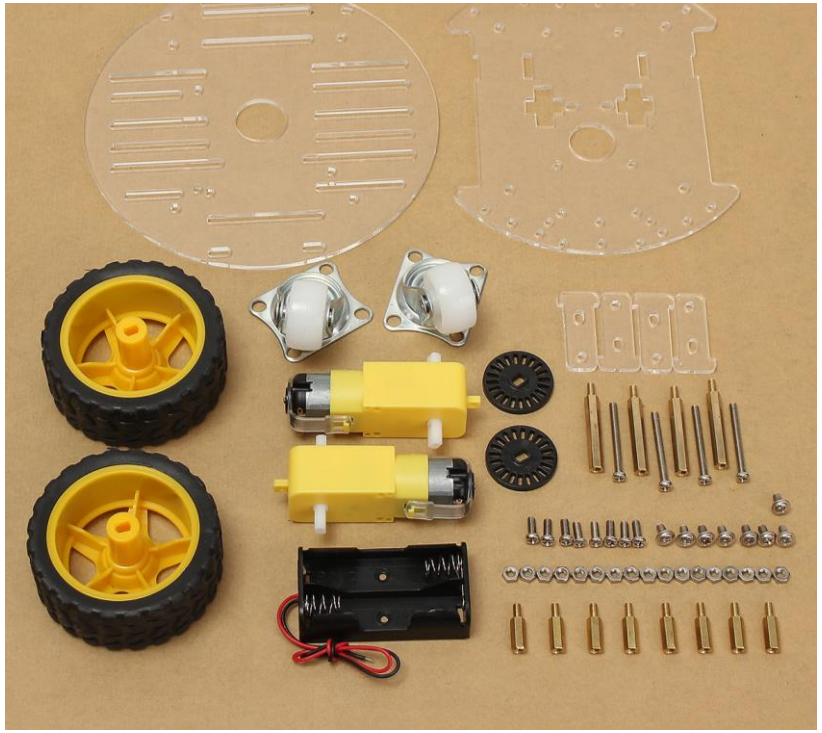
Robot assembly kit Parts to be assembled

Robot Chassis comes with below parts

- 1 x Round Acrylic Plate
- 1 x Acrylic Baseboard
- 2 x 65mm Wheel
- 2 x Universal Wheel
- 2 x BO Geared Motor
- 4 x "T" mode Fixed Motor Bracket
- 16 x M3X10mm Screw
- 8 x M3 Nut
- 4 x M3X12+6mm Copper Cylinder
- 4 x M3X30mm two-way Copper Column



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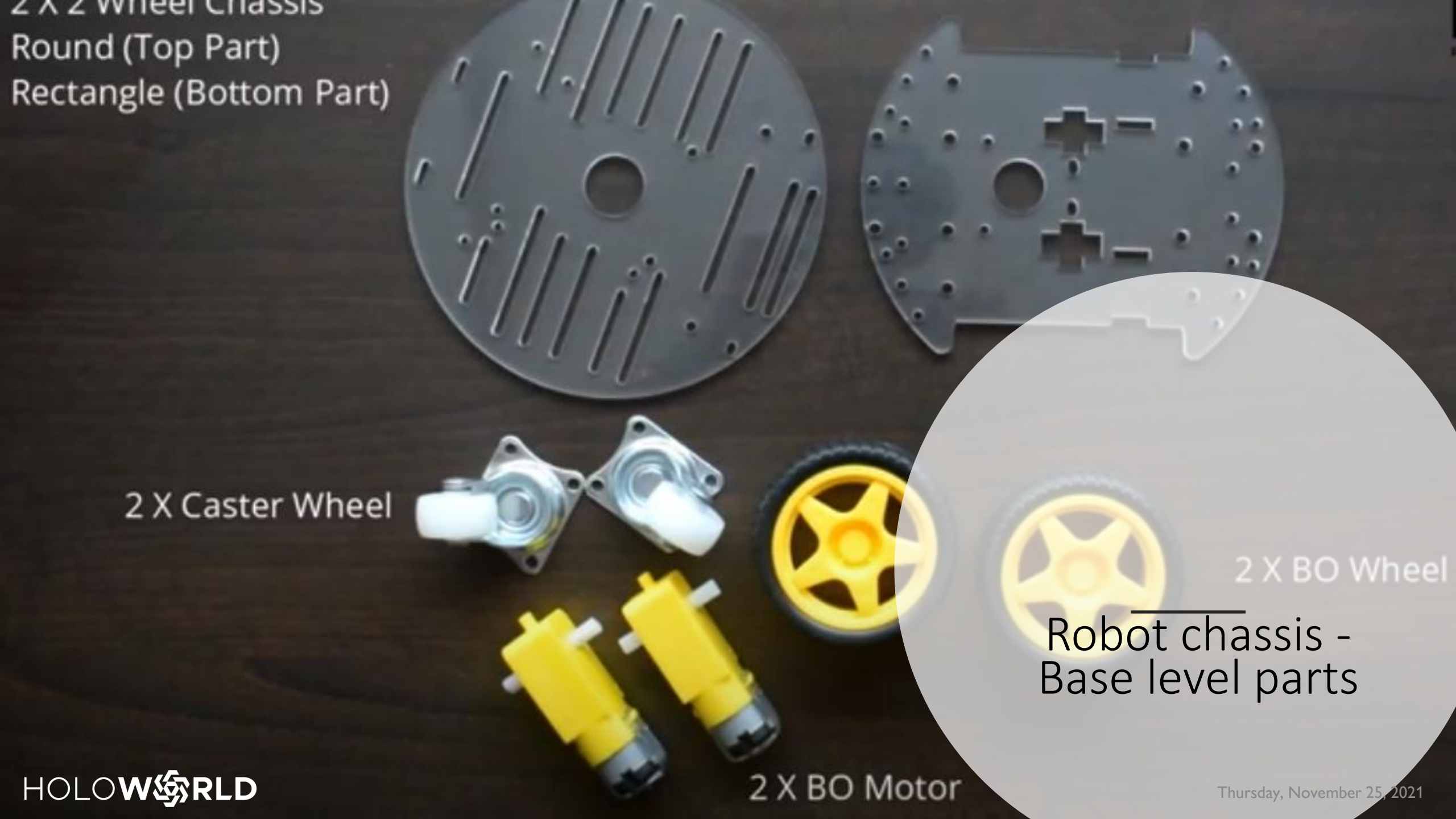

Robot chassis - Base level parts

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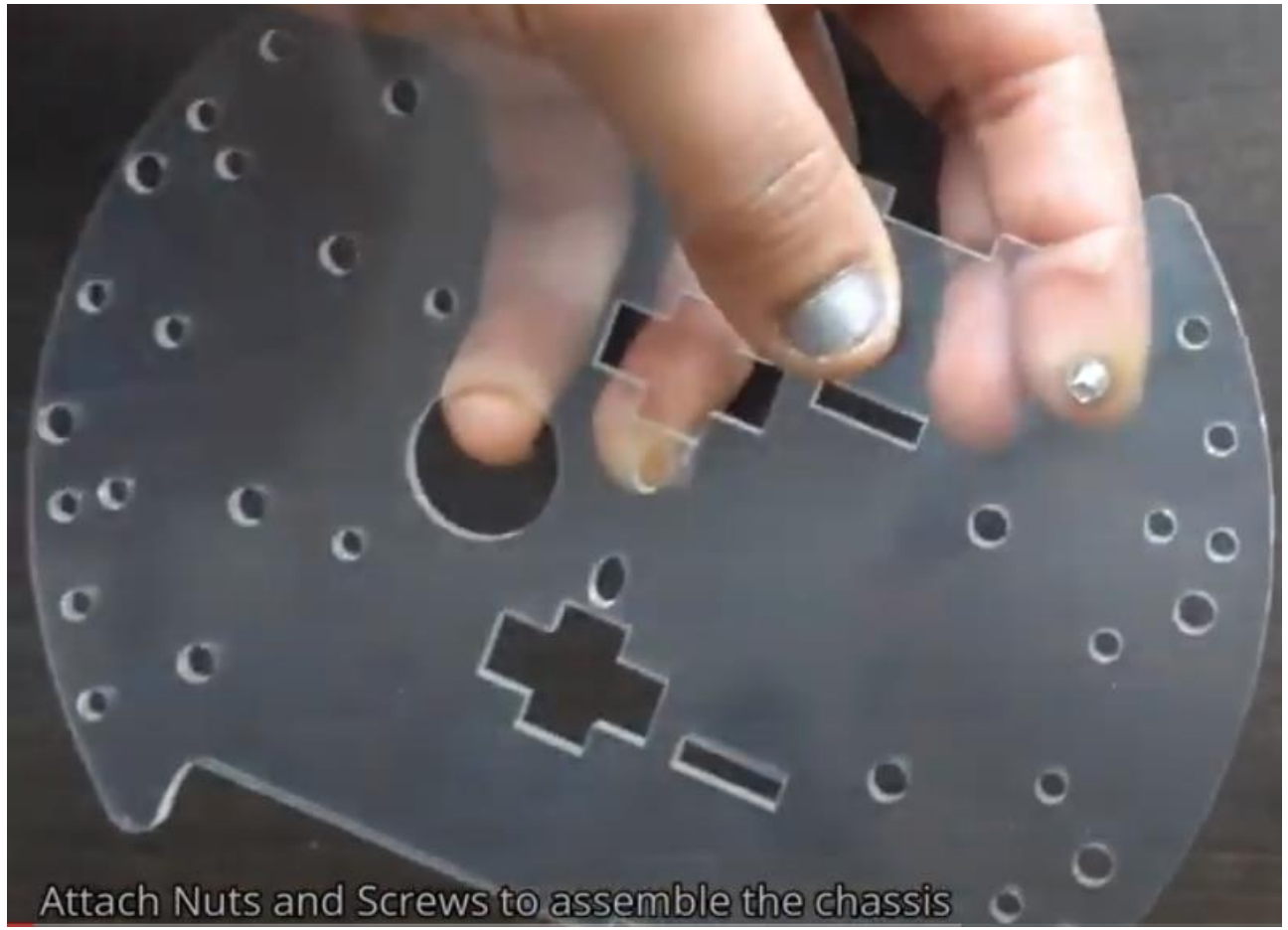
Assembling the Robotic kit

Assembly of the Robotic kit:

- Attach the given M3 screw and M3 copper cylinder to the chassis
- This gives the height between base and topmost chassis plate



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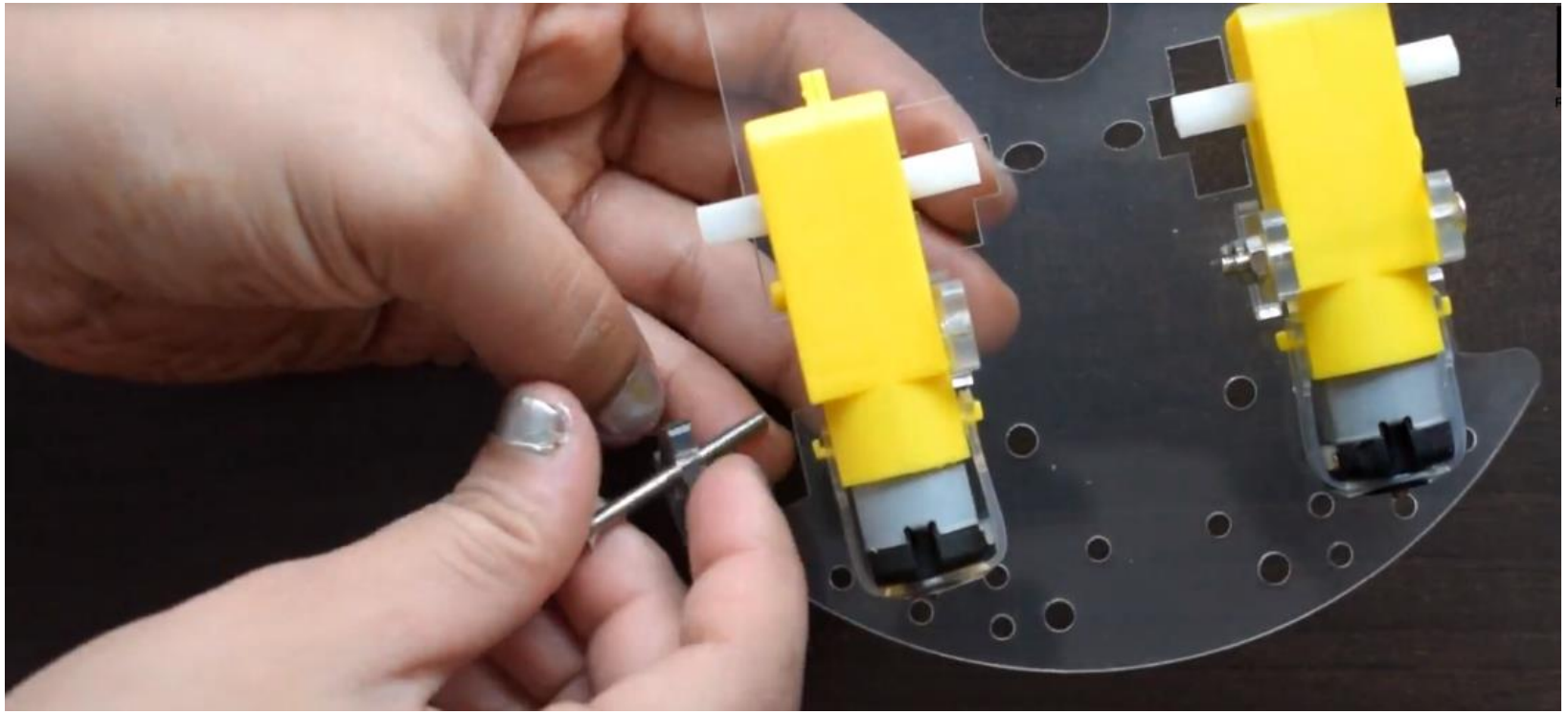
Assembling the Robotic kit

Assembly of the Robotic kit:

Attach the T mode fixed motor bracket to the base chassis and tighten with M3 screw and nut



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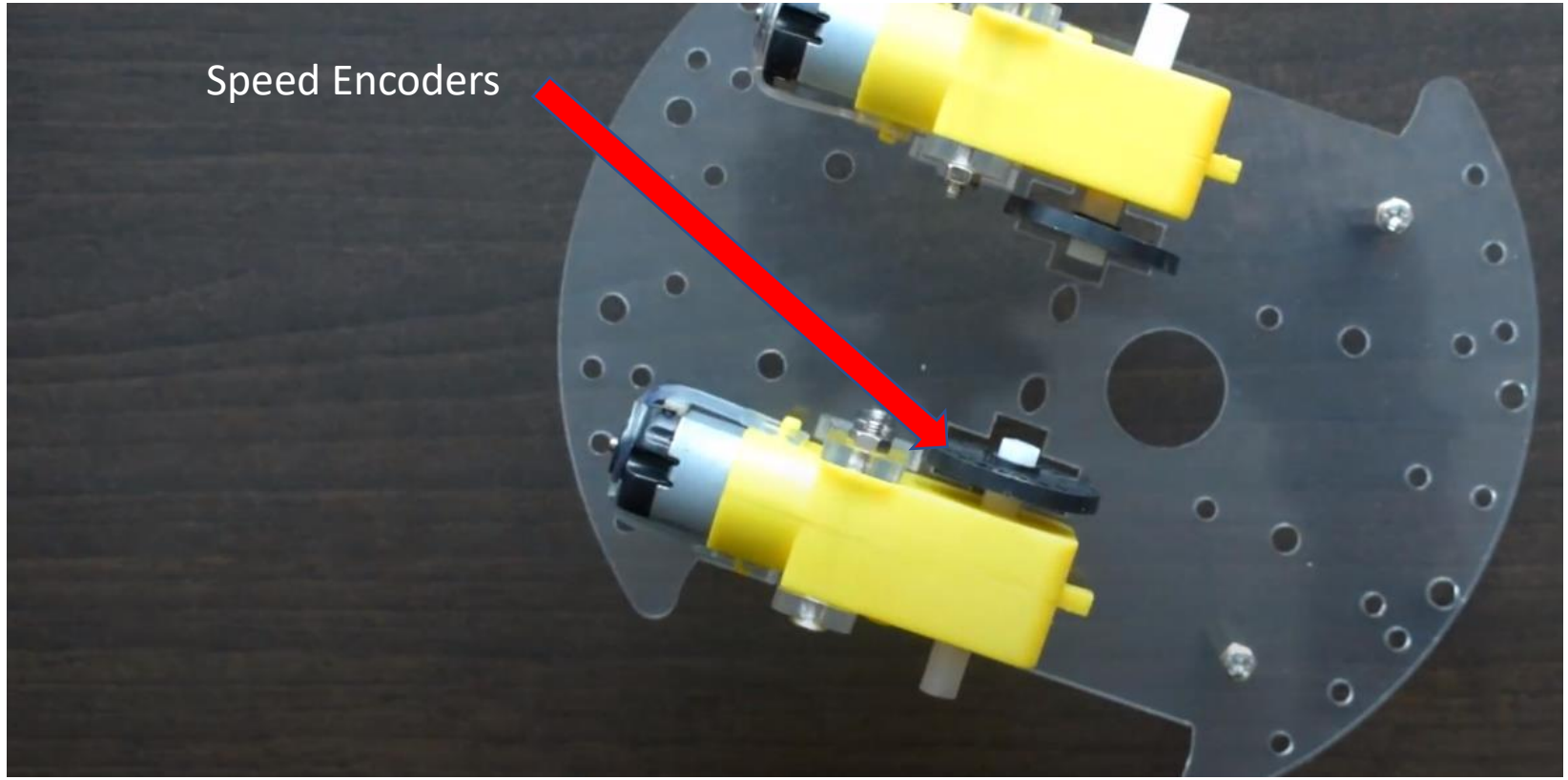
Assembling the Robotic kit

Assembly of the Robotic kit:

Attach the (black round) speed encoders to the BO motor shaft



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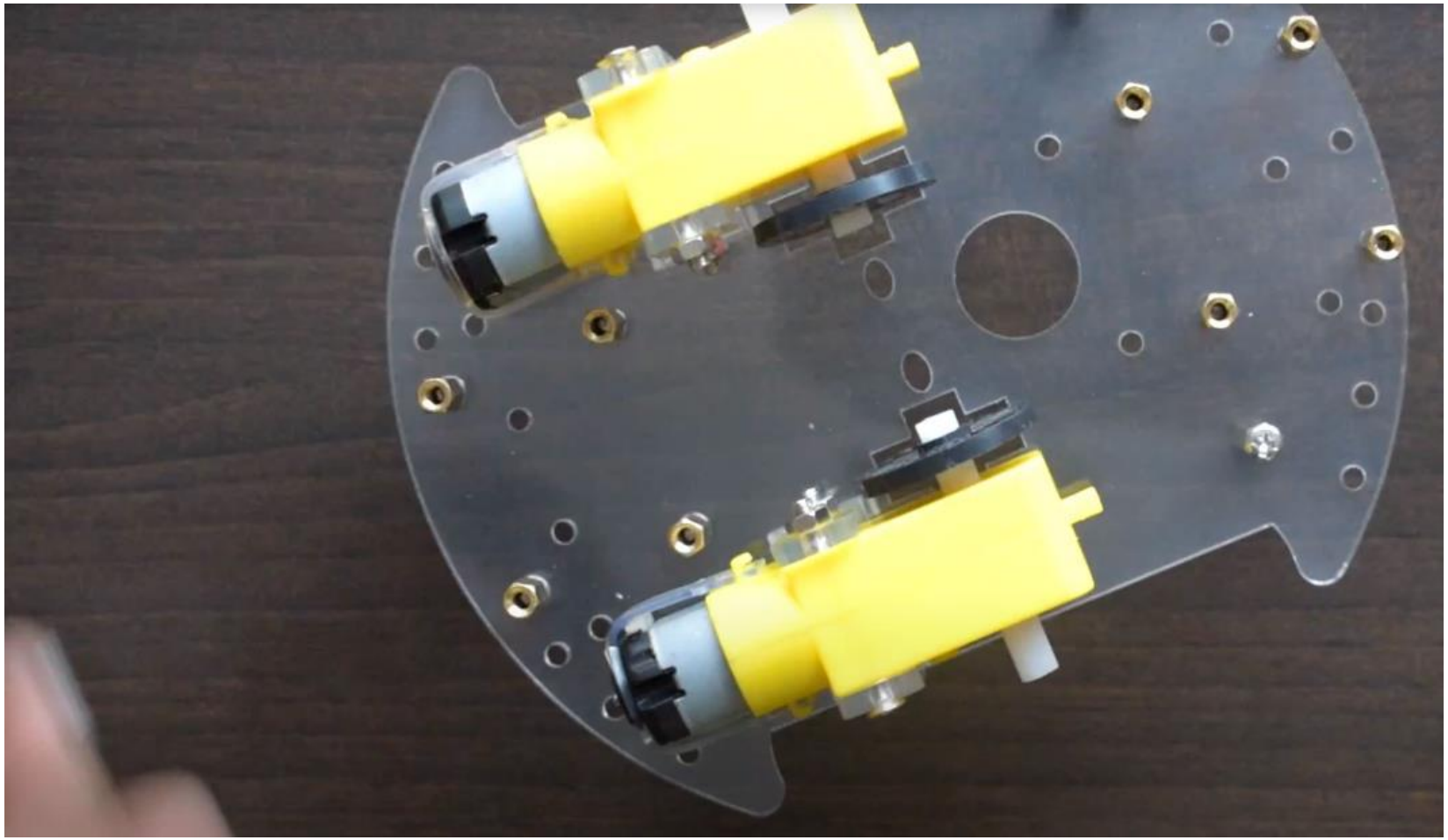
Assembling the Robotic kit

Assembly of the Robotic kit:

- Assemble both motors with T mod bracket



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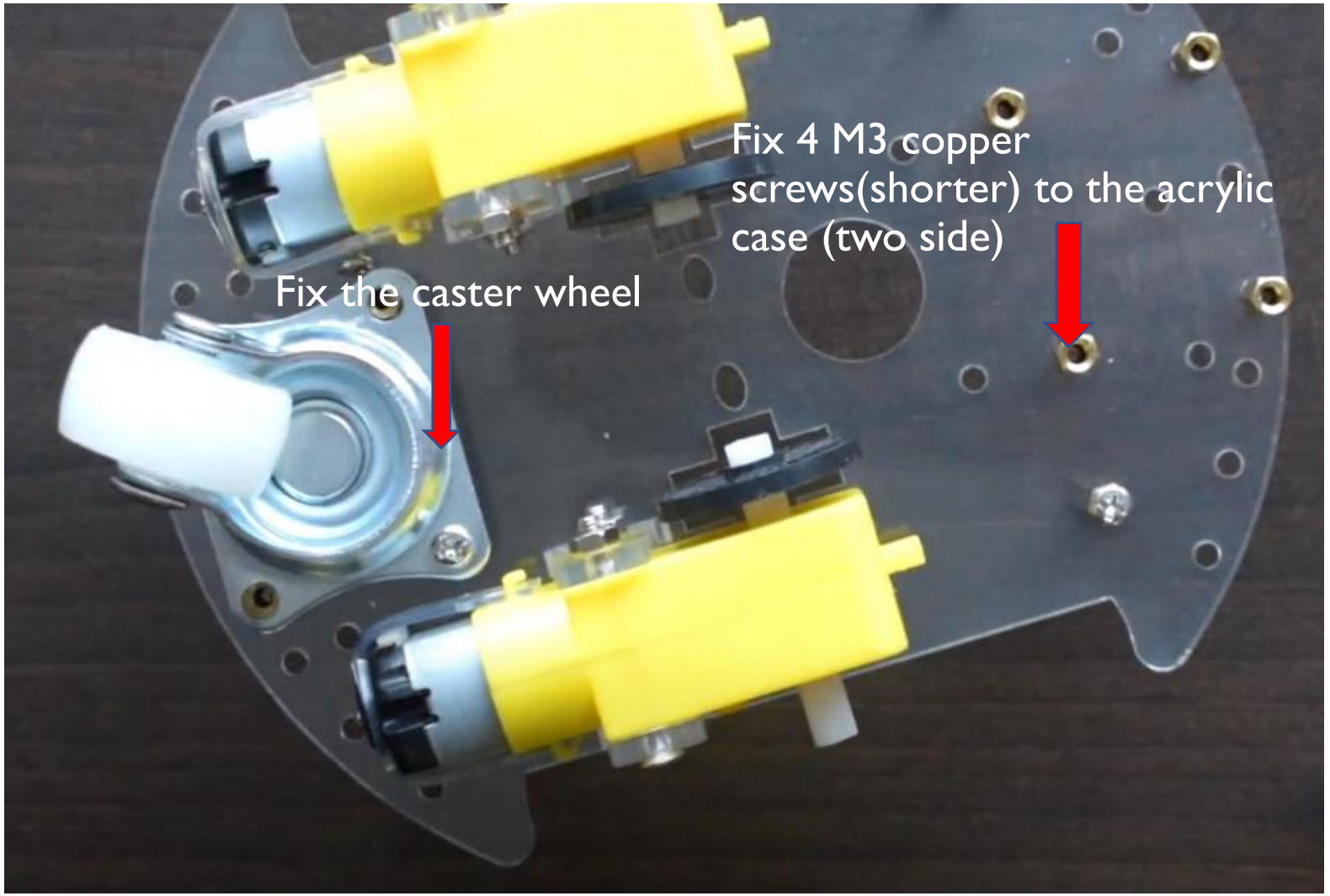
Assembling the Robotic kit

Assembly of the Robotic kit:

- After assembly, motors attached to the chassis should look like the image below



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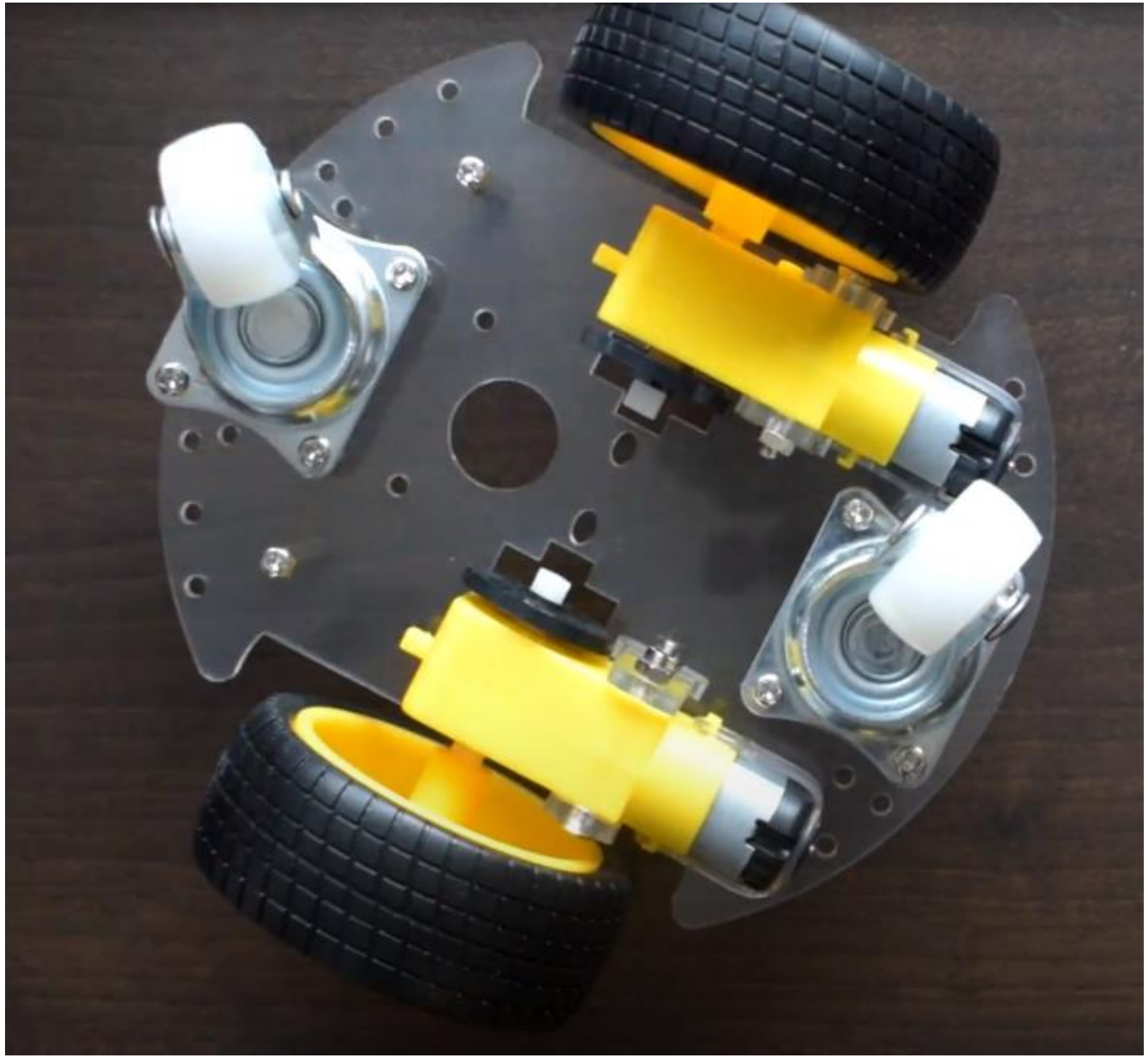
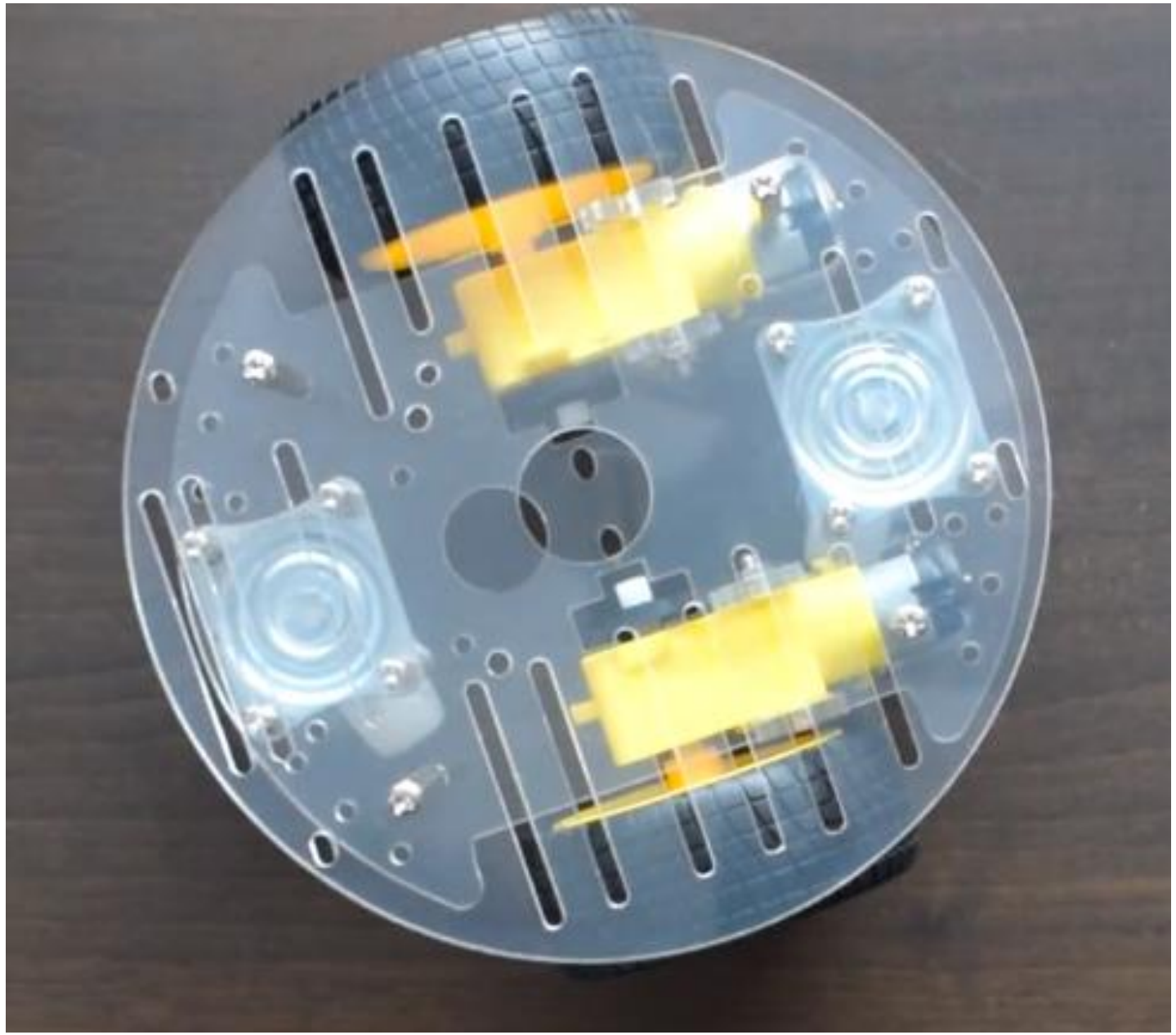
Assembling the Robotic kit

Rear view post caster wheels assembly



Assembling the Robotic kit

Fully assembled chassis - Top view



Assembling the Robotic kit

Fully assembled chassis –Side view

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Use this space or holes to Fix the Arduino UNO

How to Assemble the Arduino UNO & Motor driver

Use this space or holes to Fix the Motor driver

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Line sensor array module

High Quality 5 Channel IR Sensor Module Line Tracking Sensor TCRT5000 Module

- IR Sensor Chip: 74HC14D
- IR Sensor Working voltage: 3.3V ~ 5V
- Output mode: digital signal
- Measuring distance: 1CM ~ 1.5CM
- Detection probe: TCRT5000L
- Detection signal: detection black line output low, white line detection is high, beyond the detection range output low
- LED status: Detection black line LED off, white line detection LED light

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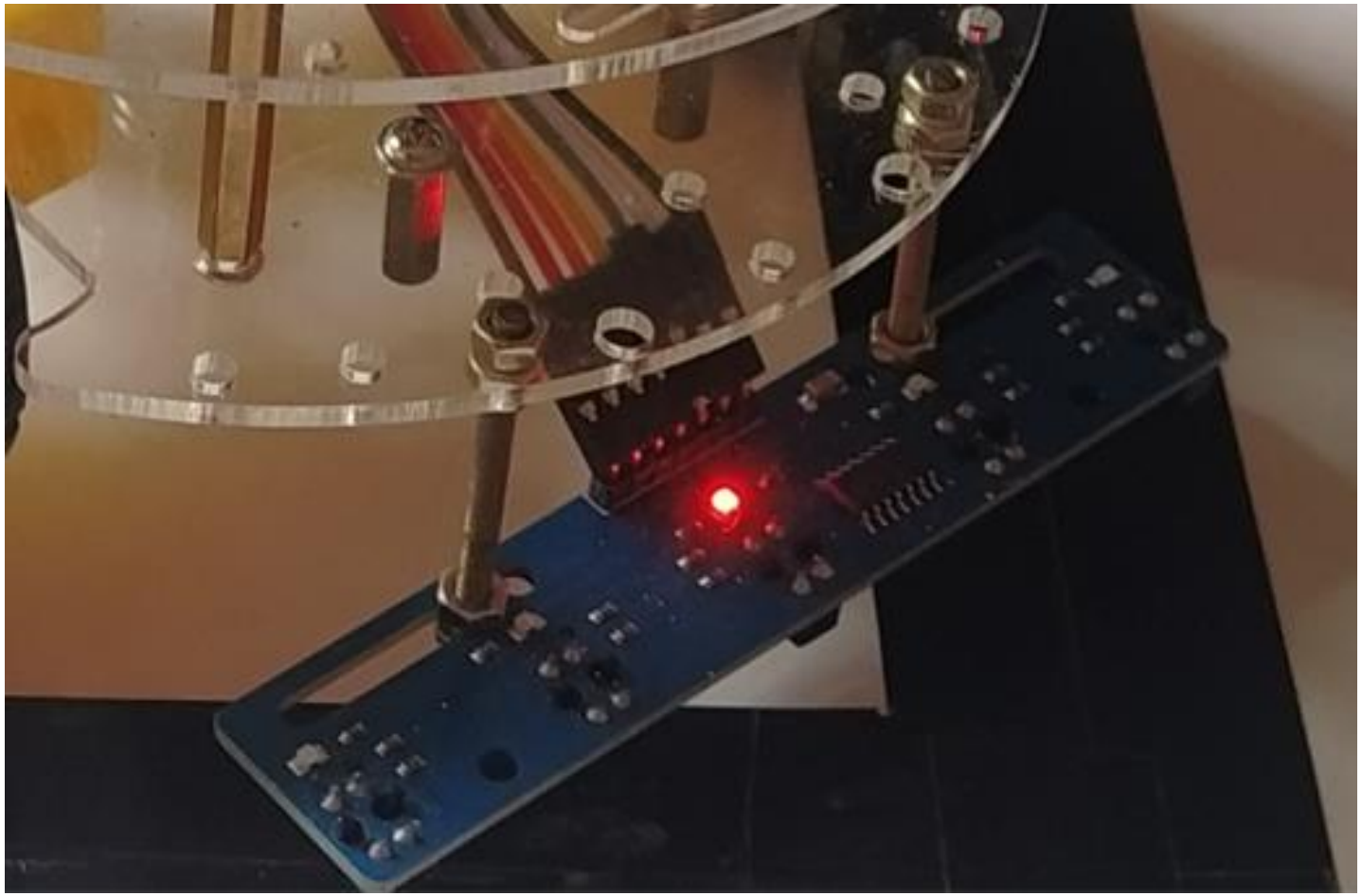
Line sensor array module

Assembling the 5 Channel IR Sensor Module to the chassis

- Use the 1.5-inch screws and nuts to assemble the 5 channel IR Sensor array module
- Assemble the sensor on the front side of the robot as shown



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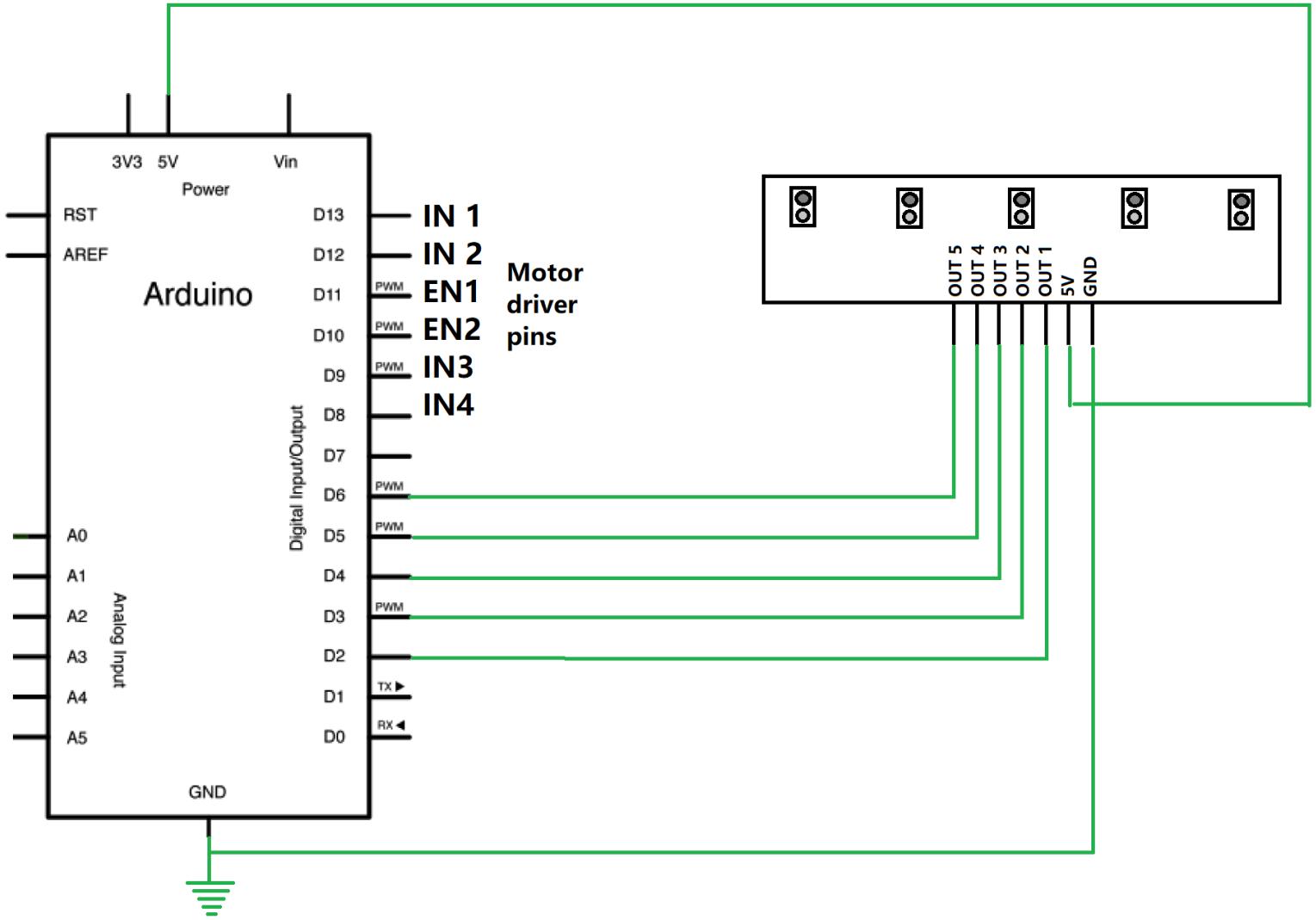
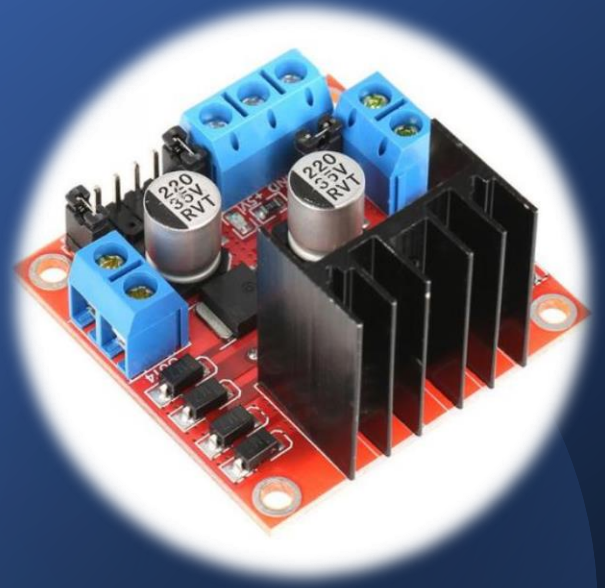
Line sensor array module

Interfacing the Line Sensor array

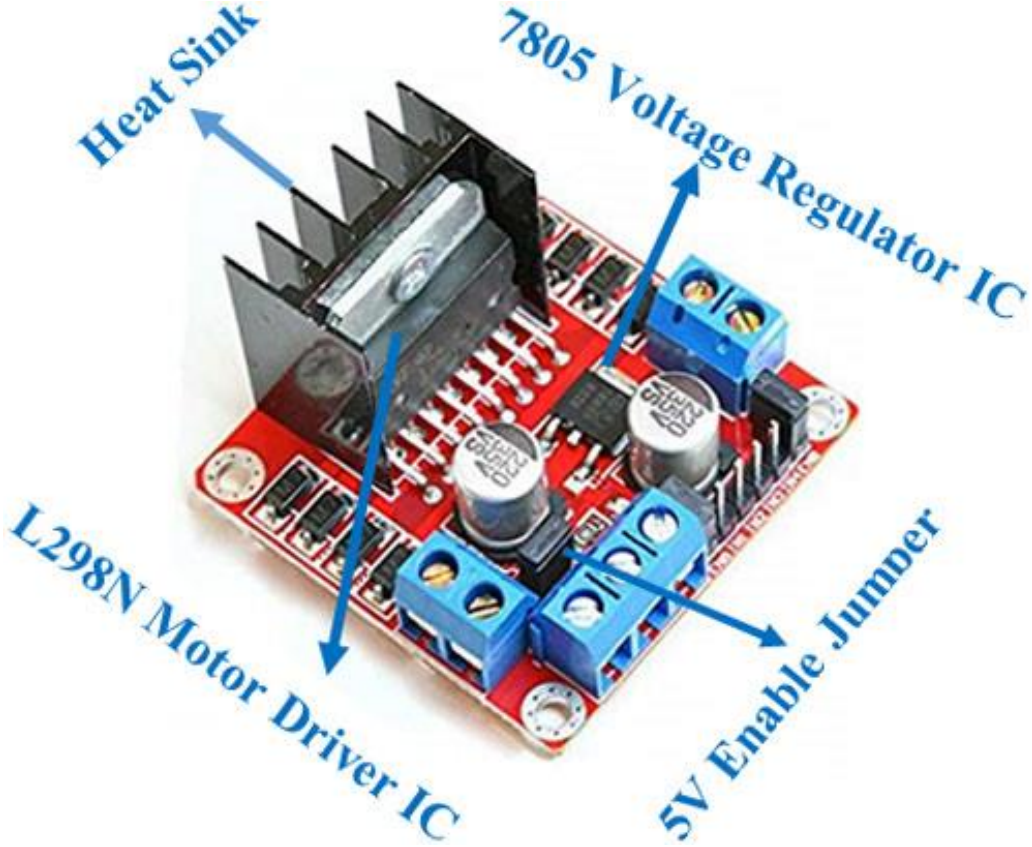




Arduino with motor using driver IC’s

L298N Motor Driver IC (H bridge)

- The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time
- The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A



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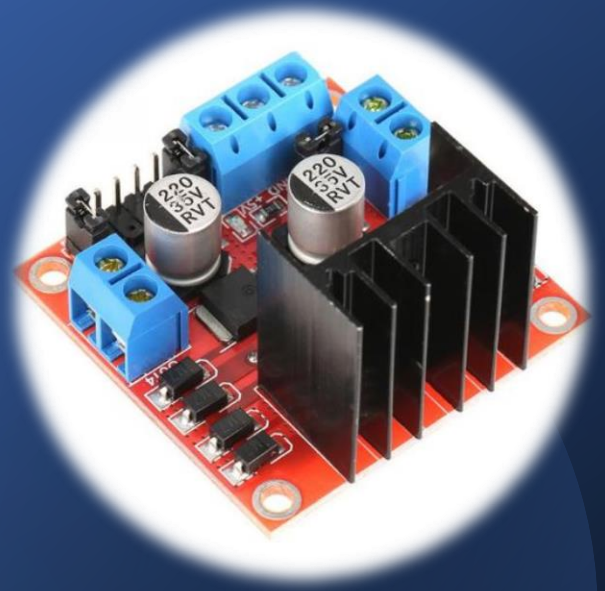
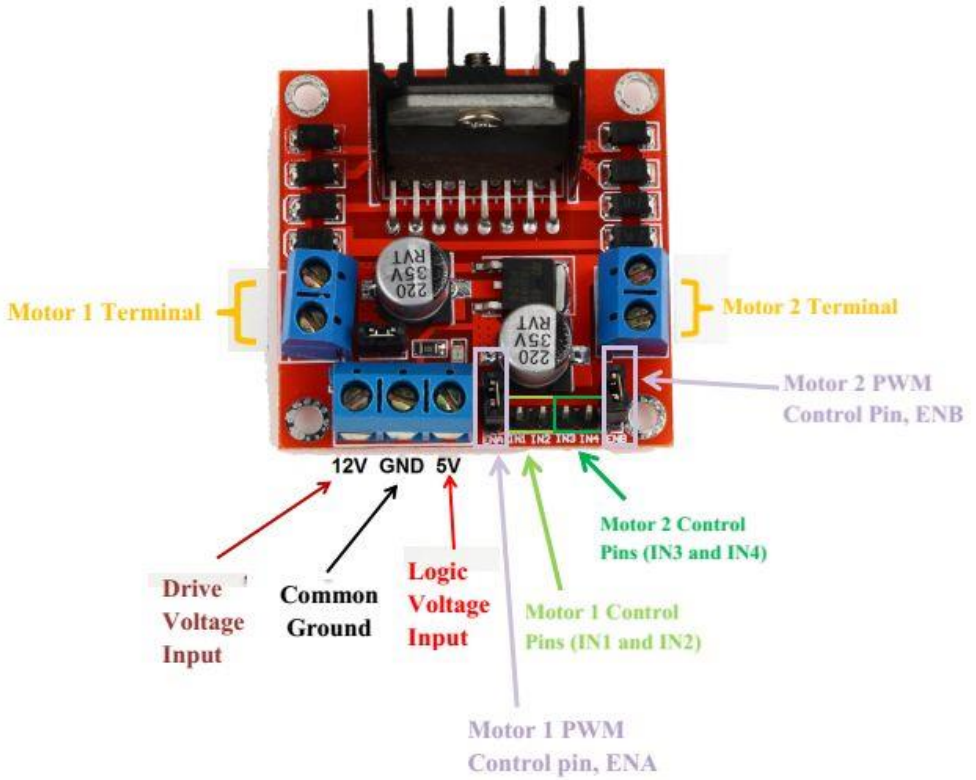


Arduino with motor using driver IC's

L298N Motor Driver IC (H bridge)

- Let's take a closer look at the pinout of L298N module and explain how it works
- The module has two screw terminal blocks for the motor 1 and 2, and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or output
- We have Enable pins for Motor1 & 2 used to control the speed using PWM signals
- The module have an onboard 5V regulator which is either enabled or disabled using a jumper



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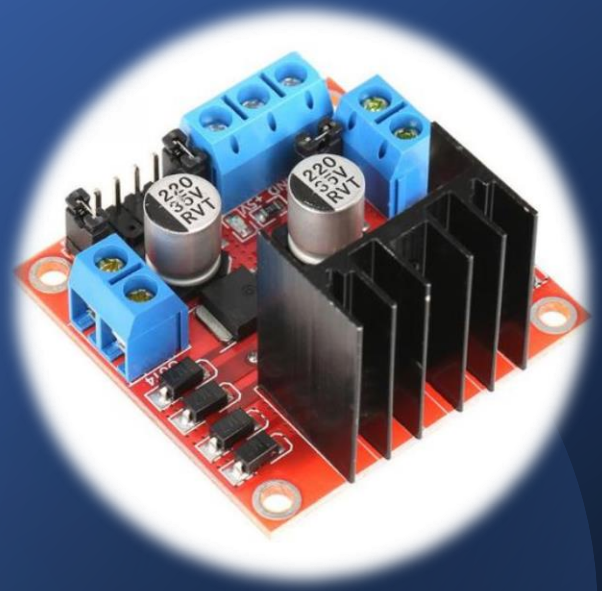
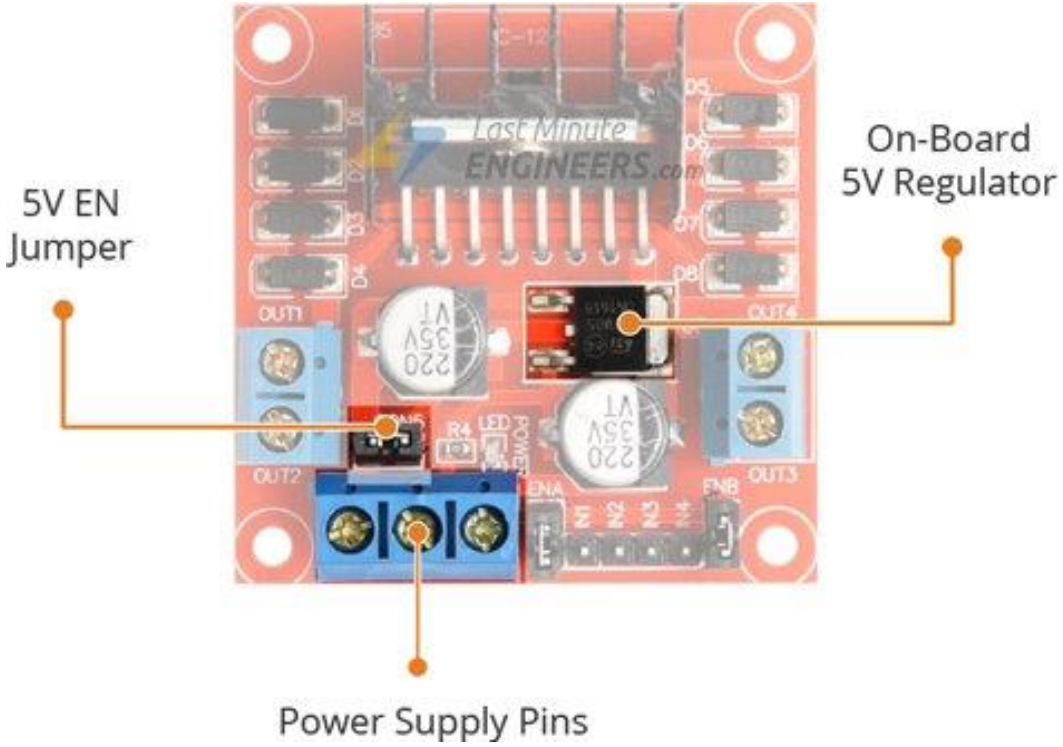


Arduino with motor using driver IC’s

L298N Motor Driver IC (H bridge)

- The motor supply voltage is up to 12V we can enable the 5V regulator and the 5V pin can be used as output, for example for powering our Arduino board
- The motor voltage is greater than 12V we must disconnect the jumper because those voltages will cause damage to the onboard 5V regulator. In this case the 5V pin will be used as input as we need connect it to a 5V power supply in order the IC to work properly.



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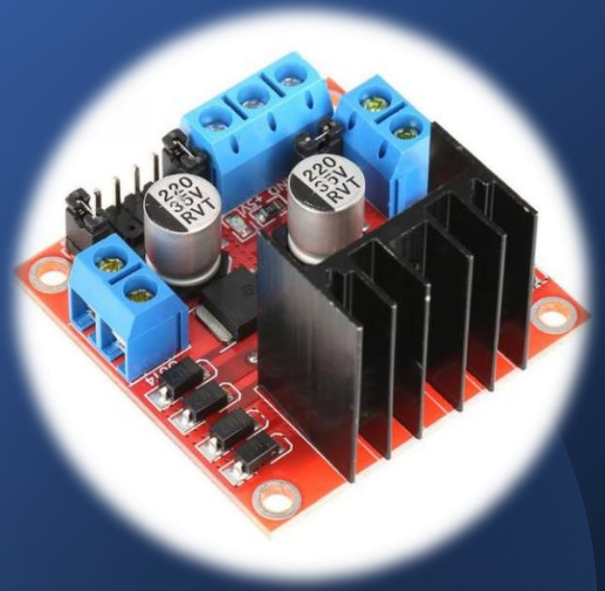
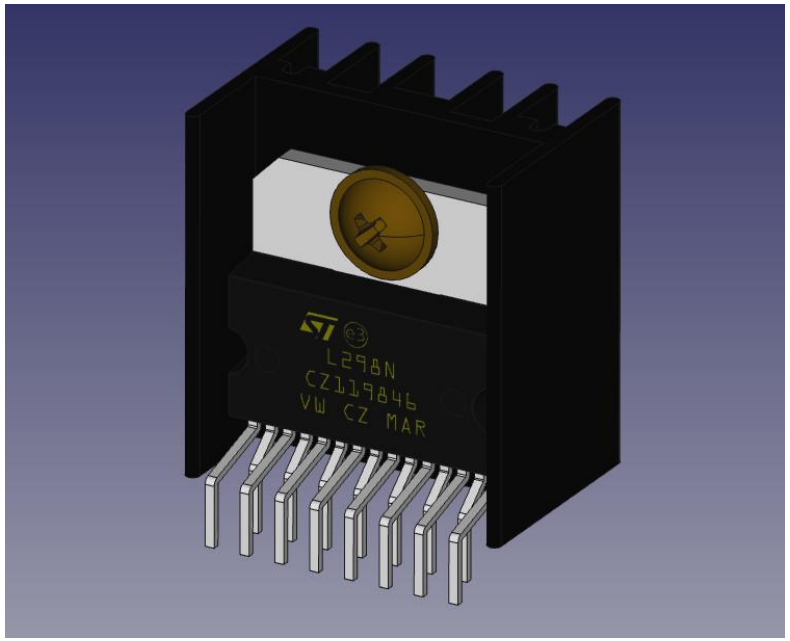


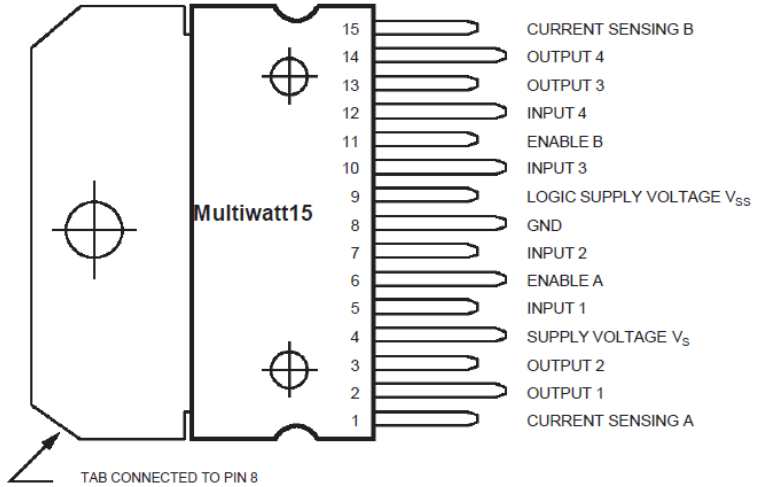
Arduino with motor using driver IC’s

L298N Motor Driver IC (H bridge)

- The L298 can control the speed and direction of DC motors and stepper motors and can control two motors simultaneously
- Its current rating is 2A for each motor. At these currents, however, you will need to use heat sinks.



L298 Pinout (top view)



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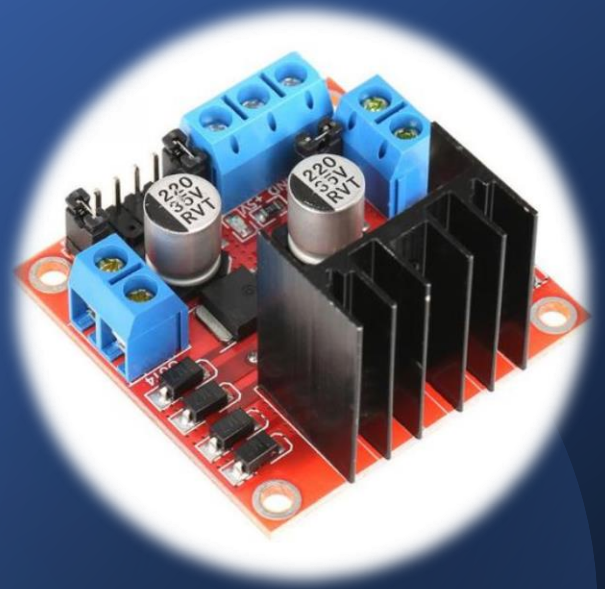
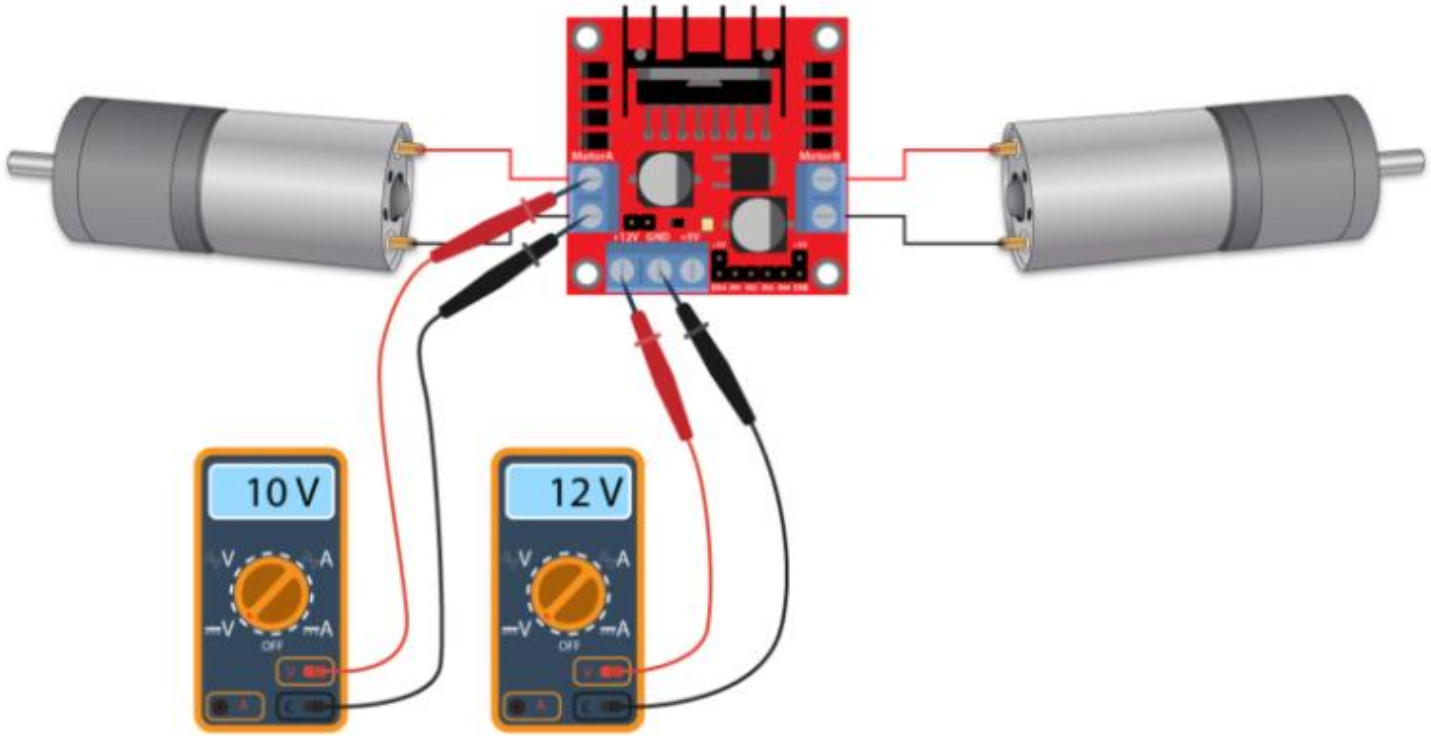


Arduino with motor using driver IC’s

L298N Motor Driver IC (H bridge)

We can note here that this IC makes a voltage drop of about 2V. So for example, if we use a 12V power supply, the voltage at motors terminals will be about 10V, which means that we won’t be able to get the maximum speed out of our 12V DC motor.



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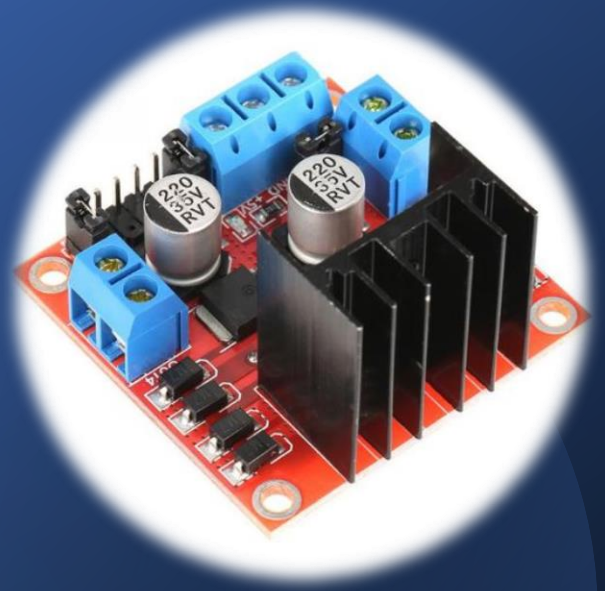
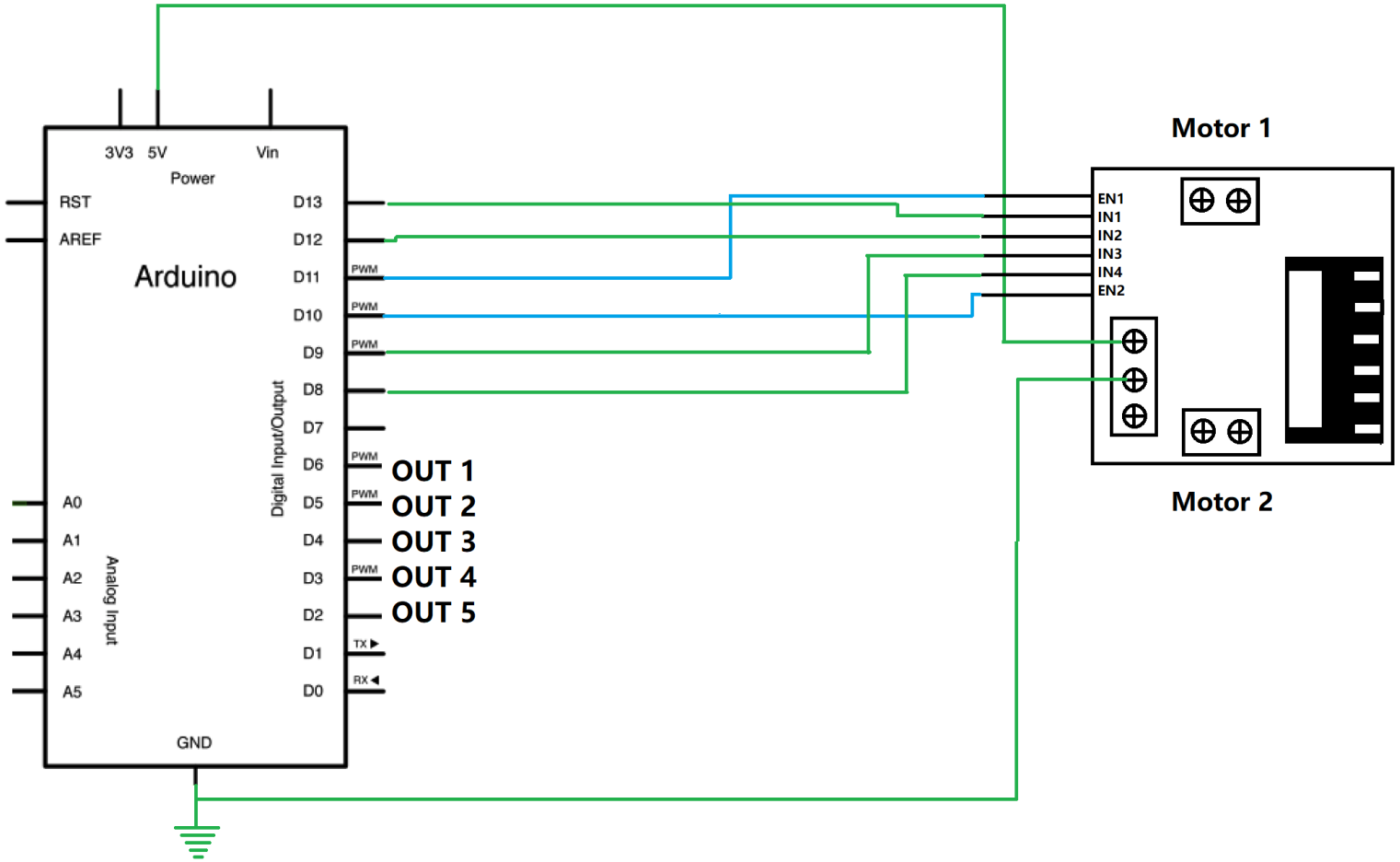


Arduino with motor using driver IC’s



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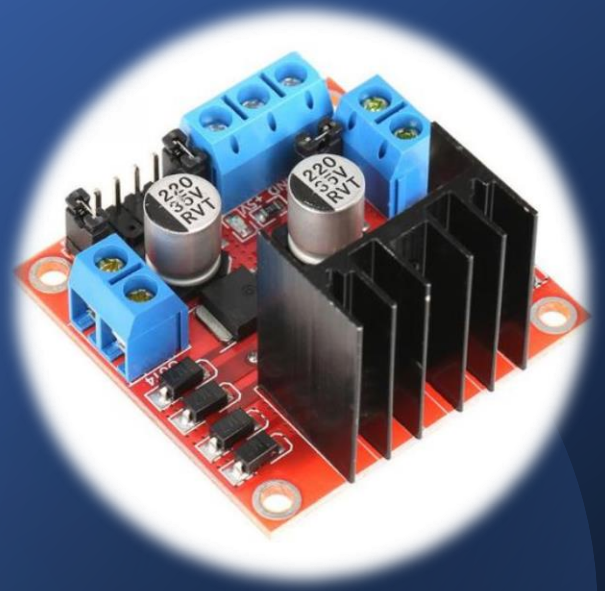
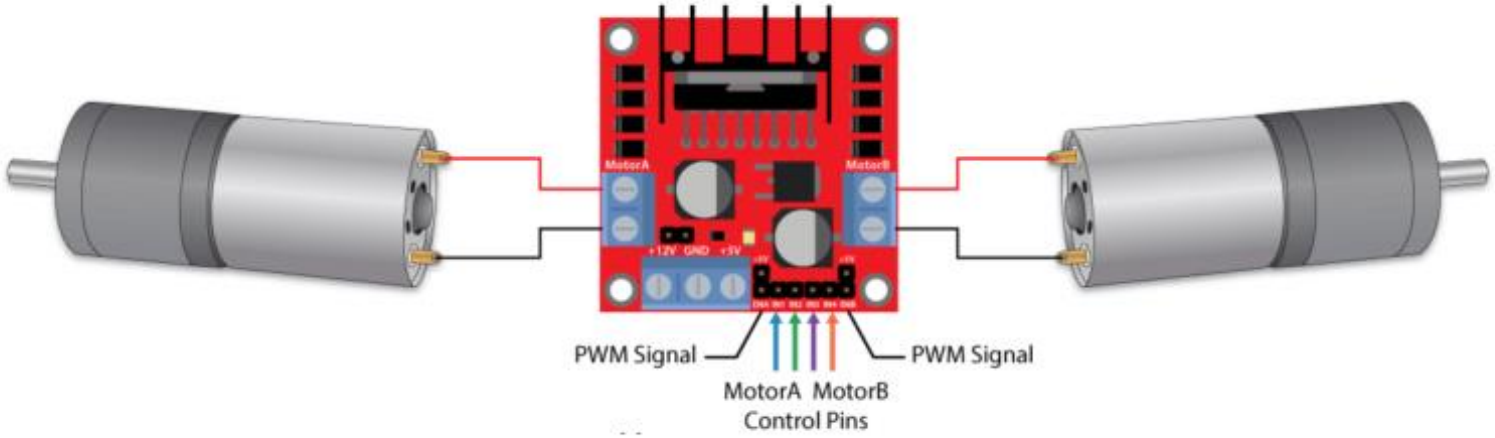


Arduino with motor using driver IC’s

L298N Motor Driver IC (H bridge)

- The Input 1 and Input 2 pins are used for controlling the rotation direction of the motor 1
- The input 3 and Input 4 pins are used for controlling the rotation direction of the motor 2
- If input 1 is LOW and input 2 is HIGH the motor will move forward, and vice versa
- If input 1 is HIGH and input 2 is LOW, the motor will move backward.
- In case both inputs are same, either LOW or HIGH the motor will stop



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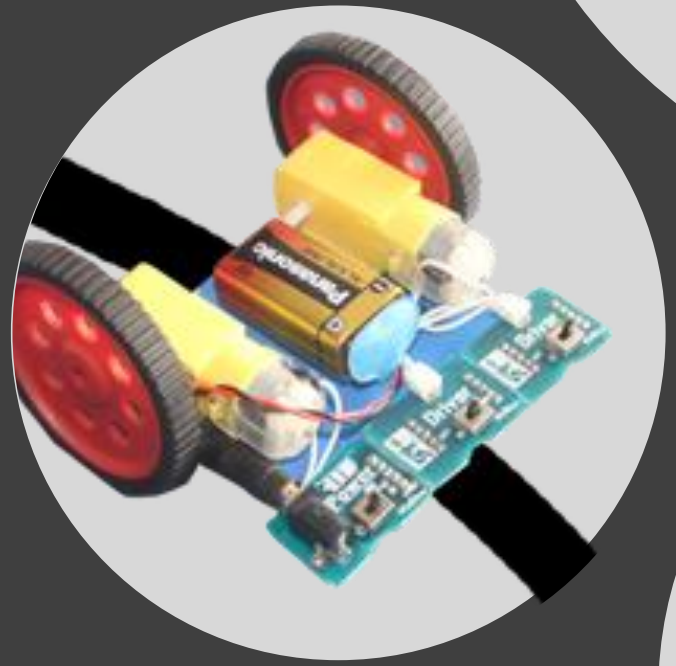
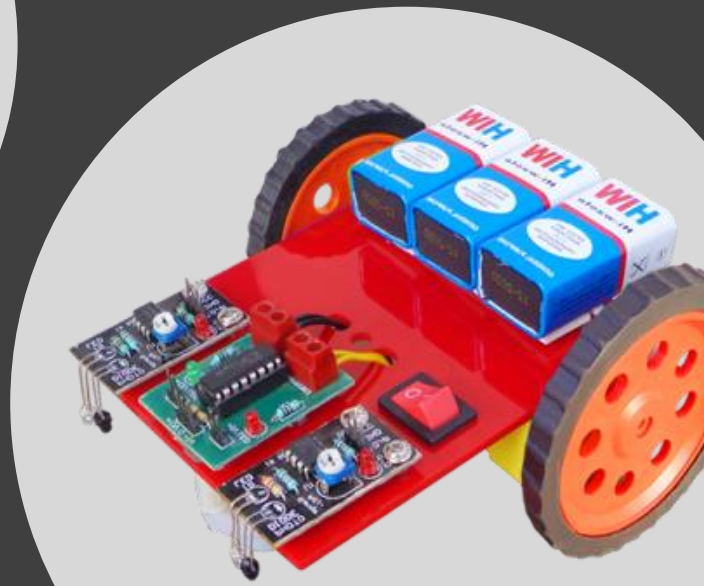
Line Tracing Robot





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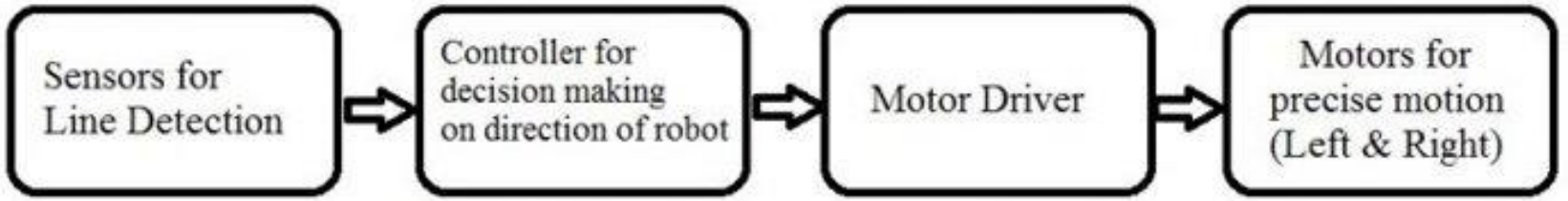
Thursday, November 25, 2021

Line Tracing Robot

Line Following Robot - Circuit Diagram



Block Diagram for Line Follower Robot

- Line Tracing is a machine that can follow a path. The path can be visible like a black line on a white surface (or vice-versa) or it can be invisible like a magnetic field
- Sensing a line and maneuvering the robot to stay on course, While Constantly connecting wrong using feedback mechanism forms a simple yet effective closed loop system

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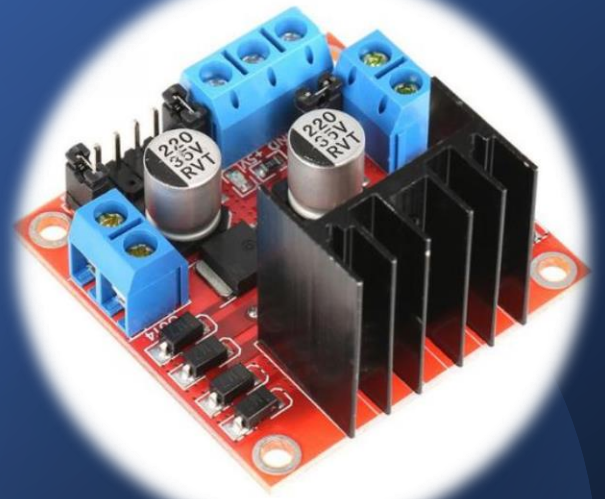
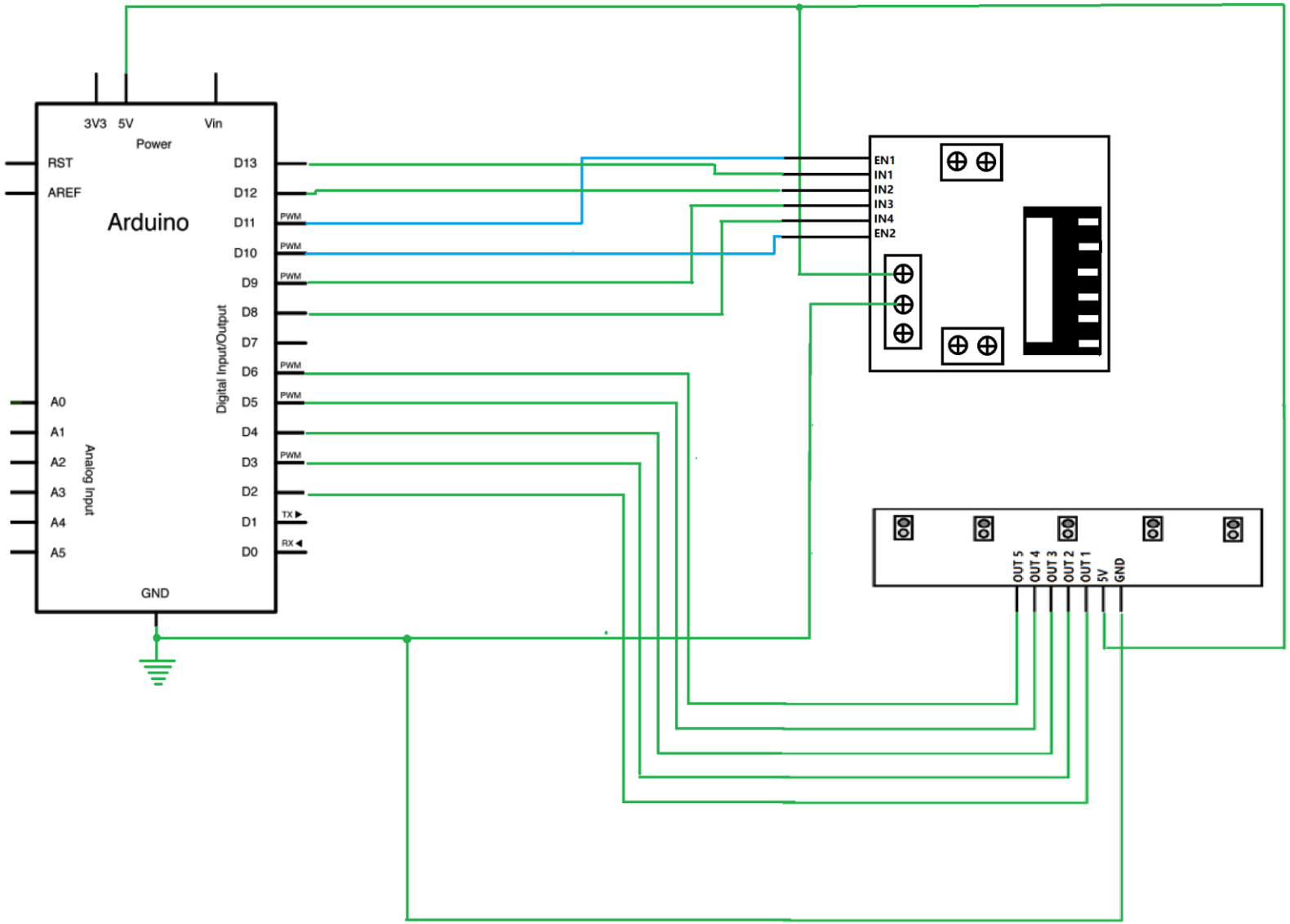


Arduino with motor using driver IC’s

Line Following Robot - Circuit Diagram



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