NSDC – Junior Skills Championship
Mobile robotics

N·S·D·C
National
Skill Development
Corporation

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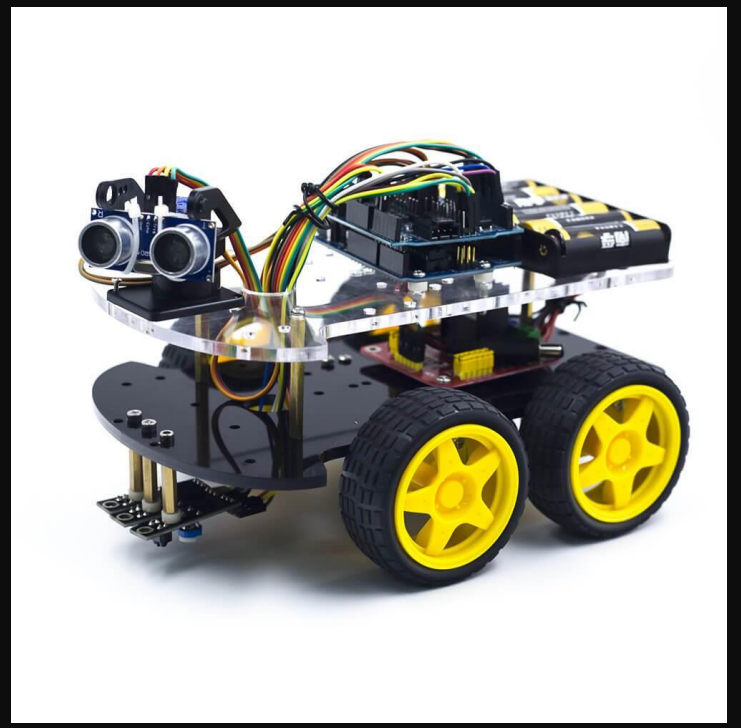

Thursday, November 25, 2021

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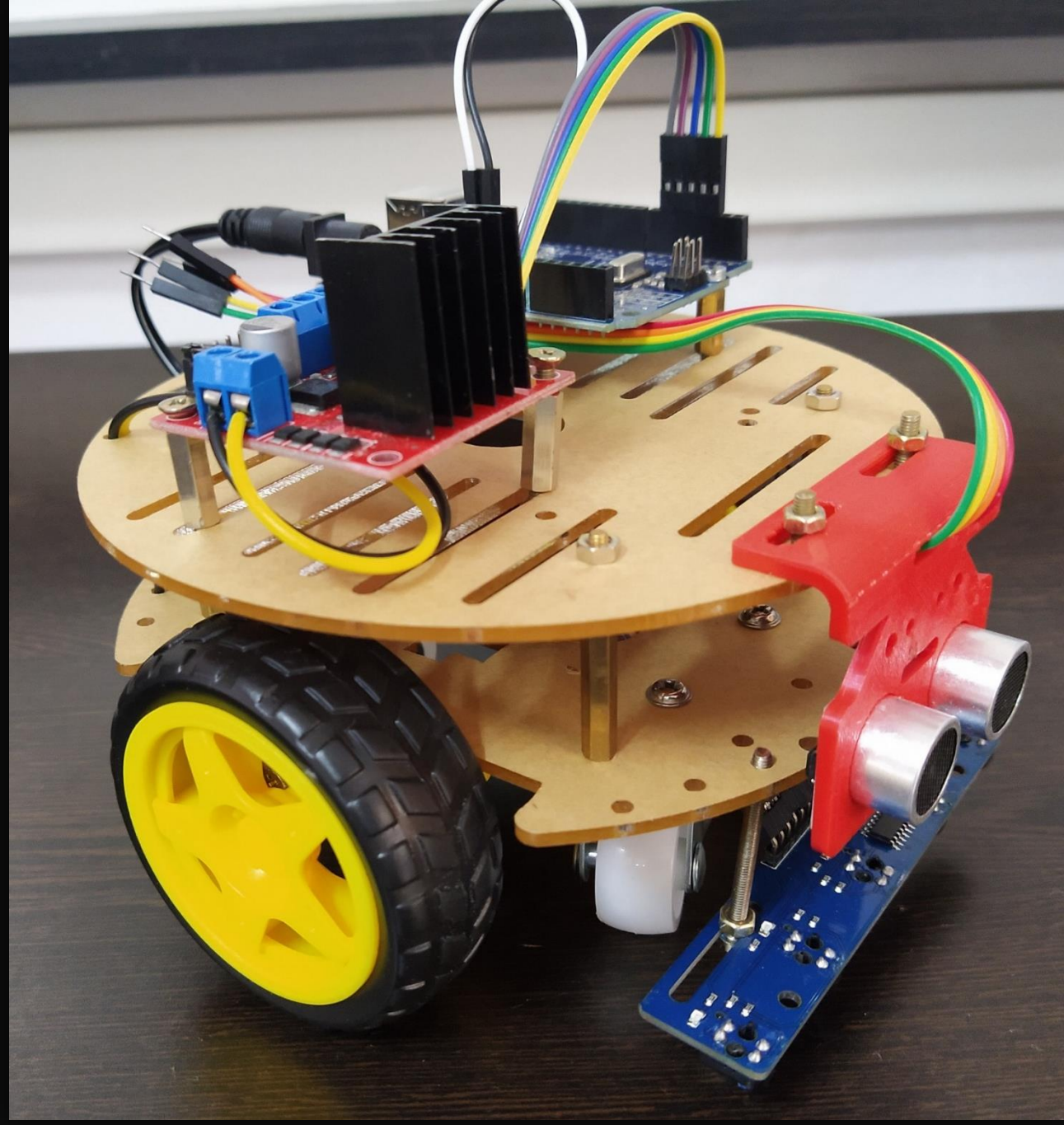
Agenda – Day 2

- Line follower Robot
  - What's line follower robot
  - Working principle
  - Components
  - Schematic and connection
  - Let's code the line following robot
- Obstacle avoidance robot
  - What's Obstacle avoidance robot
  - Working principle
  - Components
  - Schematic and connection
  - Let's code the Obstacle avoidance robot



Thursday, November 25, 2021

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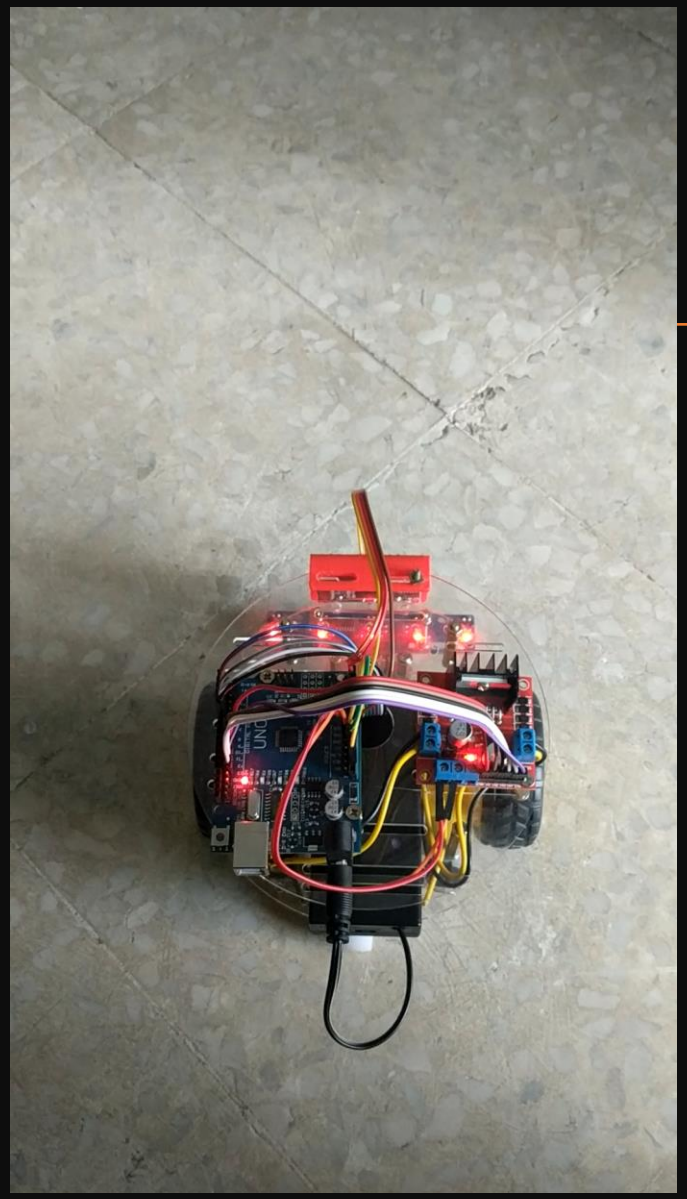
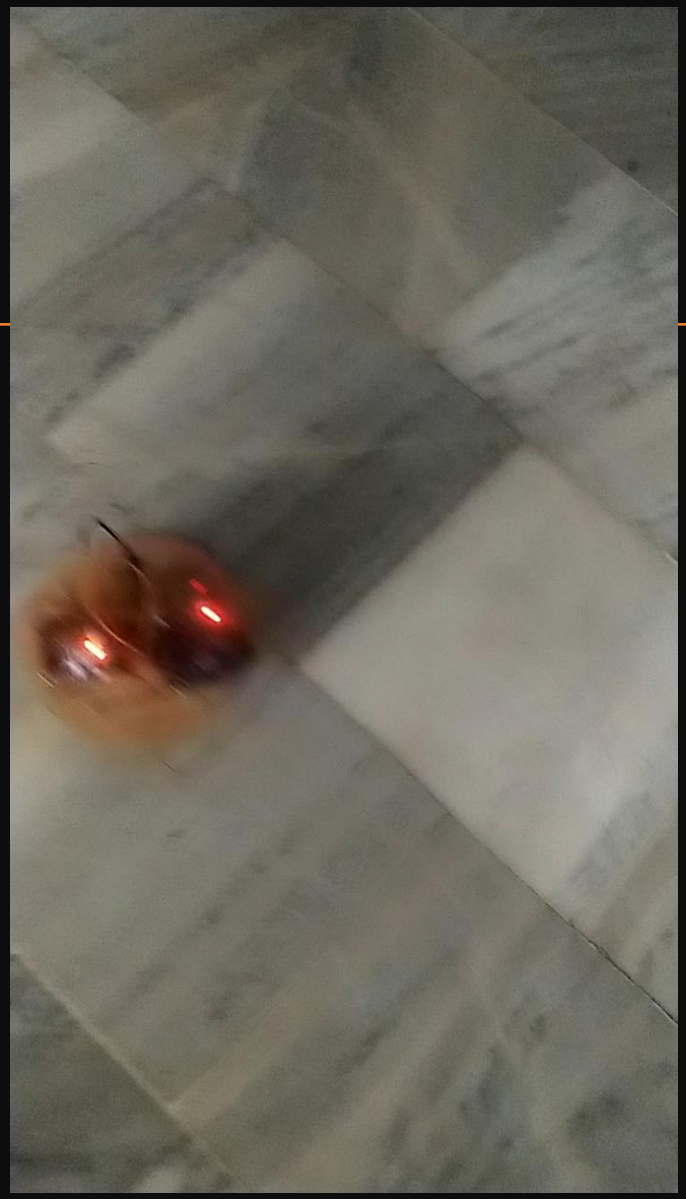
Assignment-1 Videos

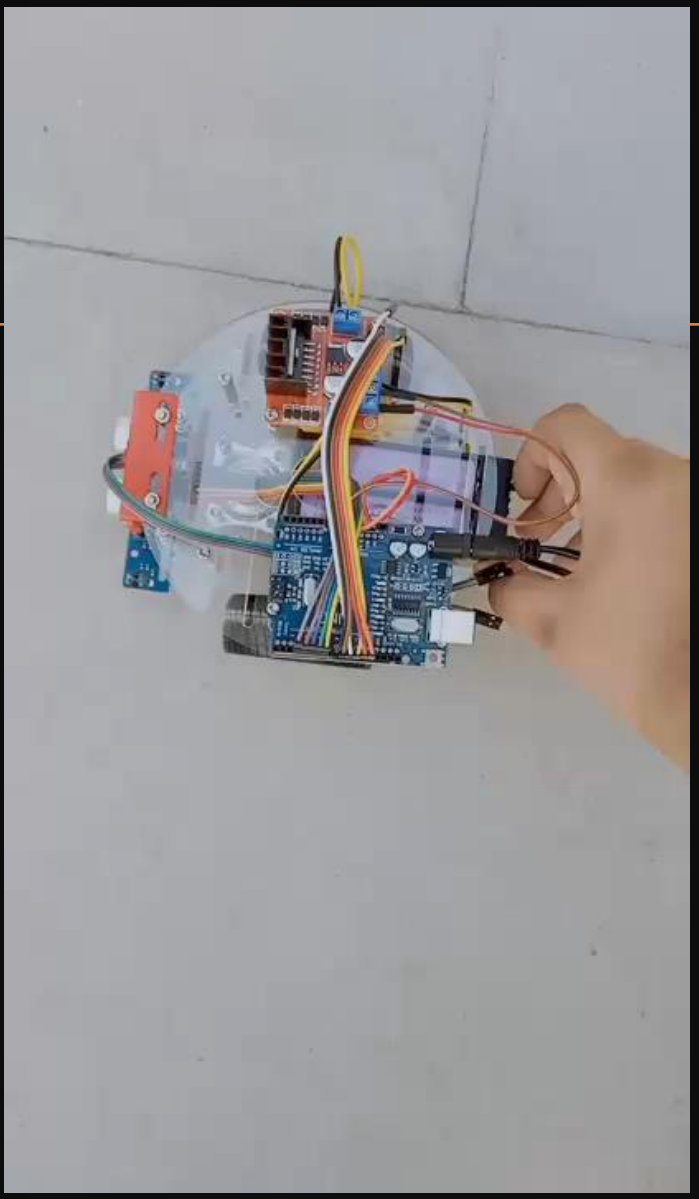
Adi Singh



Akashita



Harmanjot Singh



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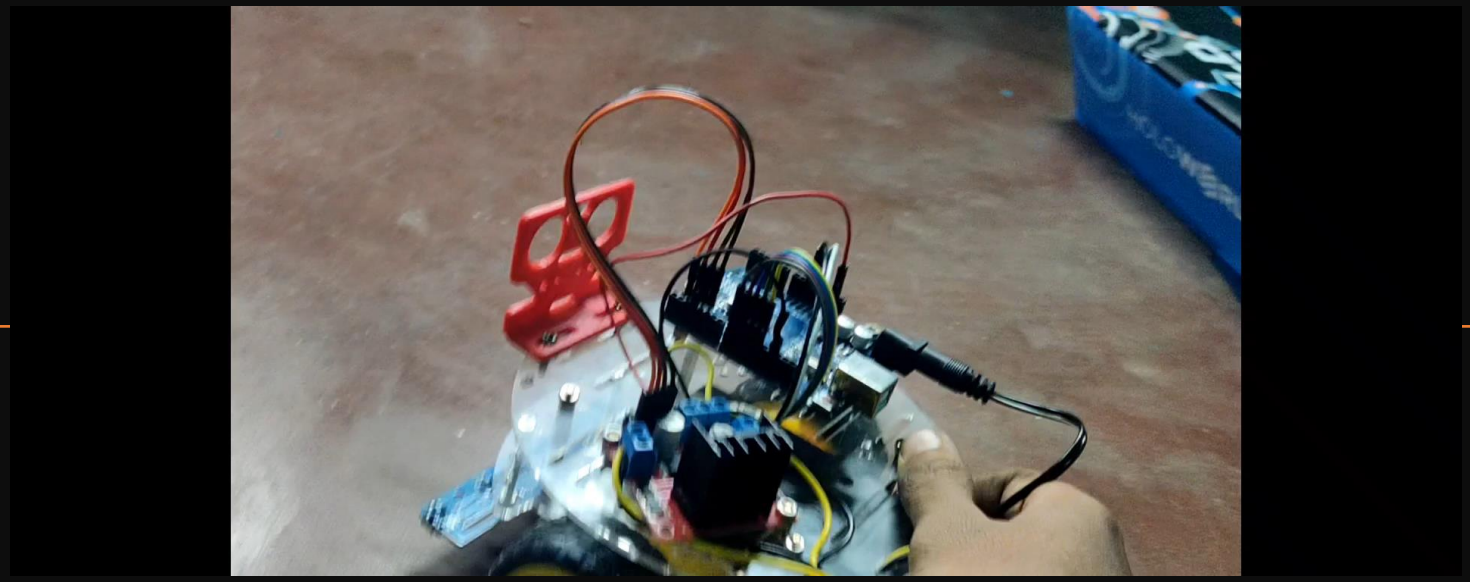
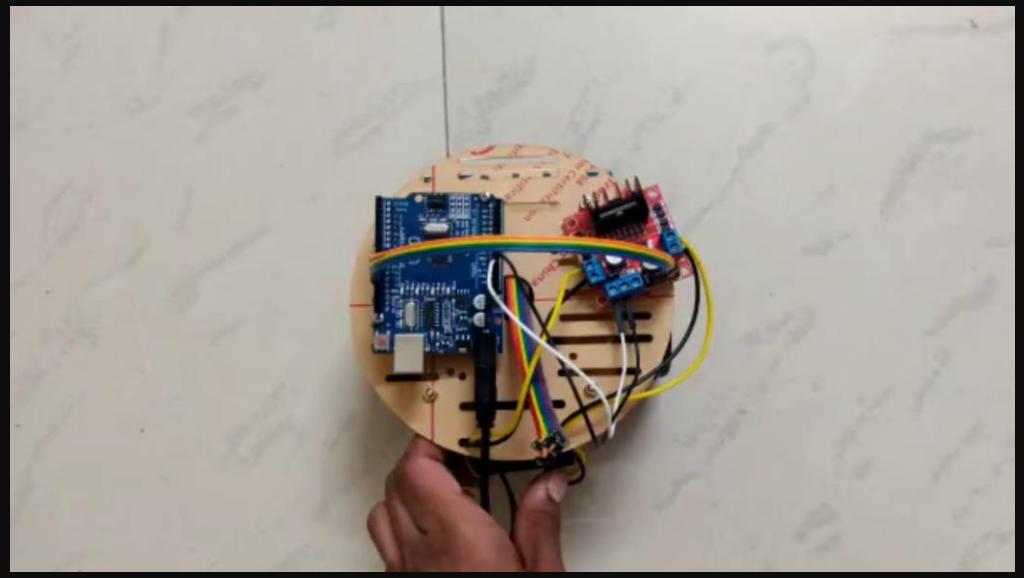
Assignment-1 Videos

Yogendra Prasad Yadav

Nilay Banerjee



Preetham Sivalingam



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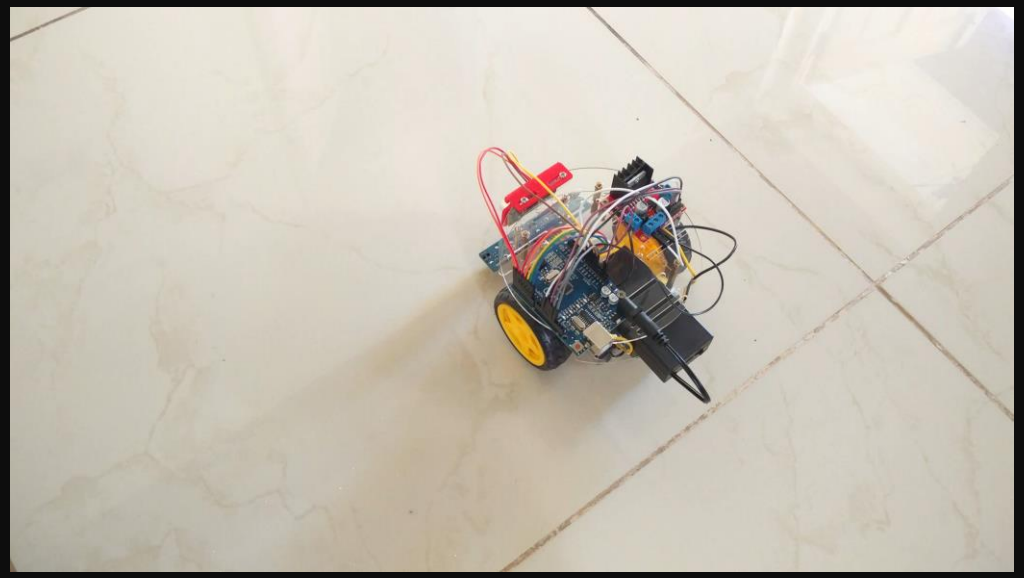
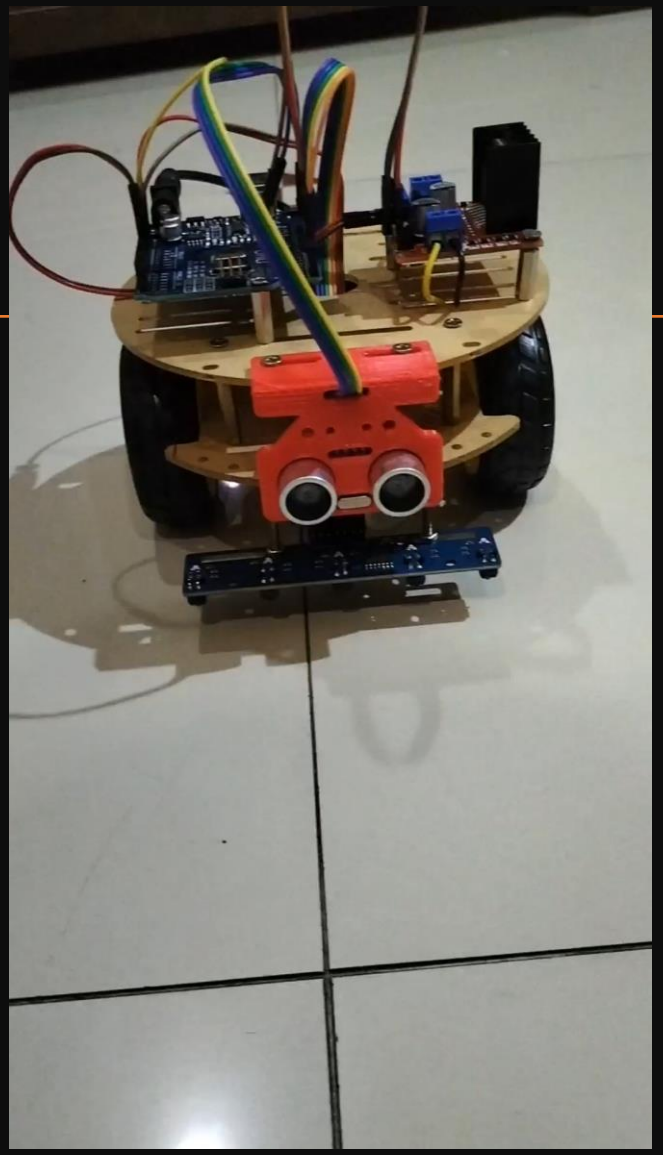
Assignment-1 Videos

Robin Bijo



sree charan

Sahil Patil



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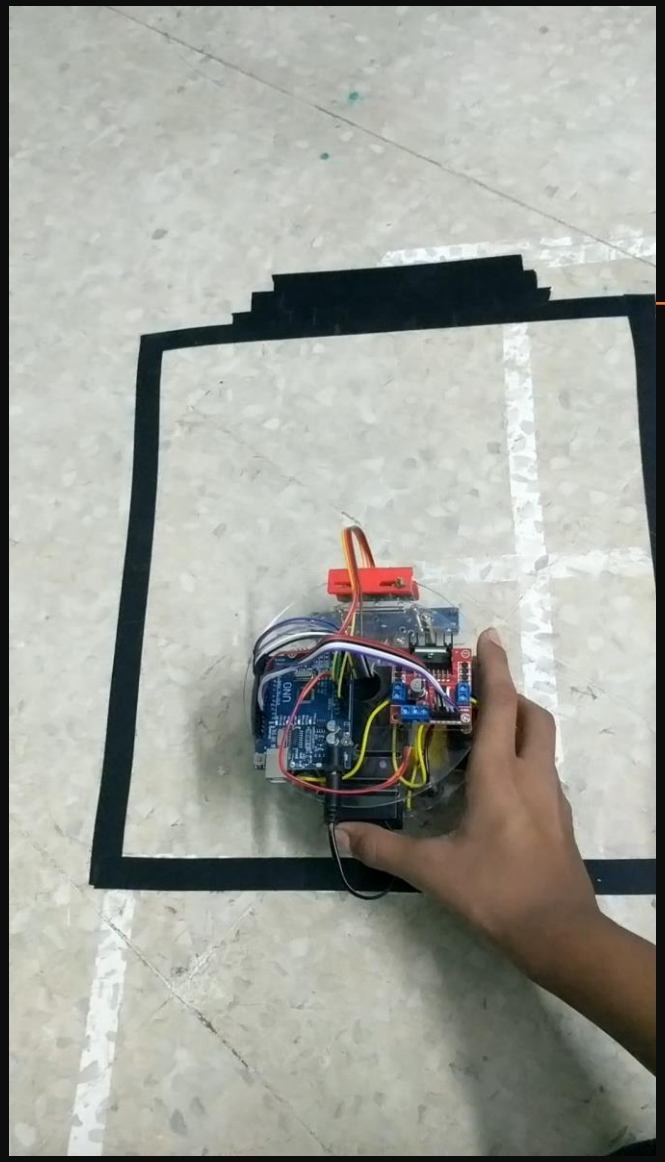
Assignment-2 Videos

Adi Singh



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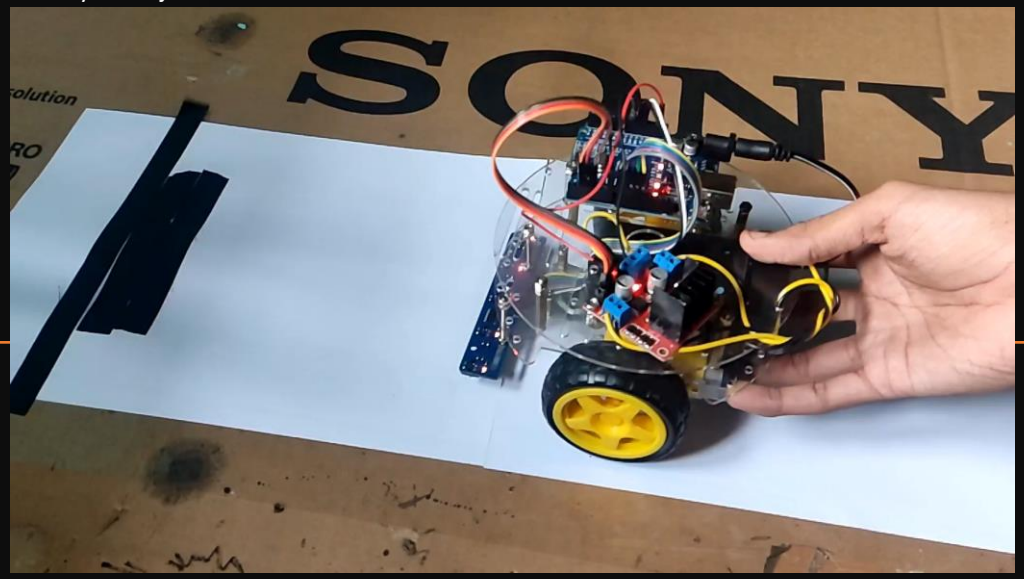

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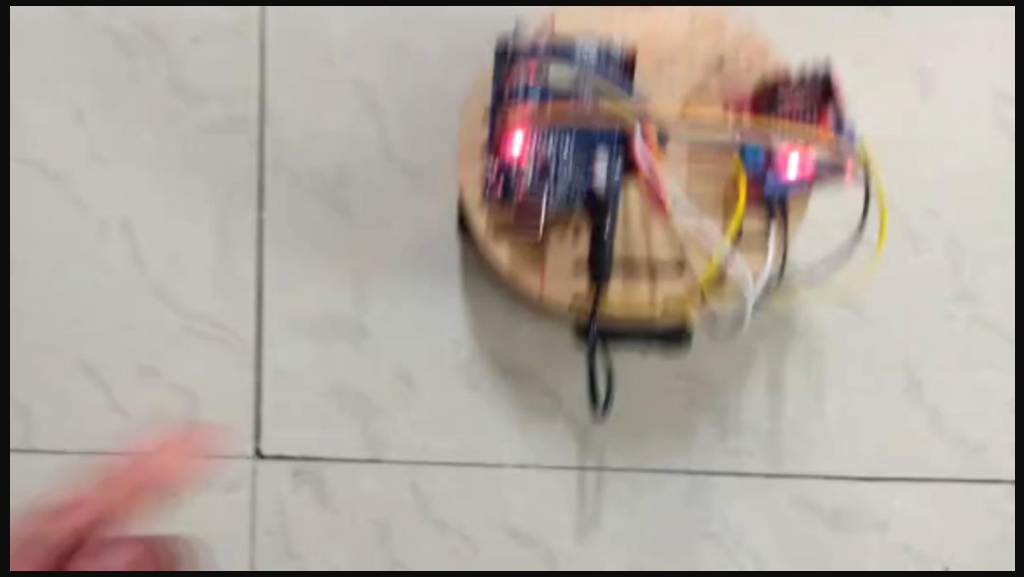

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Assignment-2 Videos

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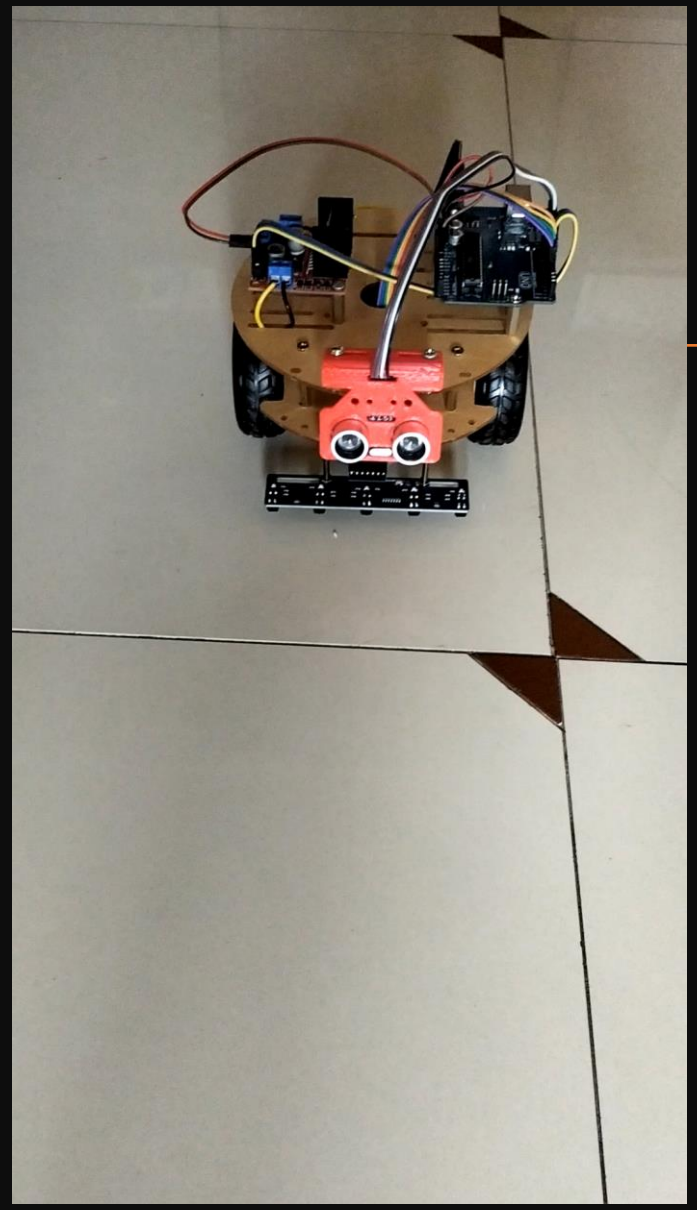
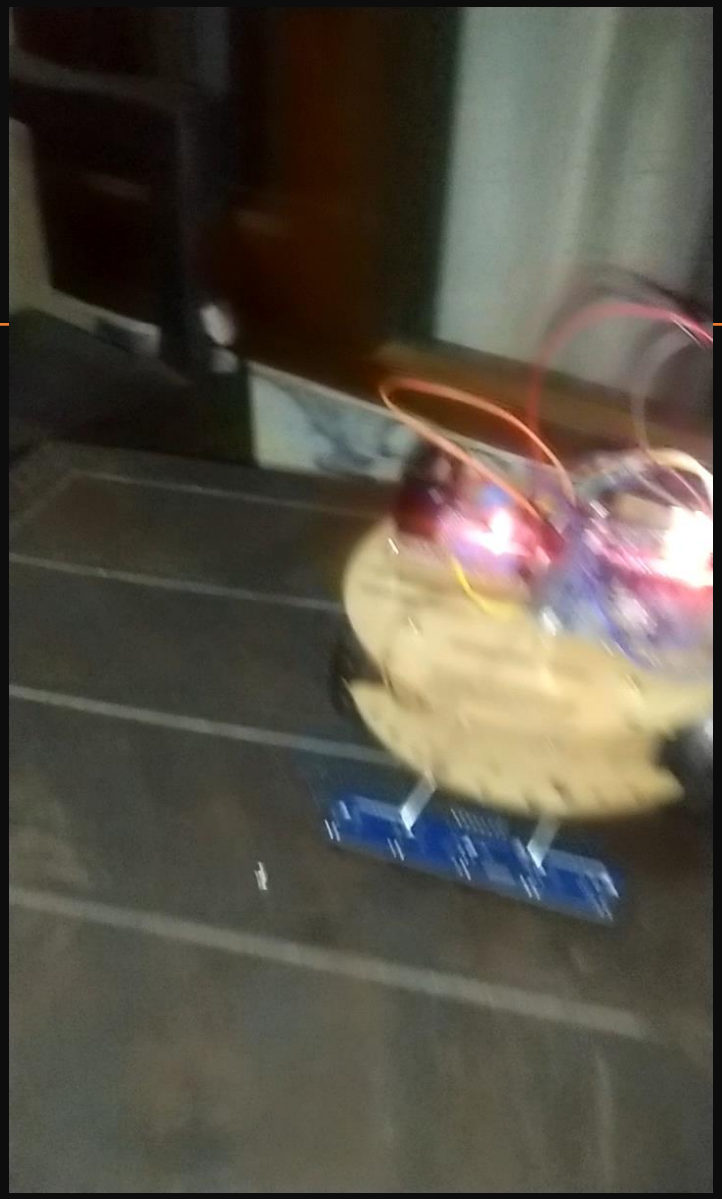
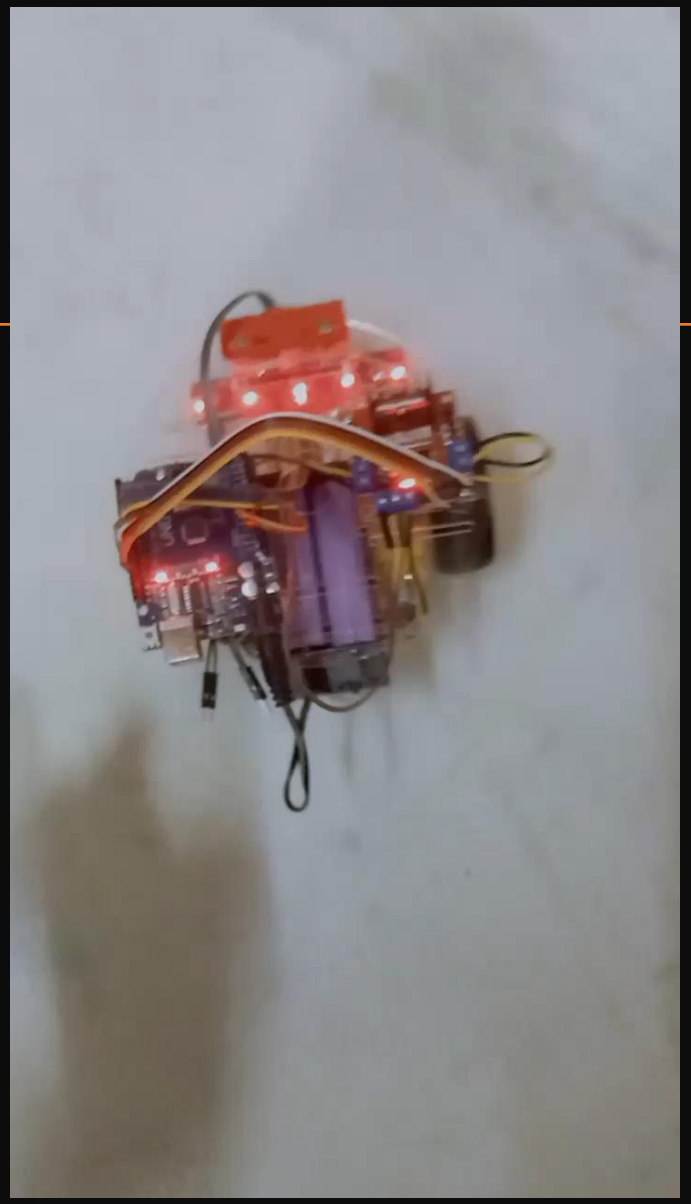


Akashita



Harmanjot Singh



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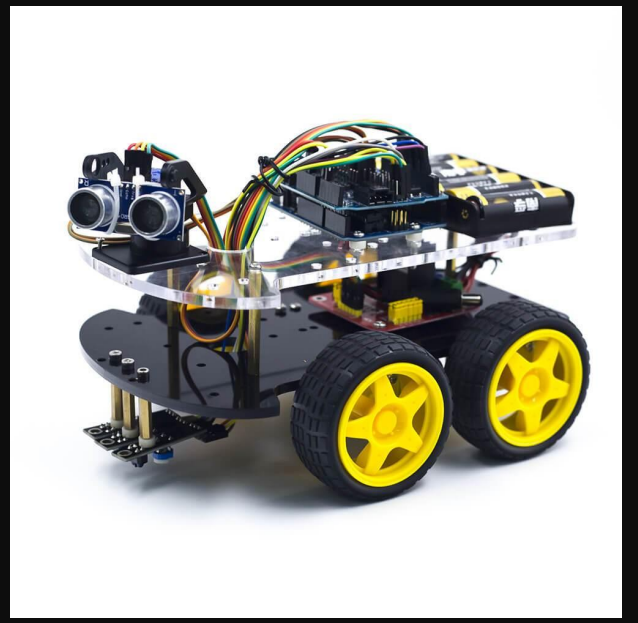
Assignment-2 Videos

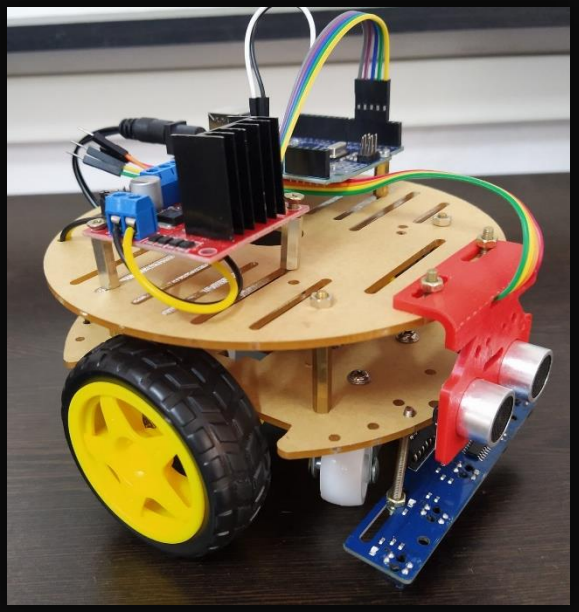
sree charan

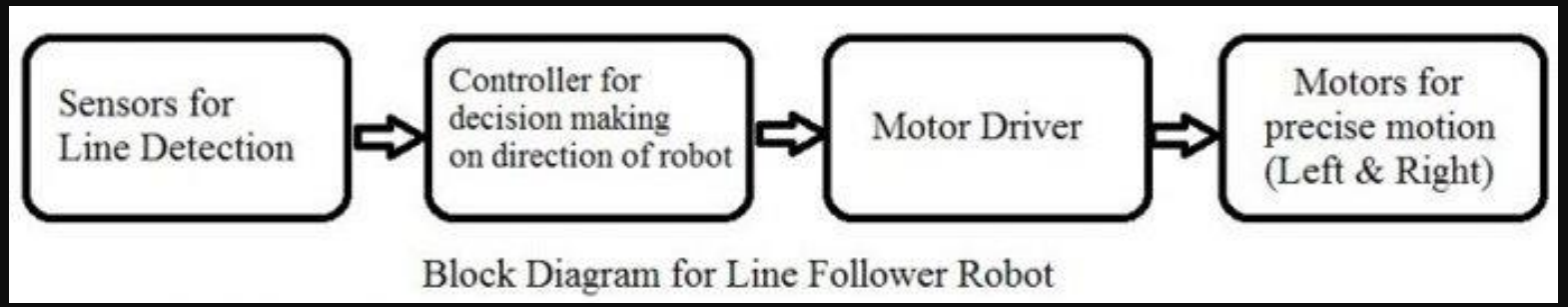
Robin Bijo

Line Tracing 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







Block Diagram for Line Follower Robot

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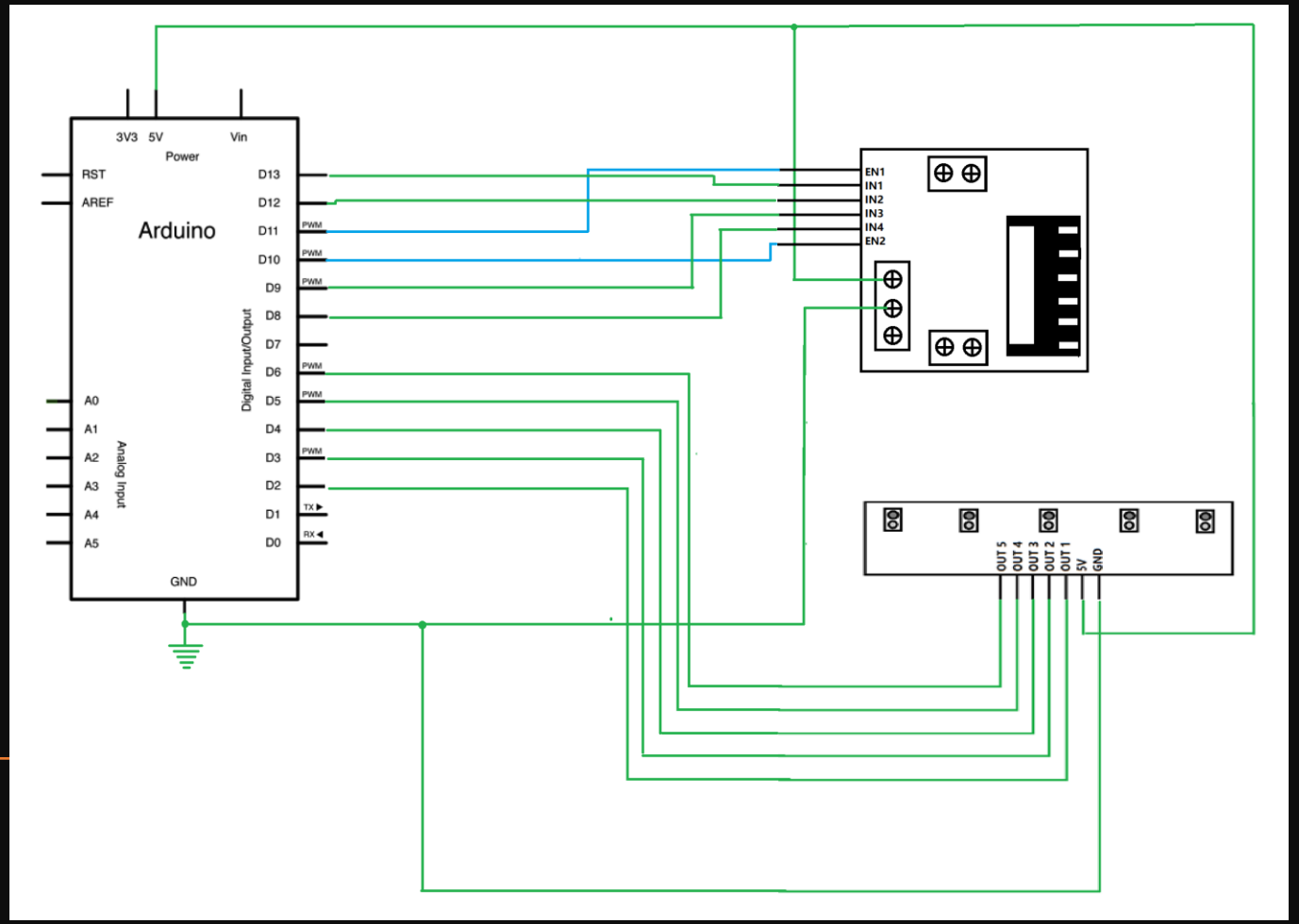
Line following robot



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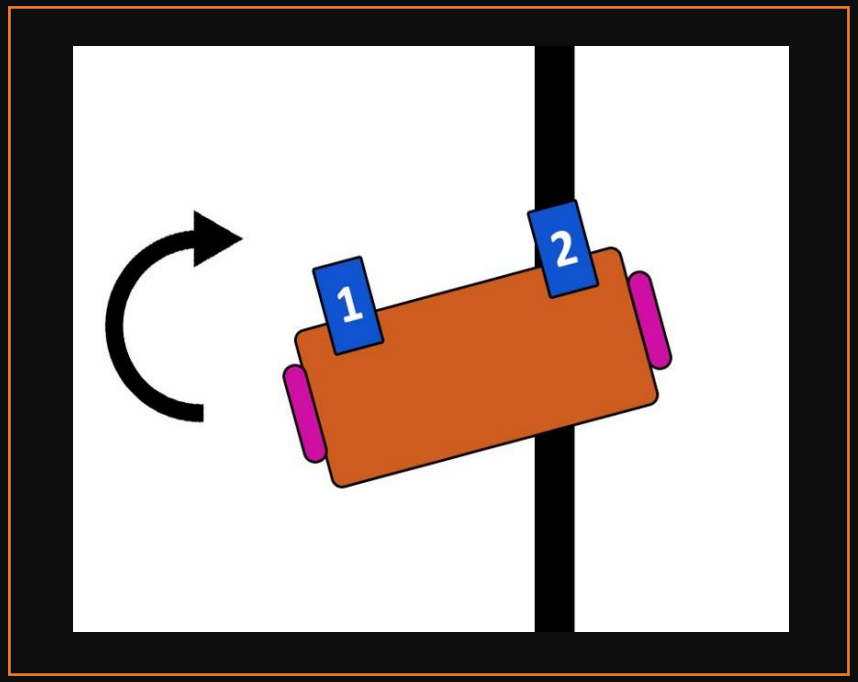
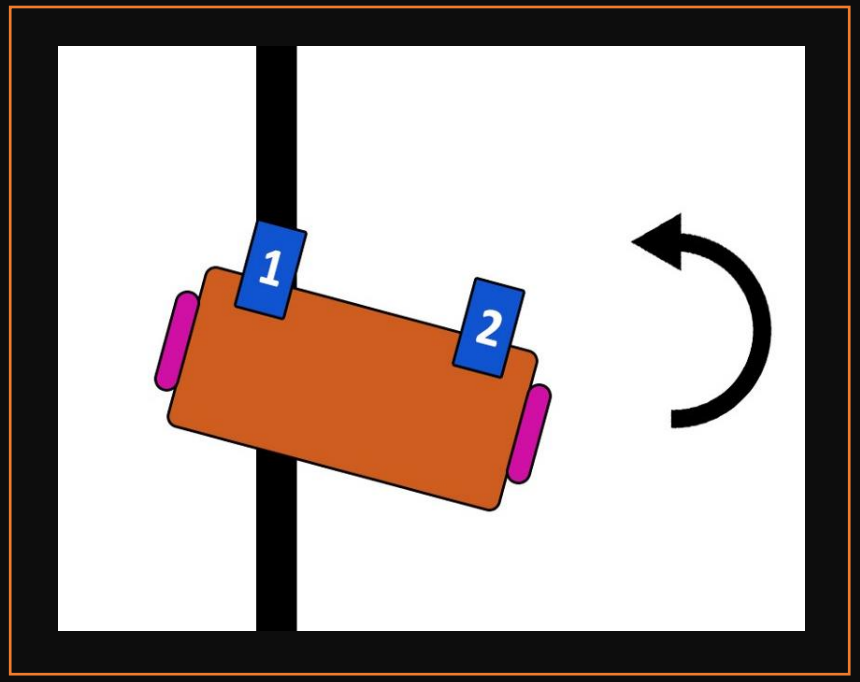
CASE 1

- In this case, only the right sensor (Sensor 2) or the left sensor (Sensor 1) detects a line they detect black color.
- If only the right sensor detects a black line, then the robot must steer right to follow the line. Alternatively, if only the left sensor detects a black line, then the robot must steer left to follow the line.





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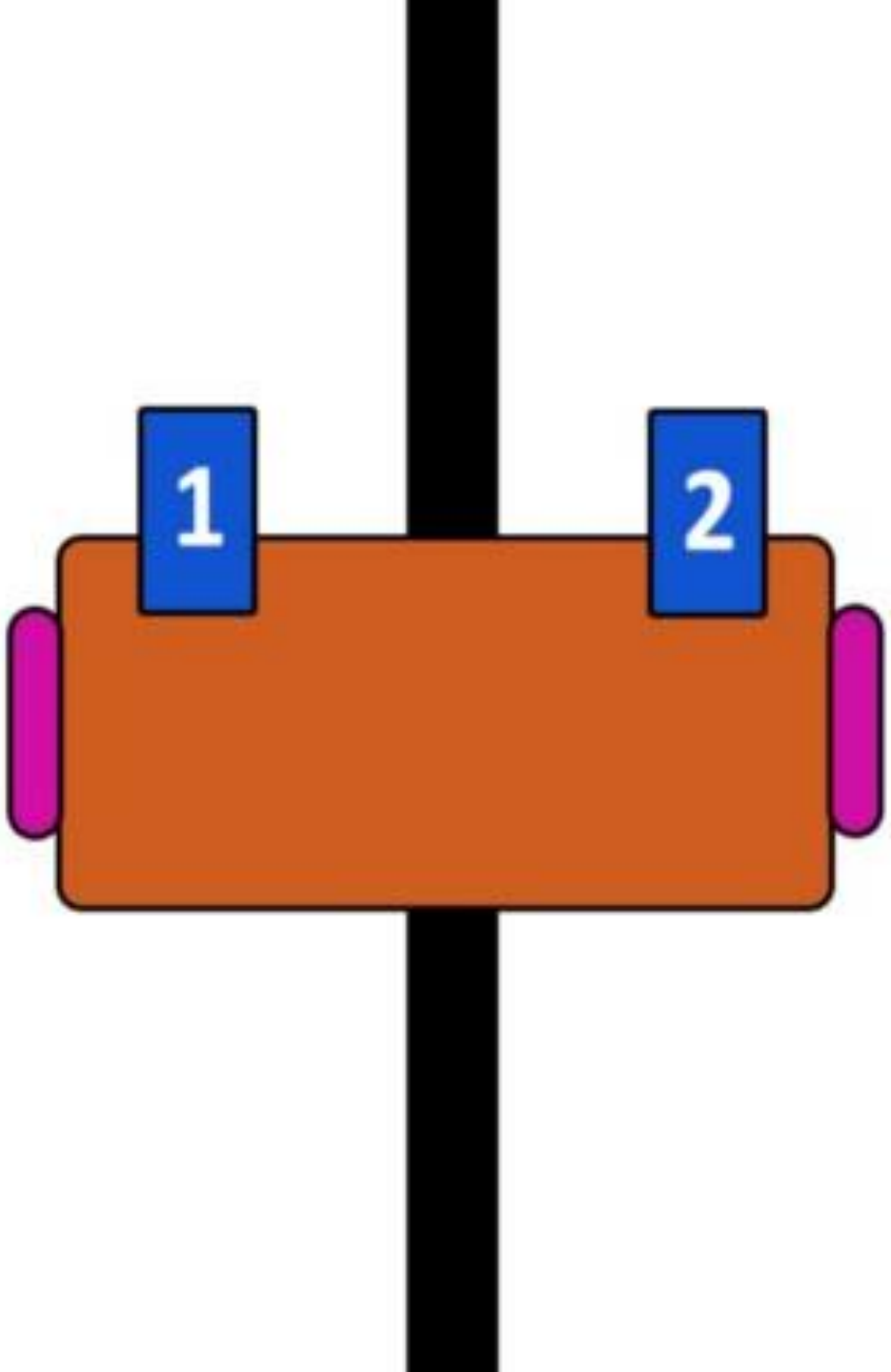
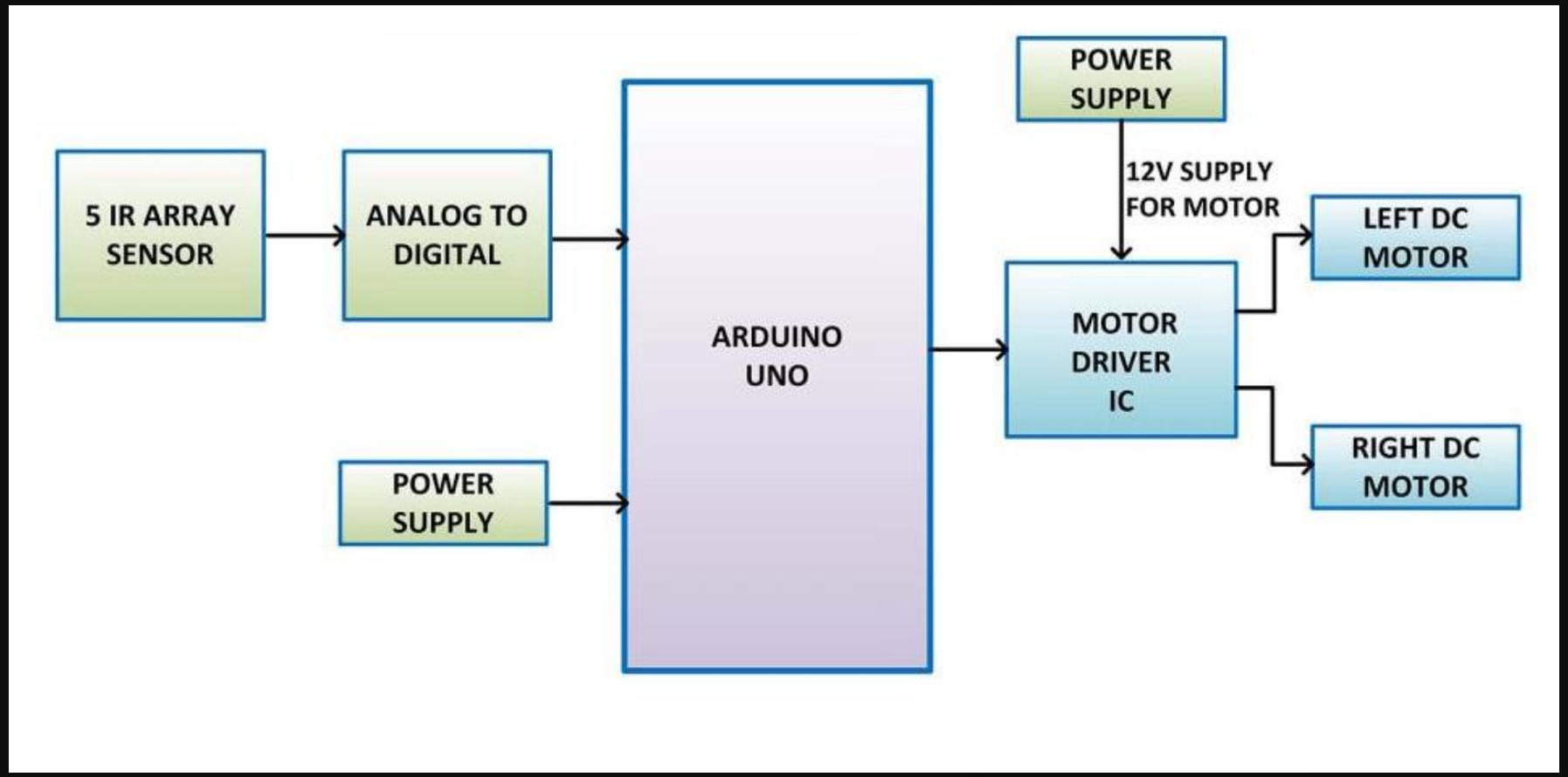
CASE 2

- In this case, both the sensors do not detect a black line, so the robot should keep moving forward in the same direction and maintain its current journey path.

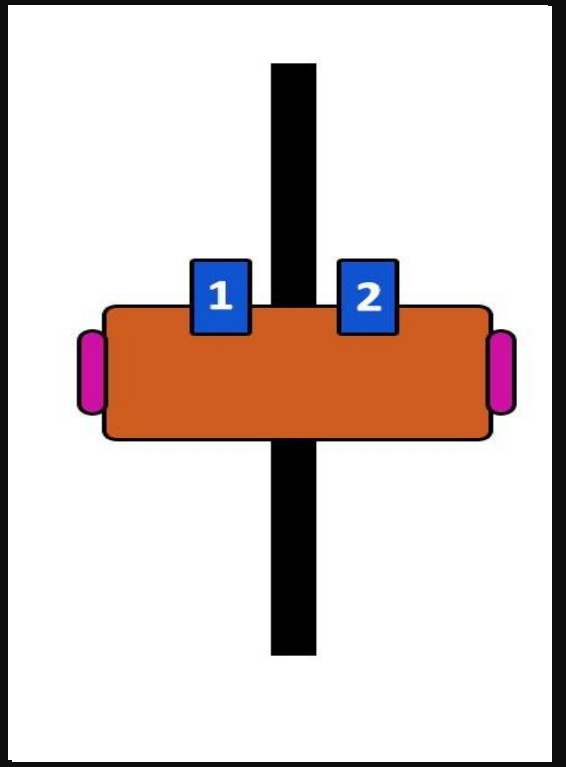


Block diagram - Line following robot



Adjust the distance between the sensors

- Generally, the robots start to tumble more as we try to increase the distance or the gap between the two sensors due to the harsh steering of the robots left and right as soon as one of the sensors encounter a black line.
- Furthermore, if the sensors are placed too close to each other, then the movement of the robot becomes very stiff and rigid as the robot is continuously taking minute left and right turns and trying very bitterly to follow the line.
- So, through thorough hit and trial, we should be able to find the right distance between the sensors to maintain the balance between the overall stability of the robot and the rigidity in movement.



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Robot Steering Technique

- In this case, only the right sensor (Sensor 2) or the left sensor (Sensor 1) detects a line they detect black color.
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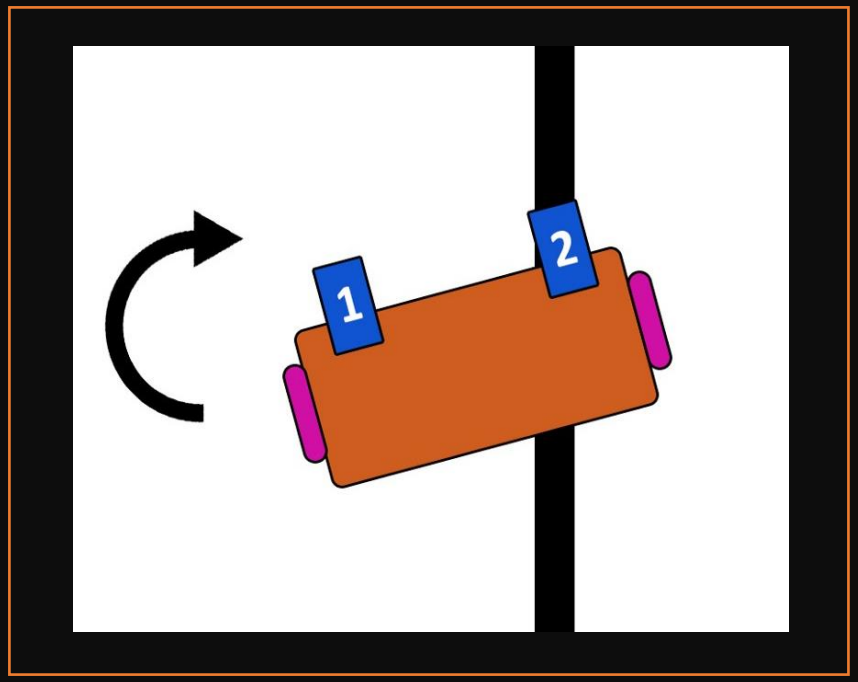

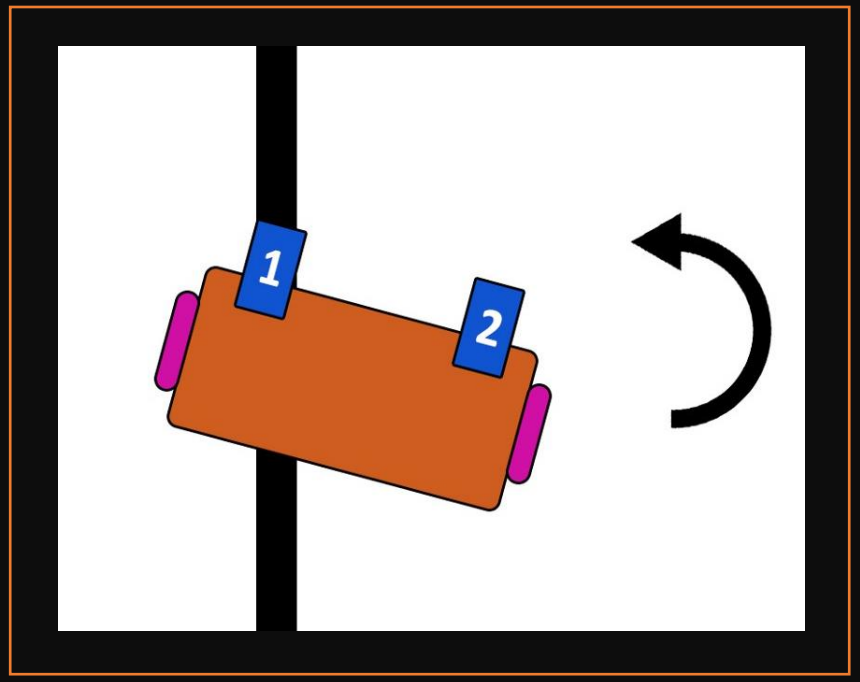

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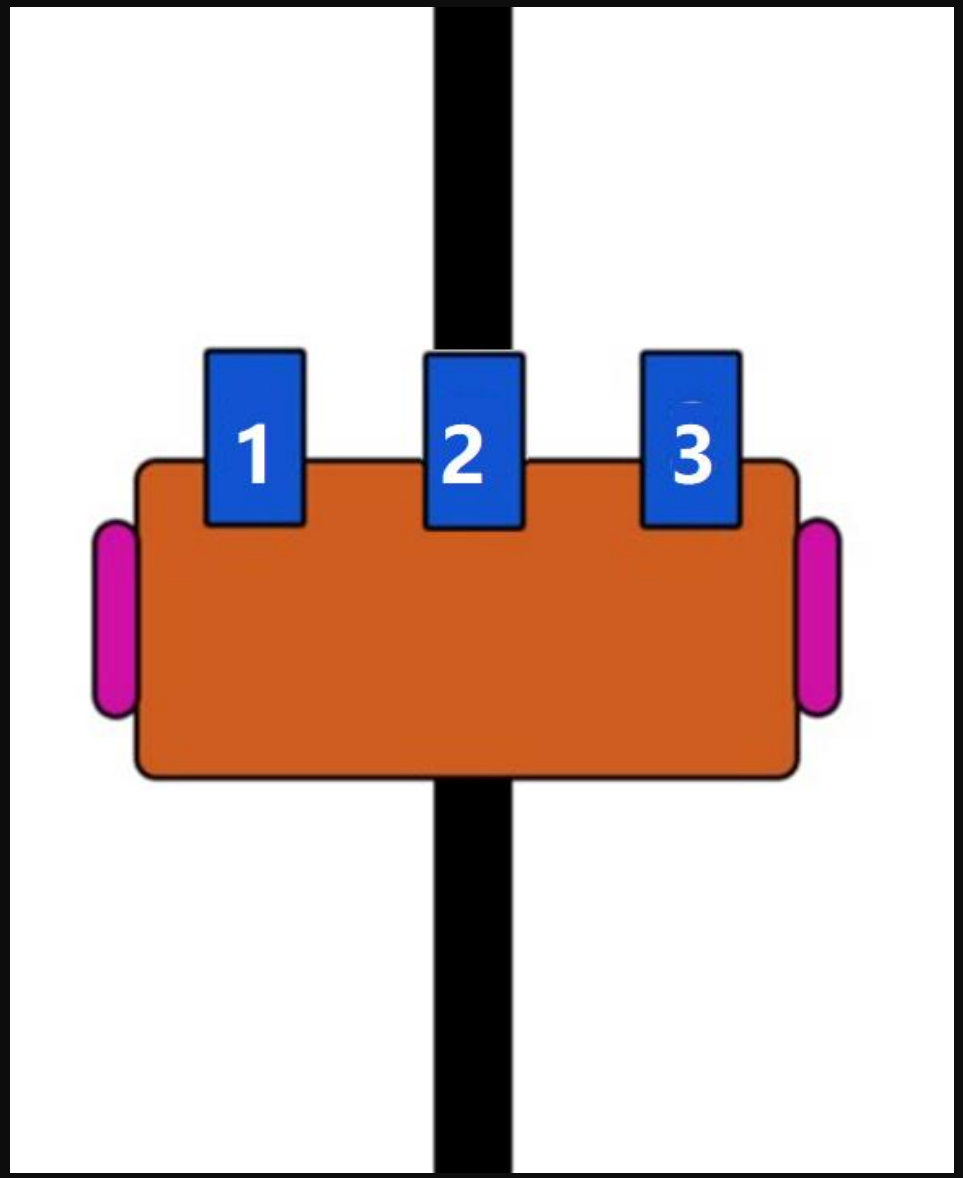

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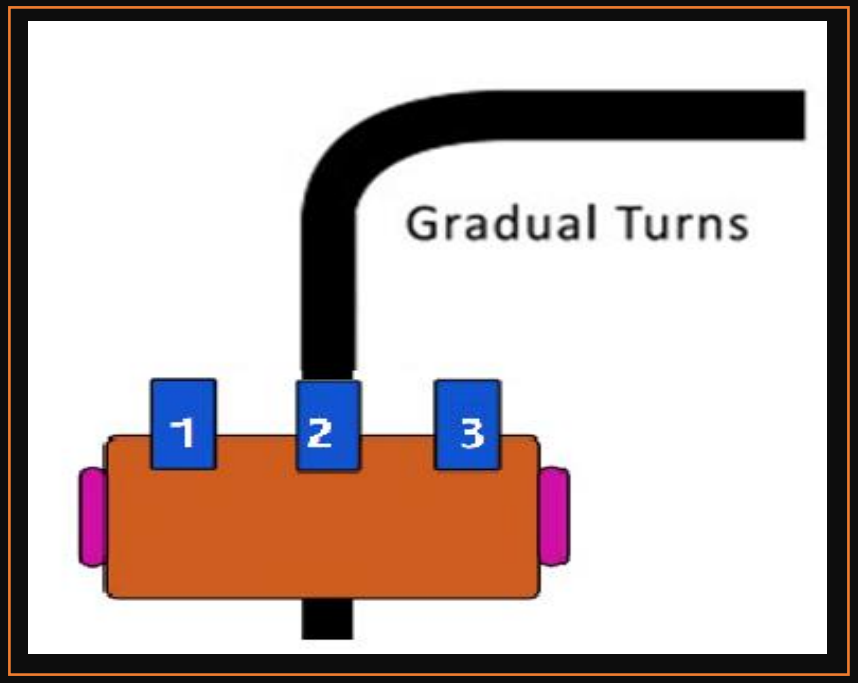
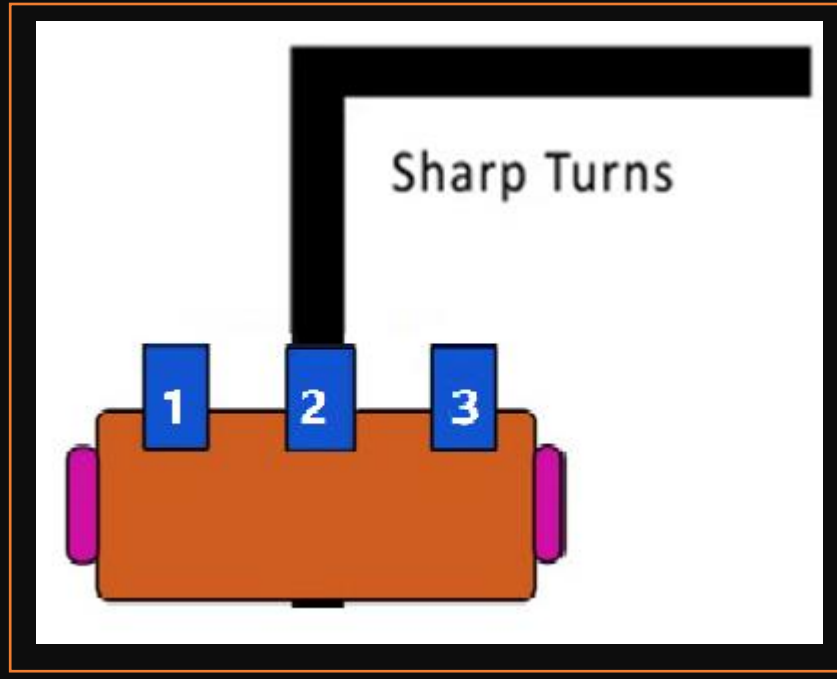
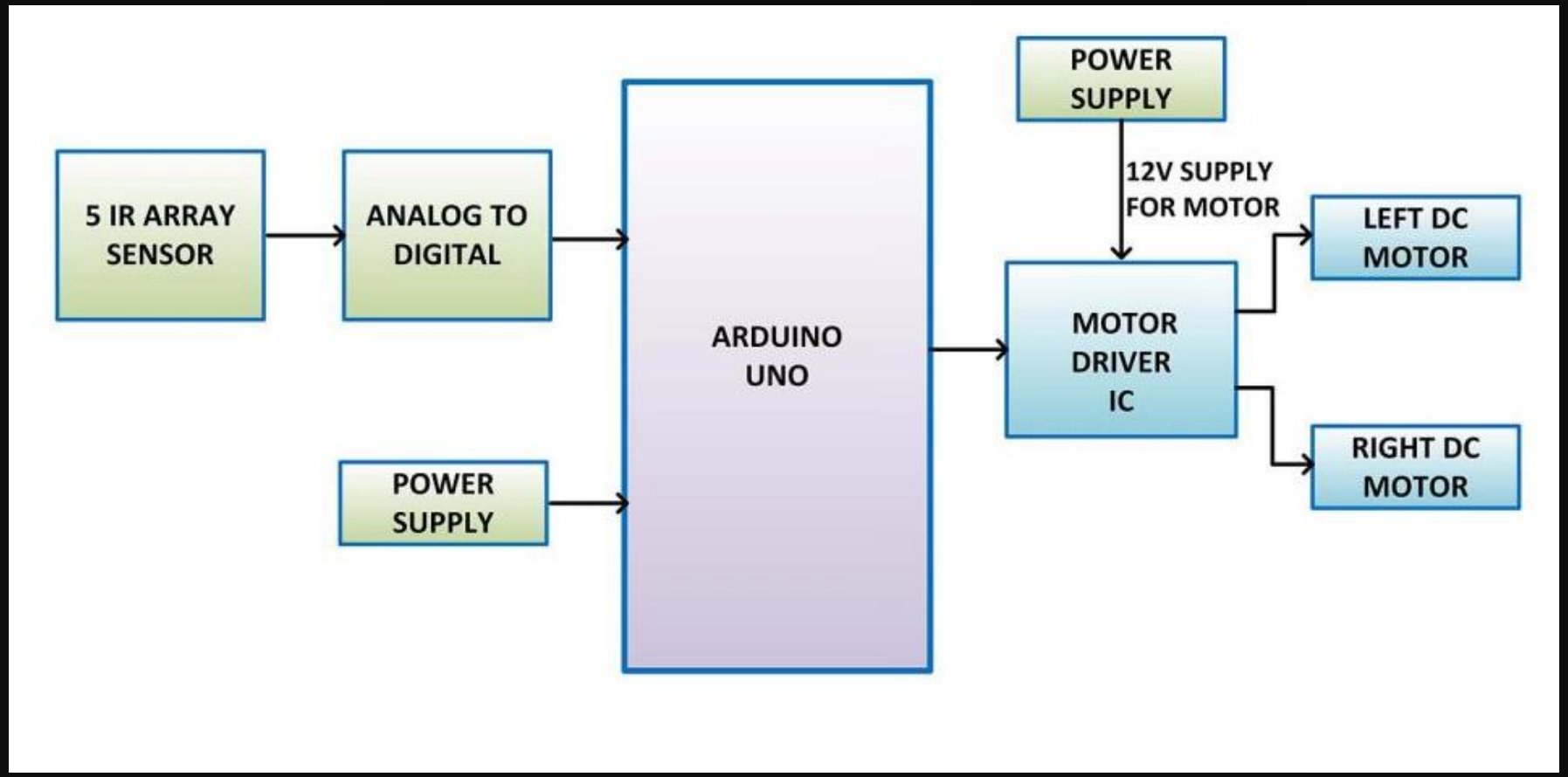
Robot Steering Technique

- Robot steering generally has two techniques — Either turn one motor OFF and turn the other motor ON to steer the robot left or right, or, run both the motors in opposite directions to take a turn. The latter usually results in more steeper turns.
- As a general rule of thumb, if the expected line following path is smooth and does not contain a lot of steep turns, then it is better to turn only using one motor. But rough line paths demand more precise turning, so, both the motors should be used to turn the robot in such cases.





Block diagram - Line following robot



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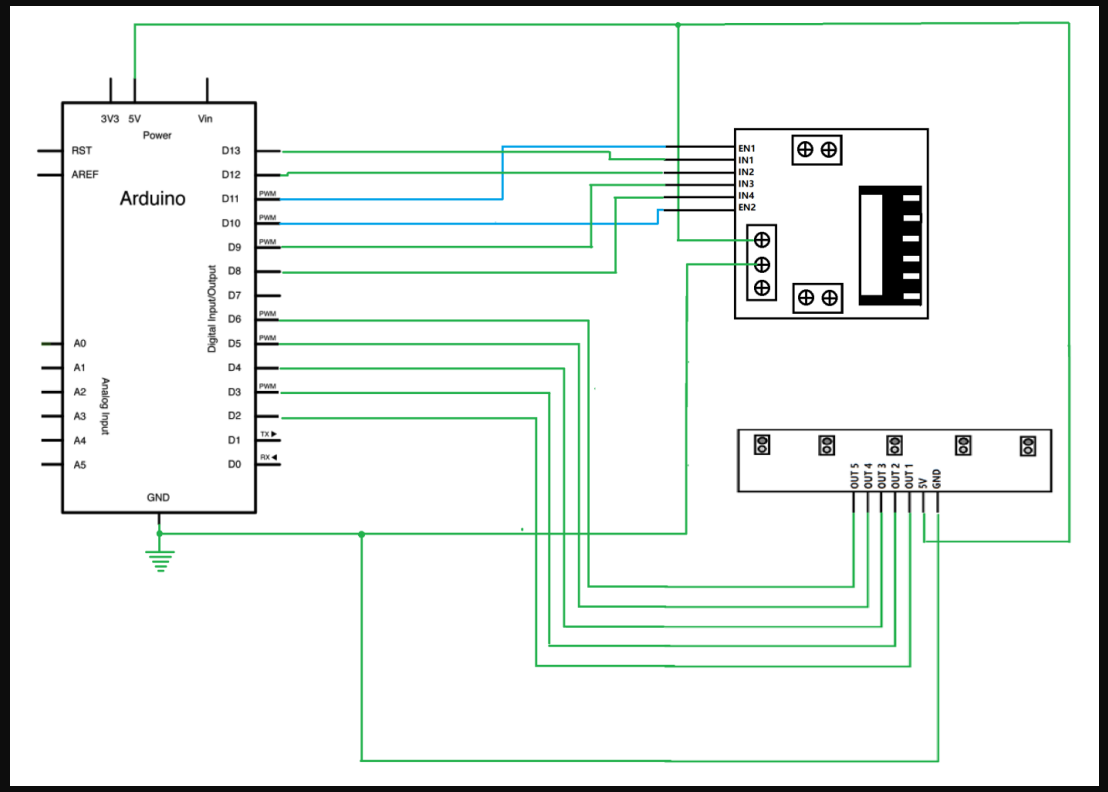
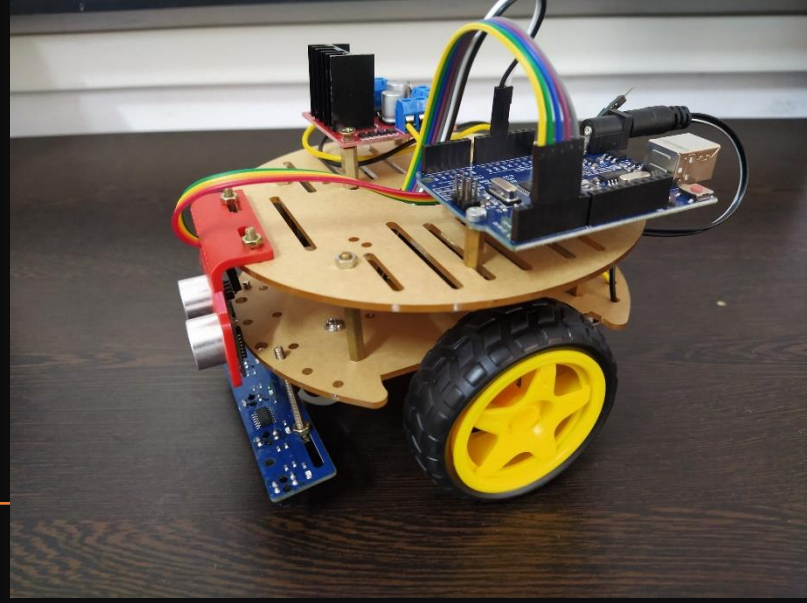
Schematic & circuit connections





Battery positive	Arduino Vin
Battery negative	Arduino GND
Motor driver 12v pin	VCC or battery positive
Motor driver GND	Arduino GND
Motor 1 A and B	Motor driver A1 B1
Motor 2 A and B	Motor driver A2 B2
Arduino – D8 D9 D12 D13	Motor driver IN1,IN2,IN3,IN4
Arduino D10, D11	Motor Enable Pins ENA & ENB
IR sensor VCC	Arduino 5v pin
IR sensor GND	Arduino GND
IR sensor OUT1	D2
IR sensor OUT2	D4

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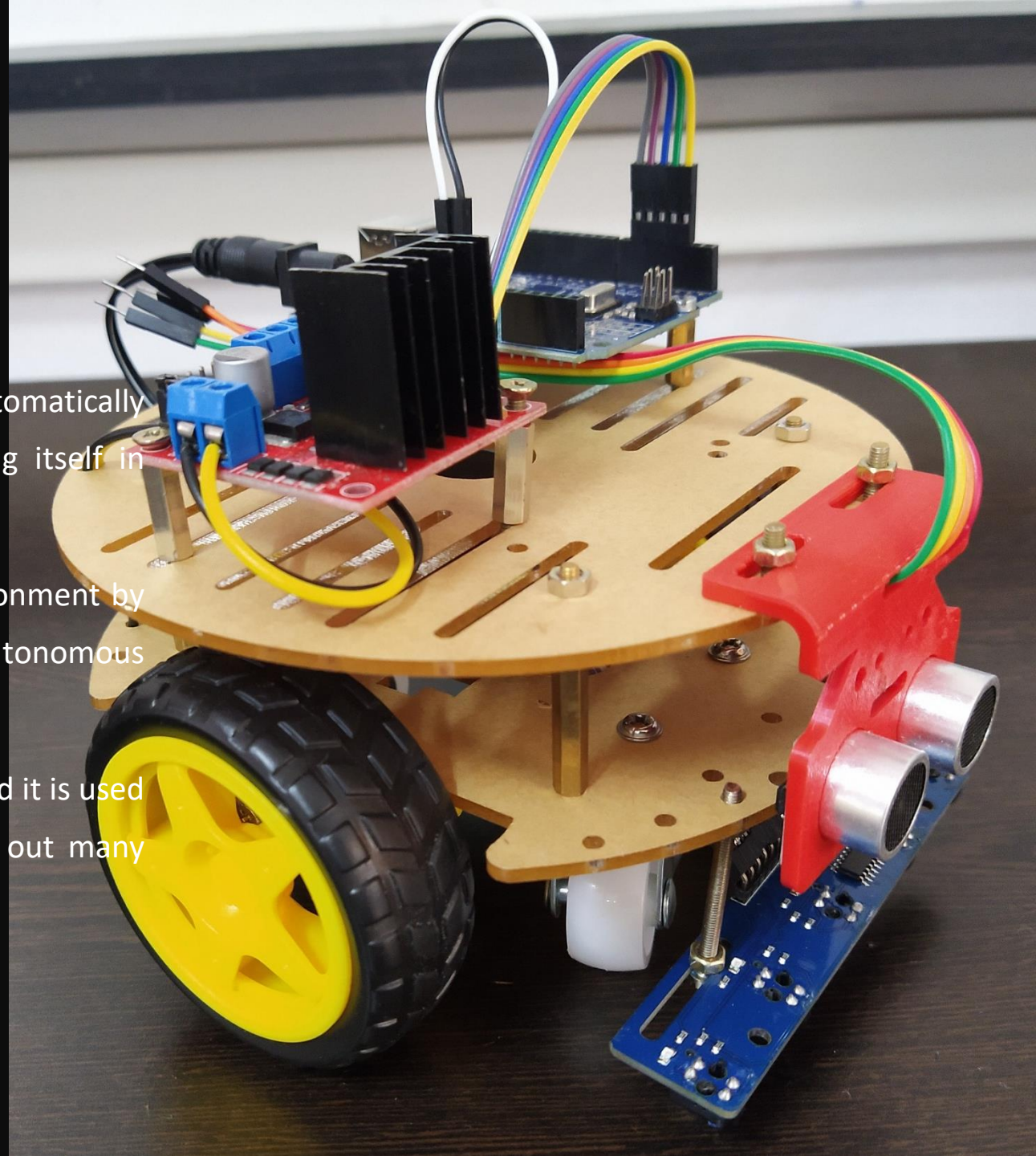
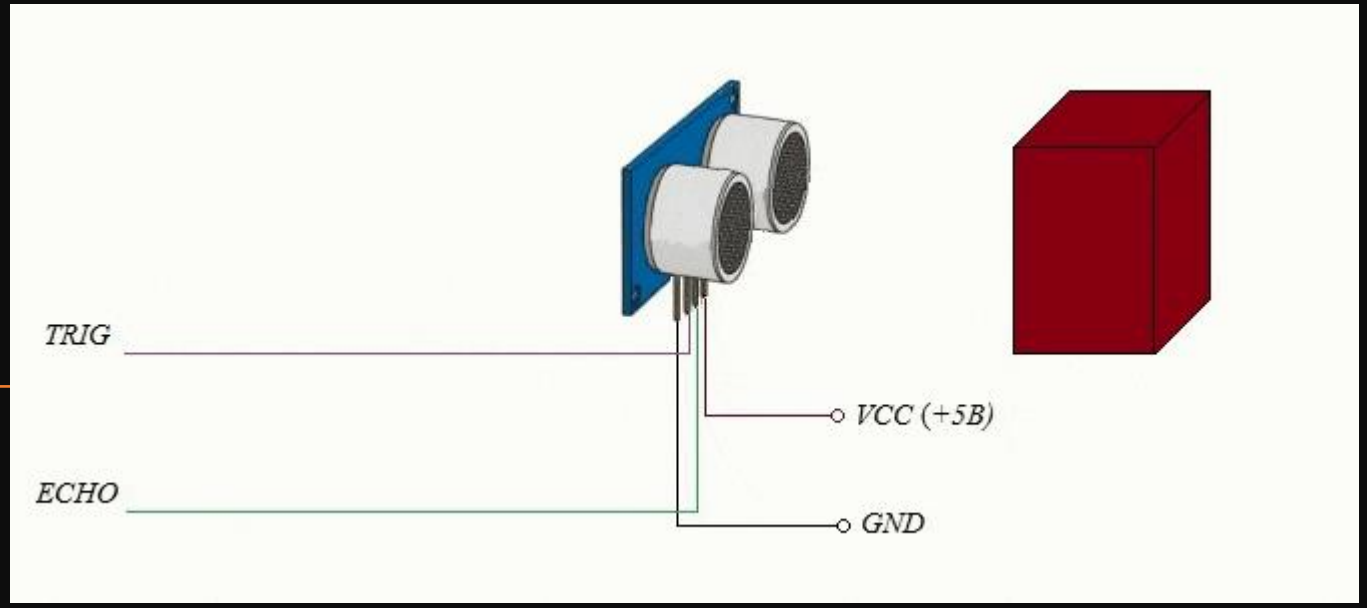
Obstacle Avoiding Robot

- Obstacle Avoiding Robot is an intelligent device that can automatically sense the obstacle in front of it and avoid them by turning itself in another direction.
- This design allows the robot to navigate in an unknown environment by avoiding collisions, which is a primary requirement for any autonomous mobile robot.
- The application of the Obstacle Avoiding robot is not limited and it is used in most of the military organizations now which helps carry out many risky jobs that cannot be done by any soldiers.



Obstacle Avoiding Robot

- Using an external trigger signal, the Trig pin on ultrasonic sensor is made logic high for at least 10µs. A sonic burst from the transmitter module is sent. This consists of 8 pulses of 40KHz.
- The signals return after hitting a surface and the receiver detects this signal. The Echo pin is high from the time of sending the signal and receiving it. This time can be converted to distance using appropriate calculations.

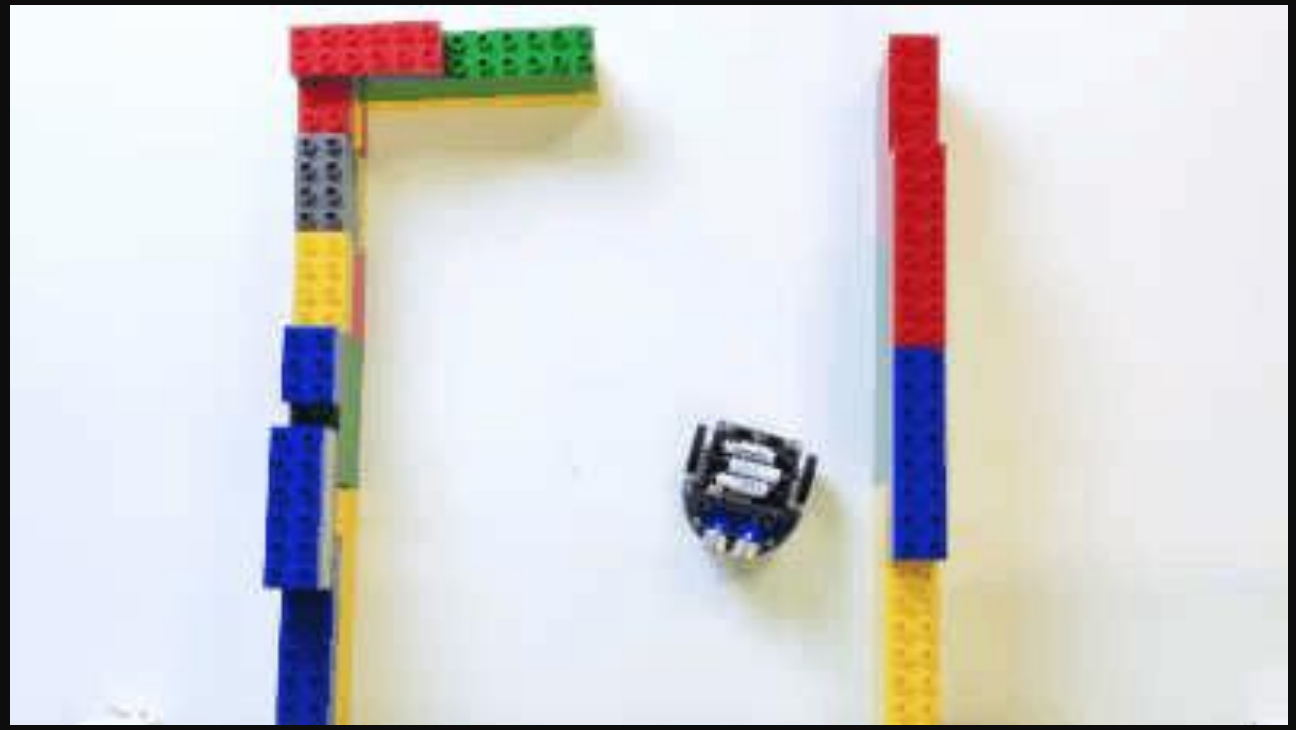


Basic principle of ultrasonic sensor working

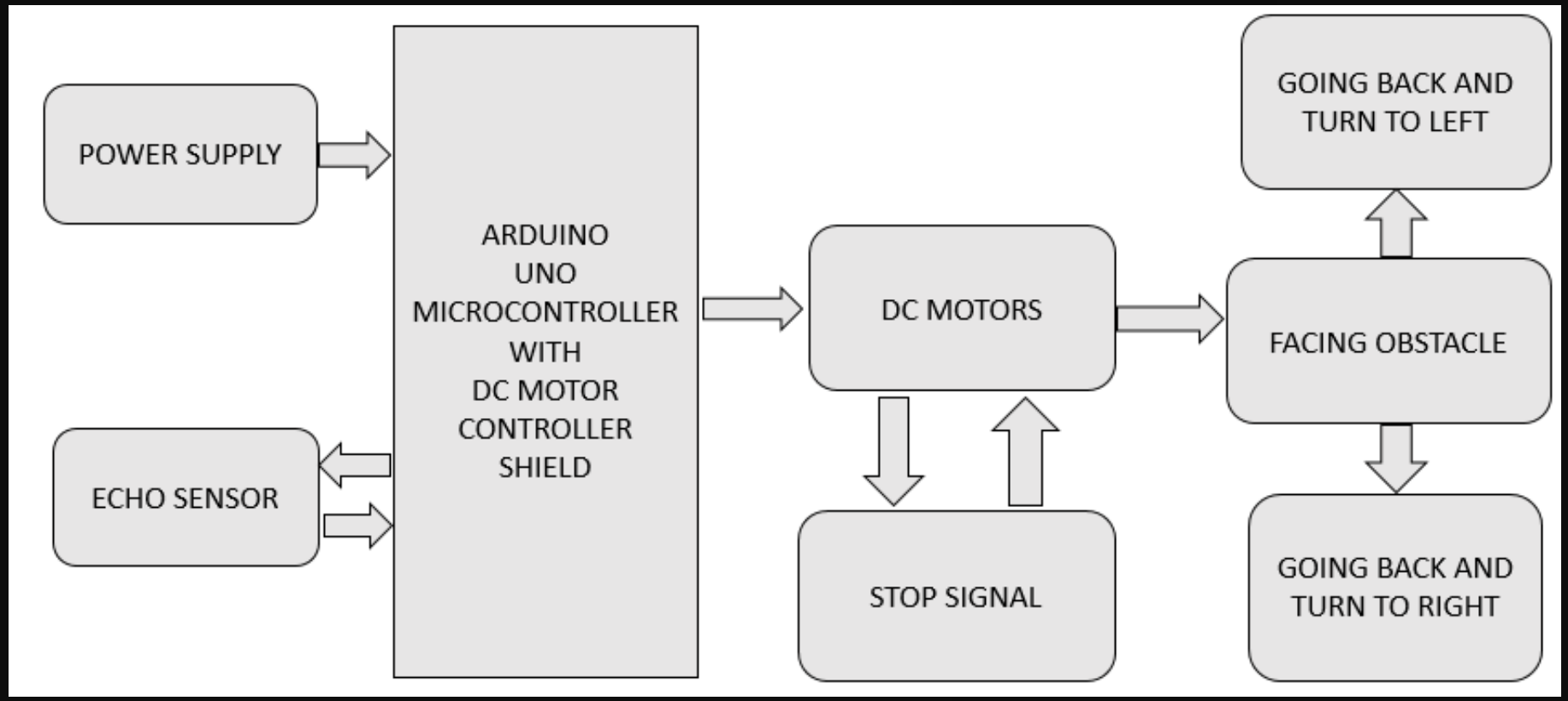
- This information is processed by the Arduino. If the distance between the robot and the obstacle is less than 15cm, the Robot stops takes the other possible path with signal from Ultrasonic Sensor.
- If the distance towards the left side is more than that of the right side, the robot will prepare for a left turn. But first, it backs up a little bit and then activates the Left Wheel Motor in reversed in direction.
- Similarly, if the right distance is more than that of the left distance, the Robot prepares right rotation. This process continues forever, and the robot keeps on moving without hitting any obstacle.

Obstacle Avoiding Robot

- When the robot is powered on, both the motors of the robot will run normally, and the robot moves forward. During this time, the ultrasonic sensor continuously calculate the distance between the robot and the reflective surface.



Block diagram - Line following robot



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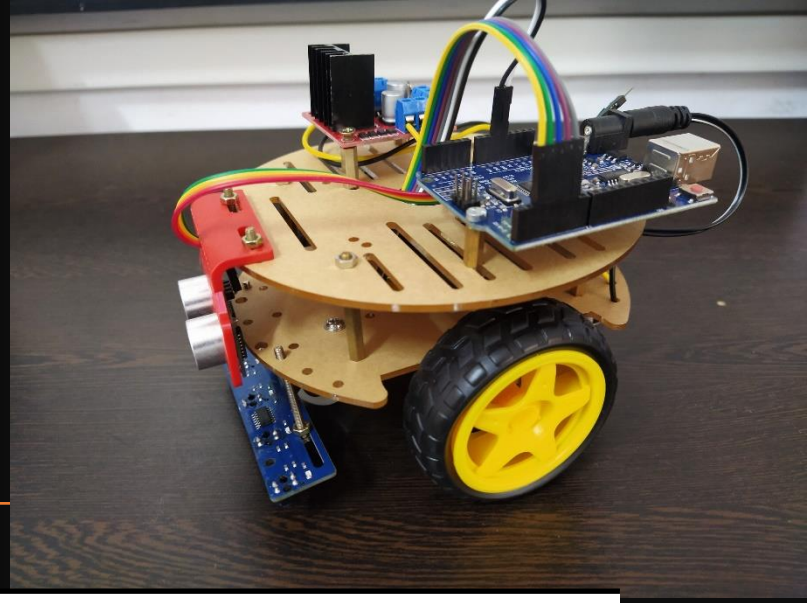
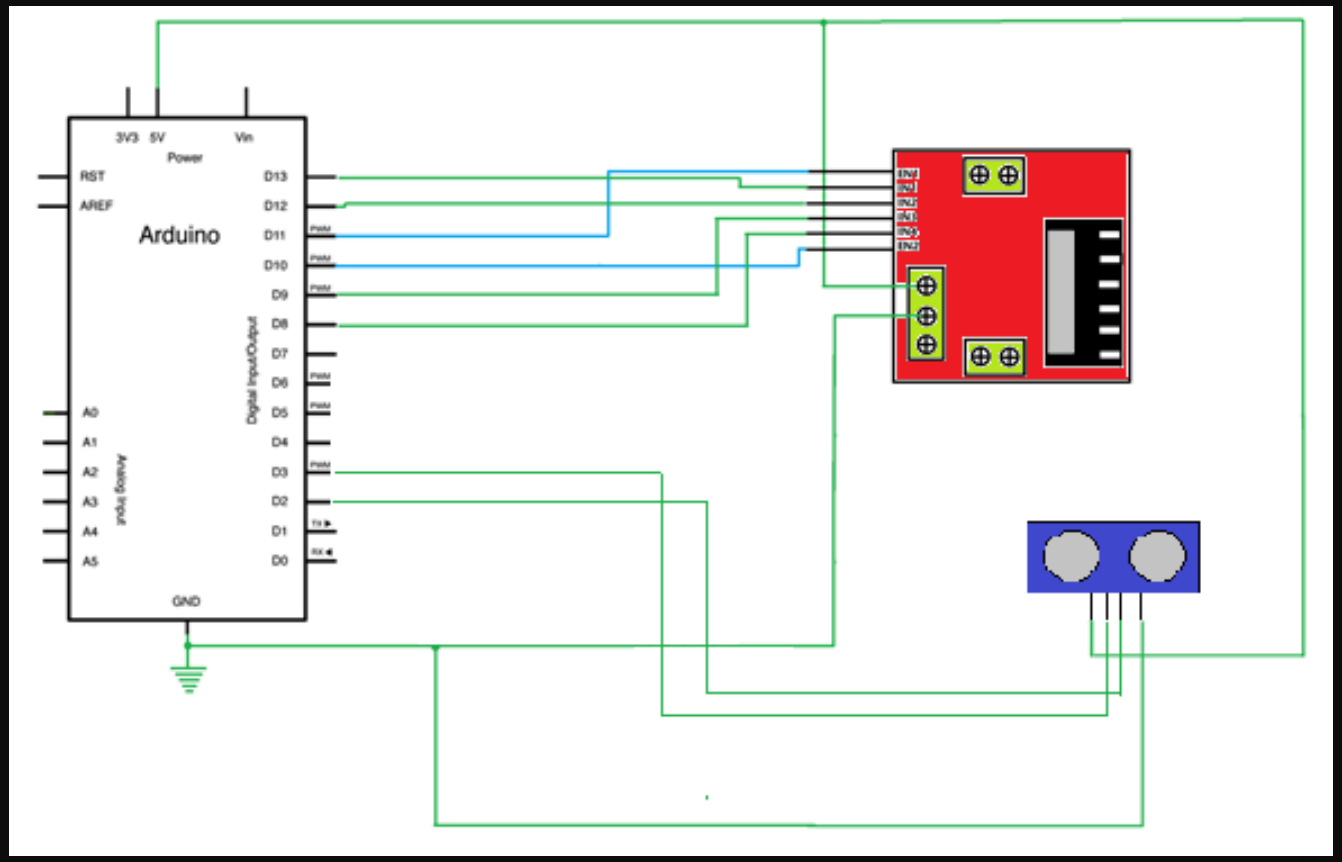
Schematic & circuit connections





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Arduino D10, D11	Motor driver ENA & ENB
Ultrasonic sensor VCC	Arduino 5v pin
Ultrasonic sensor GND	Arduino GND
Ultrasonic sensor TRIG	D3
Ultrasonic sensor ECHO	D2