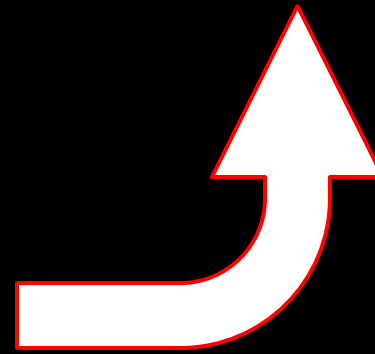


Start



Work Team

Abd-Elrahman Yehya	Mohammed Yasser	Mostafa Ashraf	Abdallah Ahmed	Adel Farooq	Adham Sayed
Rahma Ayman	Gana Mohammed	Aya Elsayed	Fatma Sameh	Fatima Sharif	

Section Team

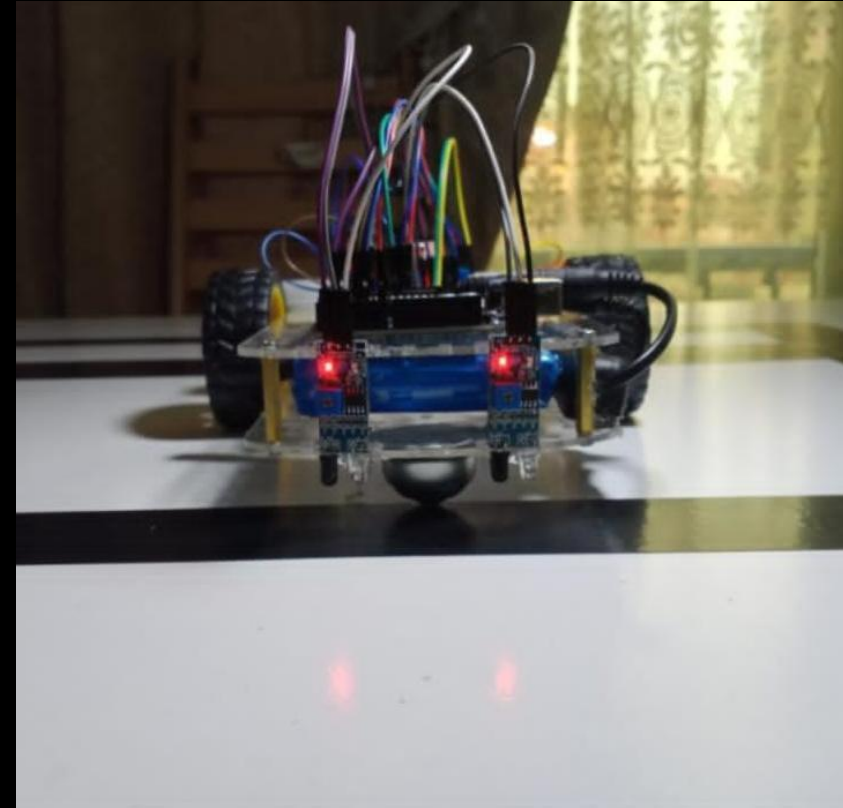
Nasr-Eldeen Elwazery	Ahmed Essam	Saleh Sayed	Mahmoud Mohammed	Bassem Rafiq
Ziad Elshafai	Youssef Osama	Kerolos Ibrahim	Mahmoud Mamdoh	Mahmoud Elsayed
Abd-Elmalek Mohammed	Abd-Elrahman Diaa	Ibrahim Magdy	Mohammed Salem	Mahmoud Safwat
Ziad Mostafa	Youssef Mohammed	Ahmed Yosri	Mohammed Ahmed	Mohammed Gamal

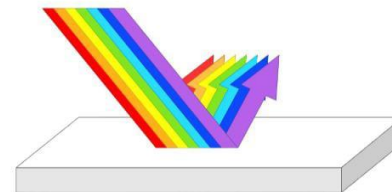
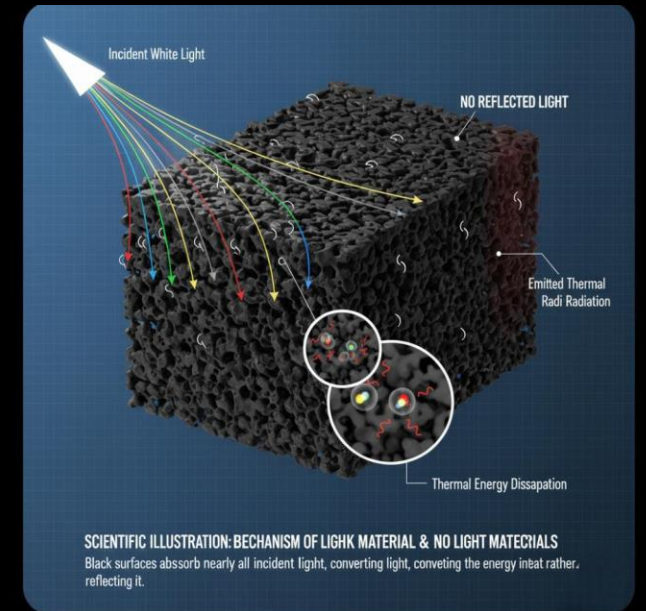
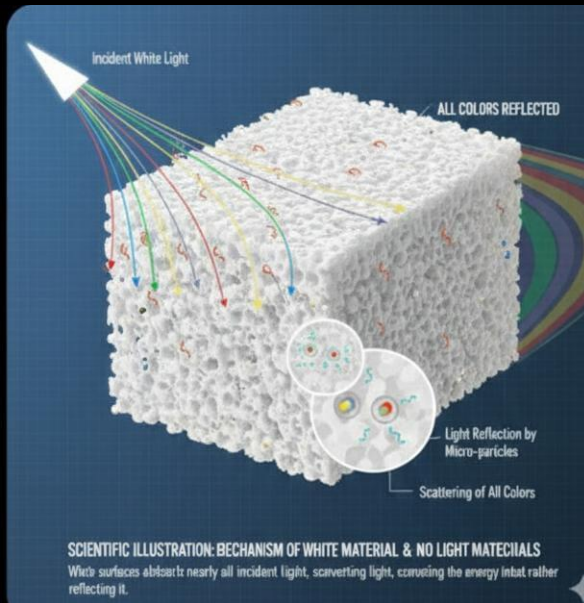


Robot line follower

Introduction

A **Line Follower Robot** is an autonomous vehicle designed to follow a predefined black line drawn over a white surface. The robot relies on **infrared (IR) sensors** to detect the path by distinguishing between the dark line and the bright background. Its operation is based on the scientific behavior of **light reflection and absorption**, where different colors reflect or absorb light in different ways. This contrast allows the robot to recognize the path and maintain accurate movement along it.



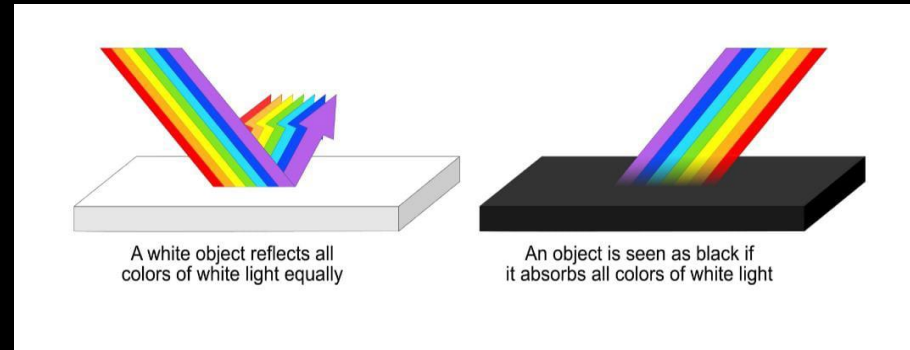
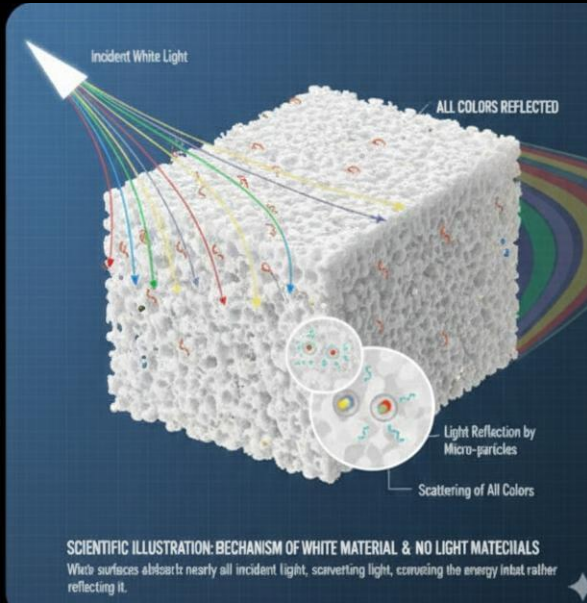


A white object reflects all colors of white light equally

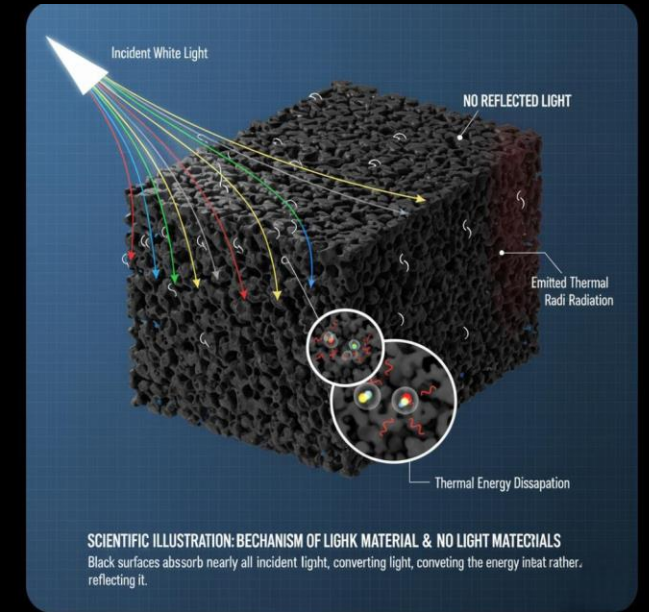


An object is seen as black if it absorbs all colors of white light

Working Principle)Light Reflection , and Absorption)



The robot's behavior depends on how surfaces interact with **infrared light**. Each IR sensor consists of: an **IR LED (emitter)** that sends infrared light toward the ground, and a **photodiode/phototransistor (receiver)** that measures the reflected light.



a) Reflective Surface (White Background)

White or light-colored surfaces reflect a large amount of IR light. The reflected light returns strongly to the sensor. The sensor produces a **high signal**, indicating the robot is *off the black line*.

Result:

The robot continuously compares the sensor signals:
High signal → white → **adjust direction away**
Low signal → black → **correct position back to the line**
This allows the robot to track the path precisely.

b) Absorptive Surface (Black Line)

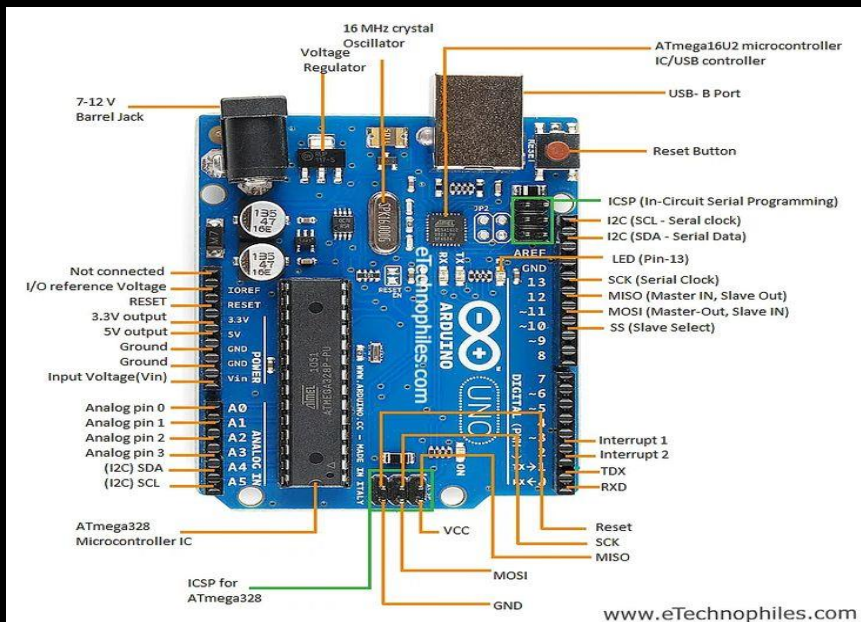
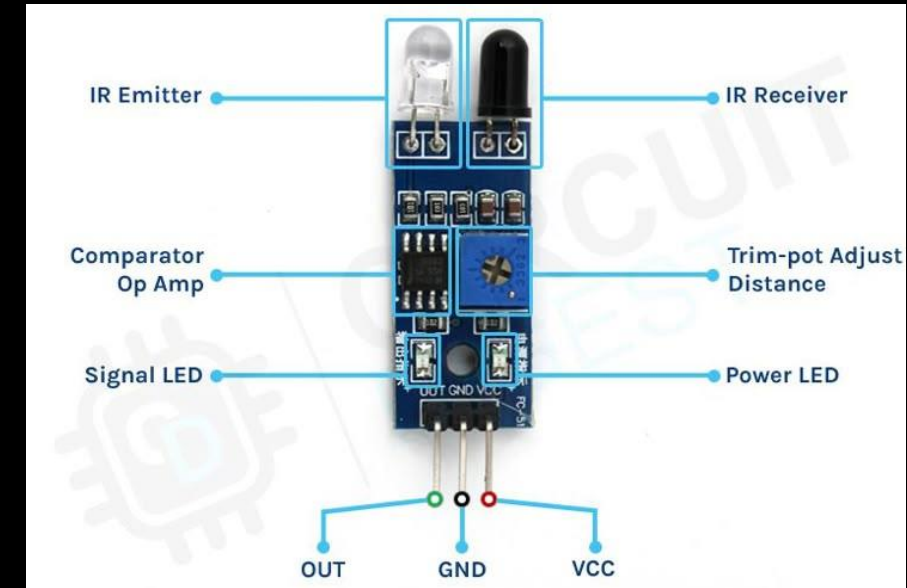
Black surfaces absorb most of the IR light. Very little light returns to the sensor. The sensor outputs a **low signal**, indicating the robot is *on the line*.

Components Used in the Line Follower Robot

1) IR Sensors (Infrared Sensors)

Function: Detect the black line by measuring the reflection of IR light from the surface.

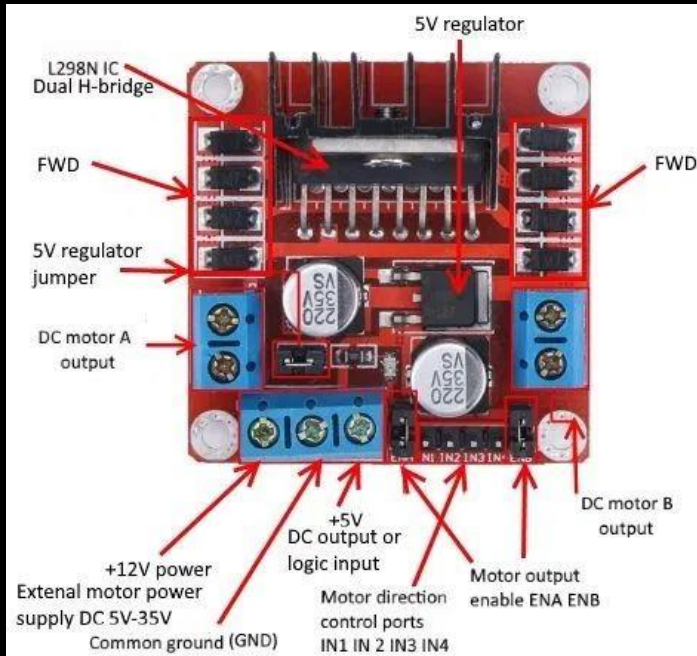
Role: Provide HIGH/LOW signals to the controller depending on the surface color.



2) Arduino Board

Function: Acts as the main controller of the robot.

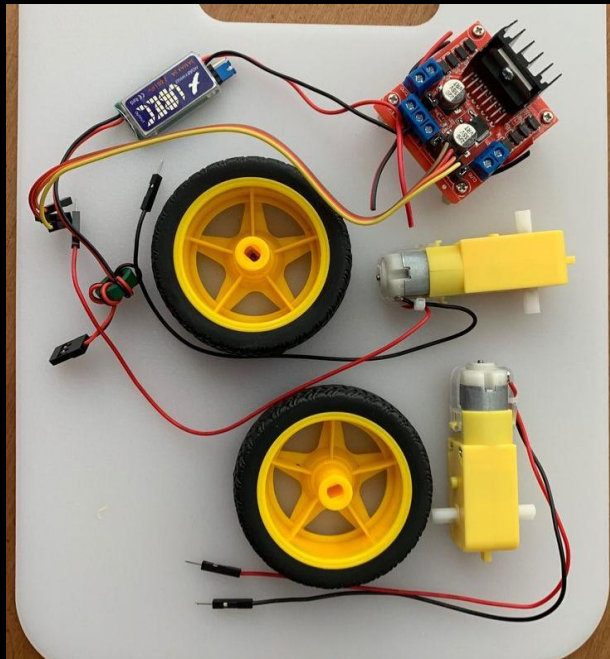
Role: Receives signals from IR sensors and makes decisions to control the motors according to the programmed code.



3) Motor Driver (L298N / L298D)

Function: Supplies the required current and voltage to the motors since the Arduino cannot drive them directly.

Role: Controls motor direction (forward/backward/left/right) and speed using PWM.



4) DC Motors

Function: Convert electrical energy into rotational motion.

Role: Drive the robot's wheels.

If both motors run at the same speed → robot moves straight.

If one motor is faster → robot turns.

5) Battery Pack

Function:

Provides the electrical power needed for all components.

Role:

Feeds the Arduino, motor driver, and motors with proper voltage and current.



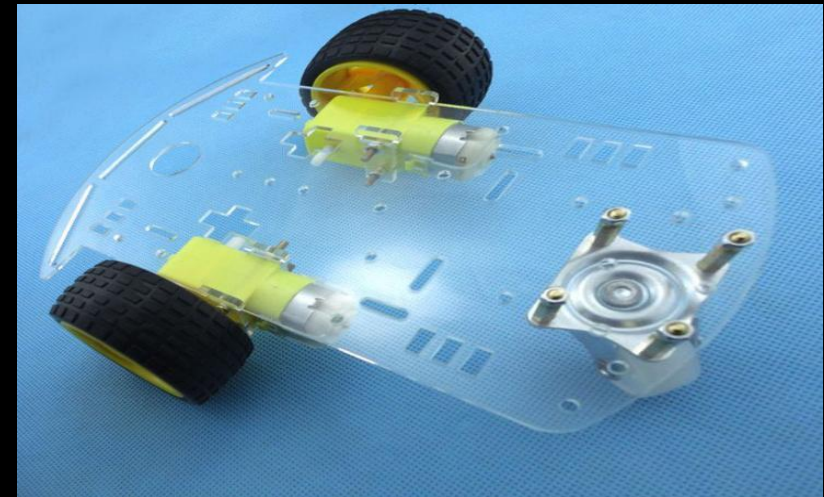
6) Robot Chassis

Function:

Holds all mechanical and electronic components together.

Role:

Provides structural stability and balance while the robot is moving.



7) Breadboard (Bridge Board)

Function:

Used for easy wiring and connecting components without soldering.

Role:

Helps distribute power and connect sensors, motors, and the controller quickly during prototyping.

Anatomy of the Breadboard

A breadboard is a circuit-building platform that allows you to connect multiple components without using a soldering iron.

POWER BUS

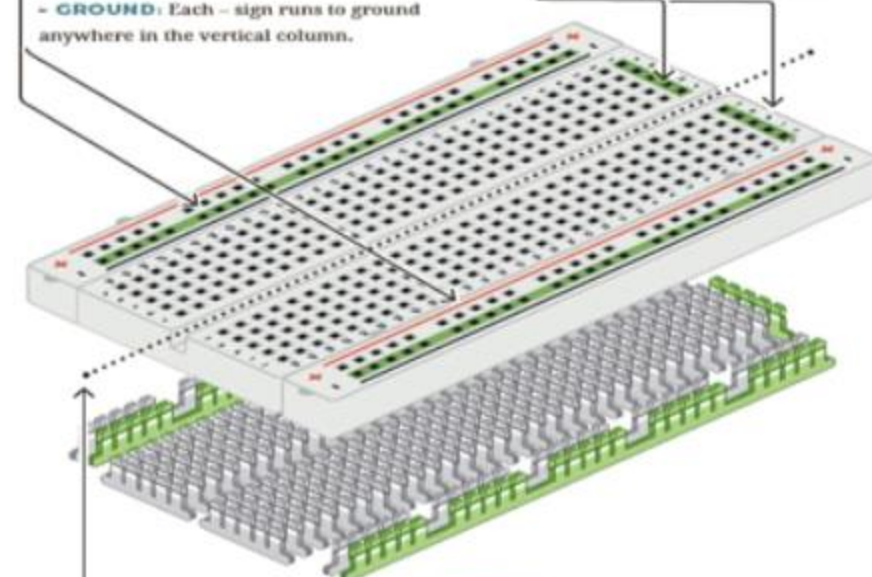
Each side of the breadboard has a pair of vertical connections marked - and +

+ POWER: Each + sign runs power anywhere in the vertical column.

- GROUND: Each - sign runs to ground anywhere in the vertical column.

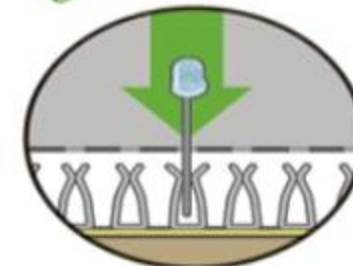
HORIZONTAL ROWS

Each series of 5 sockets marked a-e and f-j are connected. Components connected to a row will be connected to any other part inserted in the same row.



CENTERLINE

This line divides the breadboard in half, restricting electricity to one half or the other.



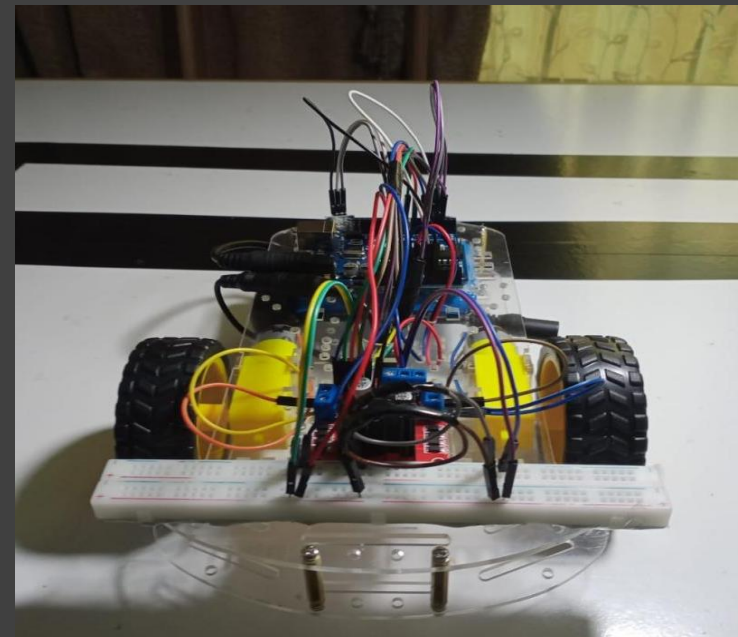
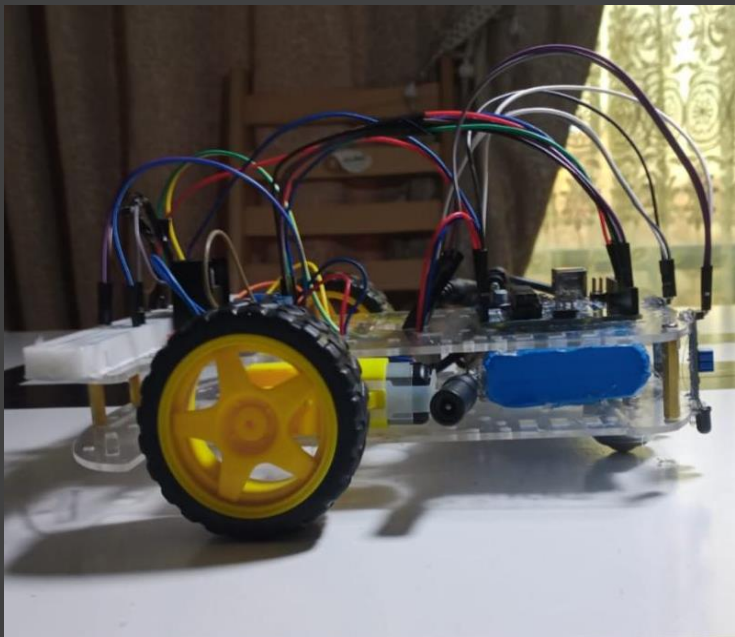
MAKING A CONNECTION

Most of the components in this kit are breadboard-friendly and can be easily installed and removed.

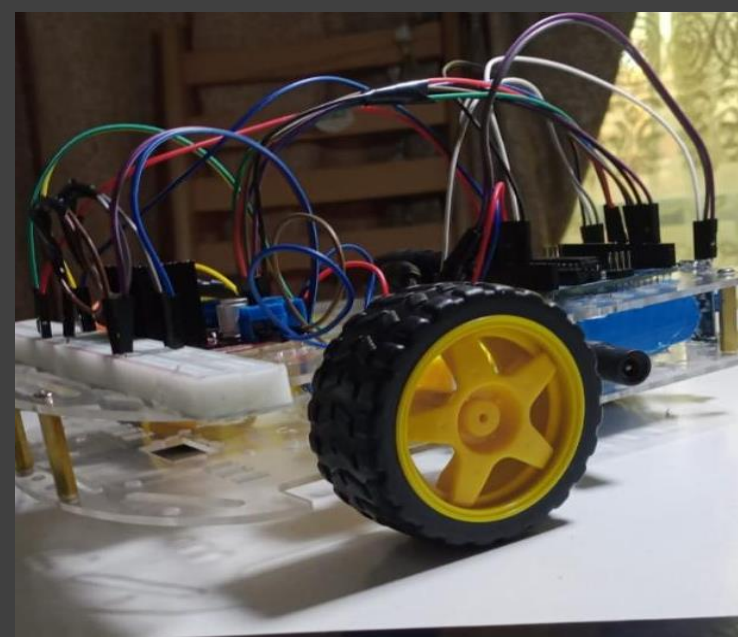
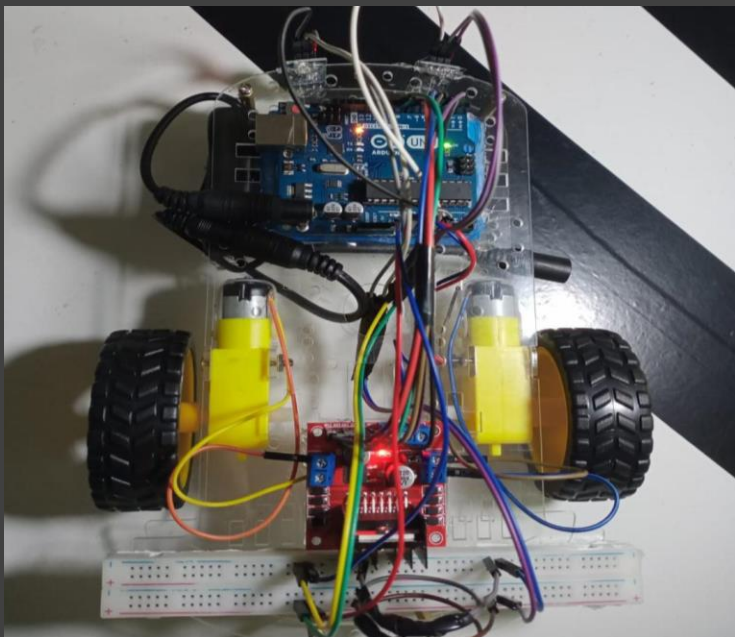
Wire connection

من	إلى				
Arduino D2	L298N IN1			Battery +	L298N +12V
Arduino D4	L298N IN2	Arduino GND	Breadboard -	Battery -	L298N GND + Breadboard -
Arduino D7	L298N IN3	Arduino 5V	Breadboard +	Right Sensor OUT	A0
Arduino D8	L298N IN4	Battery +	L298N +12V	Left Sensor OUT	A1
Arduino D3	L298N ENA	Battery -	L298N GND + Breadboard -	Right Sensor VCC	+
Arduino D5	L298N ENB			Right Sensor GND	-
				Left Sensor VCC	+
				Left Sensor GND	-
				Right Motor	OUT1 - OUT2
				Left Motor	OUT3 - OUT4

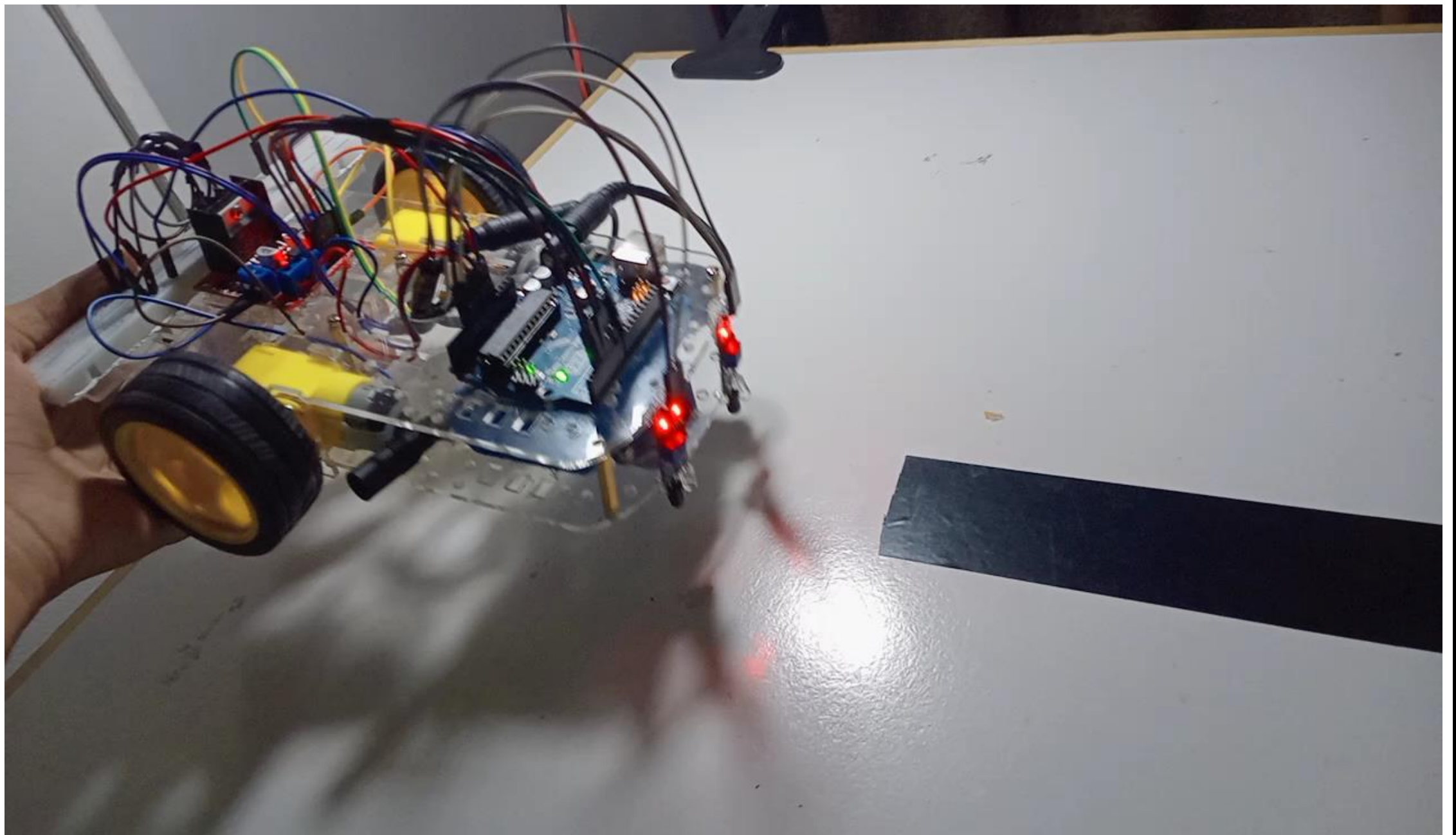
FINAL RESULT

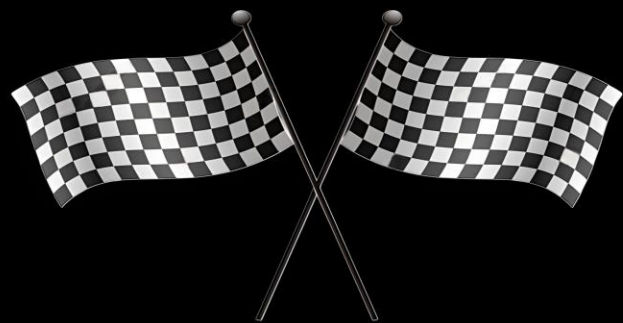


FINAL RESULT



FINAL RESULT





Finish
Thank you

