

Technical Report Line follower

Team Name:

Track Titans

Team members:

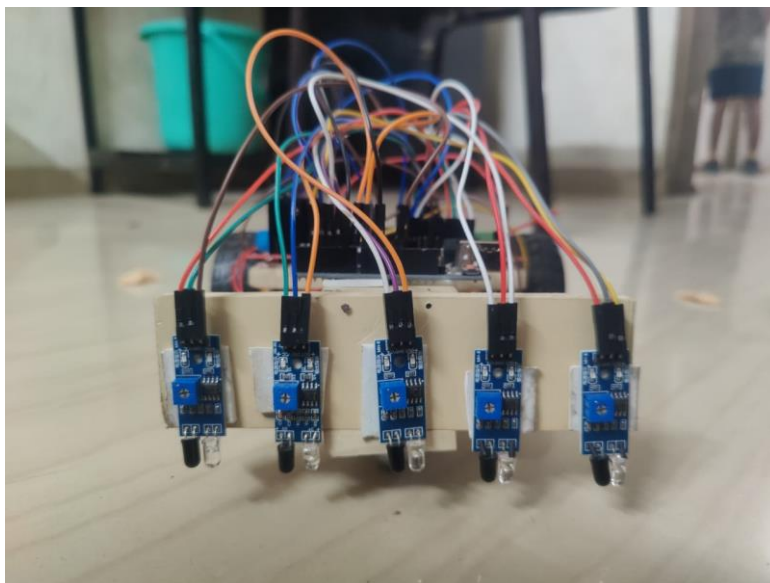
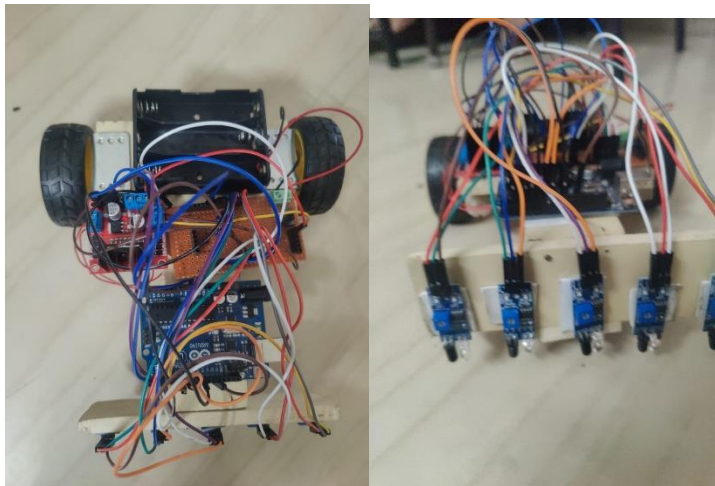
- Urja Mandali(Leader)
- Hariom Thacker(Member)
- Sarang N S(Member)
- Vraj Motiwala(Member)
- Ayush Tiwari(Member)

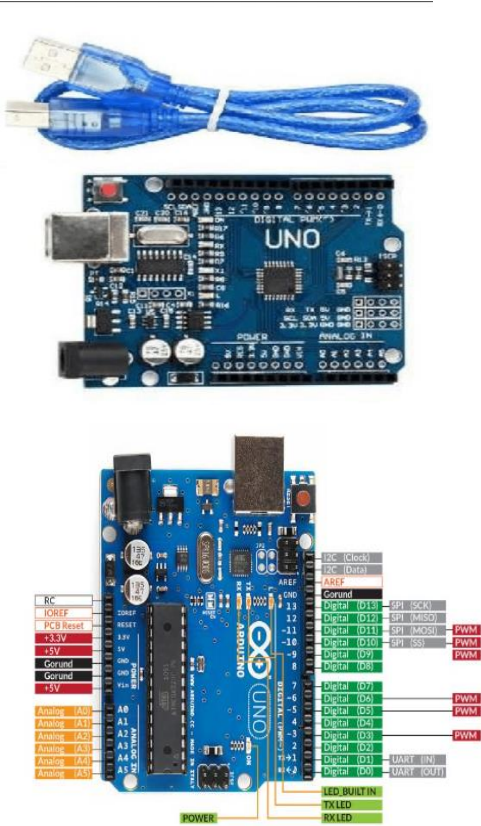
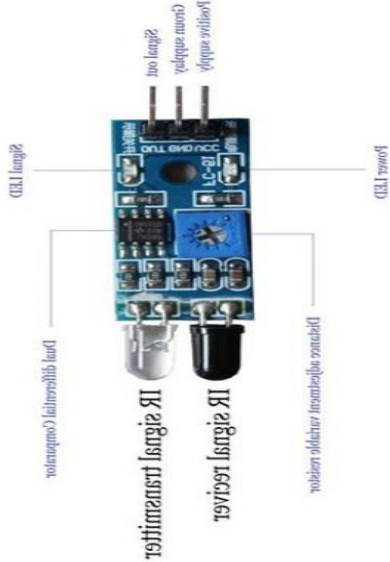
❖ Introduction


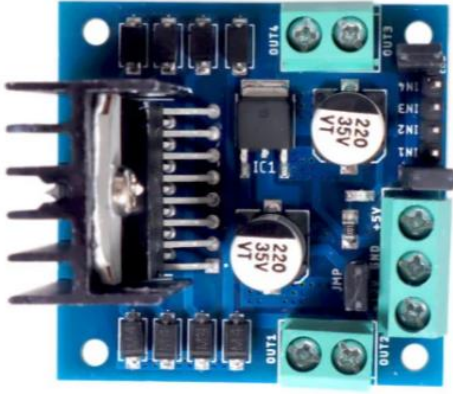
A line follower robot is an autonomous system designed to follow a predefined path using sensors and motor control. This report presents the development of a line follower.

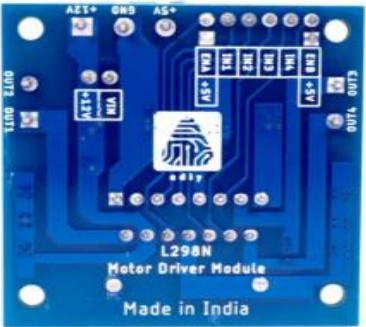
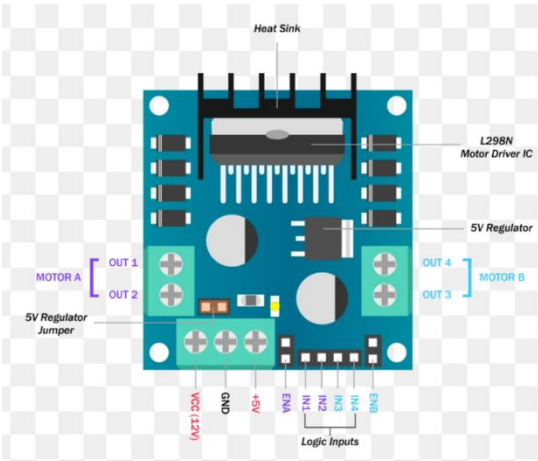

❖ objective



- To design and develop a PID-controlled or normal coded line follower robot.
- To achieve smooth and accurate line tracking with minimal deviation.
- To optimize motor speed for efficient movement and stability.



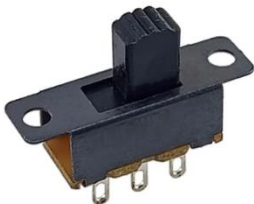





Sr. No.	Name and Image of components	Description
1.	Arduino Uno with USB cable 	<p>Arduino Uno is a popular microcontroller development board based on 8-bit <u>ATmega328P</u> microcontroller . Along with ATmega328P MCU IC, it consists of other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller</p>
2.	IR Sensor 	<p>IR sensors detect the infrared radiation emitted by objects. They measure the level and magnitude of this infrared energy to provide data on the temperature, movement, presence, or absence of objects. Some IR sensors emit IR radiation and then detect the reflected radiation to determine the distance or presence of objects (active IR sensors).</p>

<p>3.</p>	<p>TT Gear Motor and Wheels</p> 	<p>The TT Gear Motor is a widely used DC motor with a built-in gearbox, typically operating at 3V to 12V. It is known for its high torque and low speed, making it ideal for small robotic applications such as line followers. Even at lower voltages, TT gear motors provide a good balance of torque and rotational speed (RPM), ensuring stable operation for robotic applications. The built-in gearbox reduces the RPM, allowing for better control and increased torque. TT gear motors are compatible with motor drivers like L298N, and work seamlessly with development boards such as Arduino Uno.</p>
<p>4.</p>	<p>Motor Driver LN298N</p> 	<p>Voltage Regulator Function</p> <p>The L298N motor driver has an onboard 5V voltage regulator, which allows it to step down a higher voltage (e.g., 12V) to 5V. This regulated output can be used to power microcontrollers like Arduino, reducing the need for an external voltage regulator.</p> <p>Motor Driver Function</p>

	 	<p>The L298N controls DC motors using an H-bridge circuit, which allows current to flow in either direction to drive motors forward or backward. The speed is controlled using Pulse Width Modulation (PWM) signals from the microcontroller.</p> <ul style="list-style-type: none"> • IN1 & IN2: Control the direction of Motor A. • IN3 & IN4: Control the direction of Motor B. • ENA & ENB: Enable pins for speed control via PWM. • VCC: Main power input (5V–35V). • GND: Ground connection.
<p>5.</p>	<p>Chasis(self made) and L Clamp</p> 	<p>A chassis is the structural framework of a device or vehicle that supports and houses various components. In electronics and robotics, it refers to the base or frame that holds circuit boards, motors, batteries, and other components. In automobiles, it includes the main frame, suspension, and wheels, providing strength and stability.</p> <p>An L-Clamp is a metal or plastic bracket shaped like the letter "L," used for holding, securing, or mounting objects at a 90-degree angle. In robotics and electronics, L-</p>

		clamps are commonly used to attach motors, sensors, or structural components to a chassis. They provide stability and support in mechanical assemblies
6.	<p>Solder iron and soldering wire</p> 	<p>A soldering iron is a hand tool used to heat and melt solder wire, allowing it to join electronic components and wires. The soldering iron typically operates at 200–450°C and consists of a heated metal tip and an insulated handle. Solder wire, usually made of tin and lead (or lead-free alternatives), melts when heated and forms a strong electrical and mechanical bond between components. These are essential for circuit board assembly, repairs, and DIY electronics projects.</p>
7.	<p>DMM (Digital Multimeter)</p> 	<p>A multimeter is an electronic measuring instrument used to measure voltage (V), current (A), and resistance (Ω). It can be analog or digital (DMM) and is essential for troubleshooting circuits, checking battery levels, and testing components. Most multimeters also feature continuity testing and diode testing modes, making them a</p>

		versatile tool in electronics and electrical work.
8.	Jumper wires 	Jumper wires are flexible, insulated wires used for making temporary connections between components in electronic circuits. They come in three types: male-to-male, male-to-female, and female-to-female, with metal pins or sockets at the ends. Commonly used with breadboards, Arduino, and other microcontrollers, they simplify prototyping and circuit testing without soldering.
9.	GCB 	A General Circuit Board (GCB), also known as a Printed Circuit Board (PCB), is a board that electrically connects and supports electronic components using copper traces. It can be single-layer, double-layer, or multi-layer, depending on complexity. GCBs are widely used in electronics, robotics, automotive, and industrial applications to provide a compact and reliable circuit foundation.
10.	Switch 	A three-terminal switch is a type of switch with three connection points (terminals). here ,we are sorting 2 terminal to use it as normal two terminal switch.

11.	Screw Connector 	<p>A screw connector, also known as a screw terminal, is an electrical connector that uses a screw mechanism to secure and connect wires. It allows for easy, tool-based connections without the need for soldering. Screw connectors are commonly used in power supplies, circuit boards, and electrical panels for secure and reliable wiring.</p>
12.	Male and Female Header 	<p>Male and Female Headers are connector pins used in electronics for easy circuit connections, Male Header: Consists of exposed metal pins that insert into sockets or breadboards. Female Header: Has sockets that receive male header pins for secure connections. These headers are commonly used in Arduino boards, sensors, and PCB connections for modular and removable setups.</p>
13.	Single stand wire and Multistand wire 	<p>A multi-strand wire consists of multiple thin strands of wire twisted together, making it highly flexible and resistant to breakage due to repeated bending</p> <p>A single-strand wire has a solid metal core, making it less flexible but more durable for fixed installations. It is often used in circuit boards, where rigidity and stability are preferred.</p>

❖ Another items

1. Double sided tape
2. Stripper

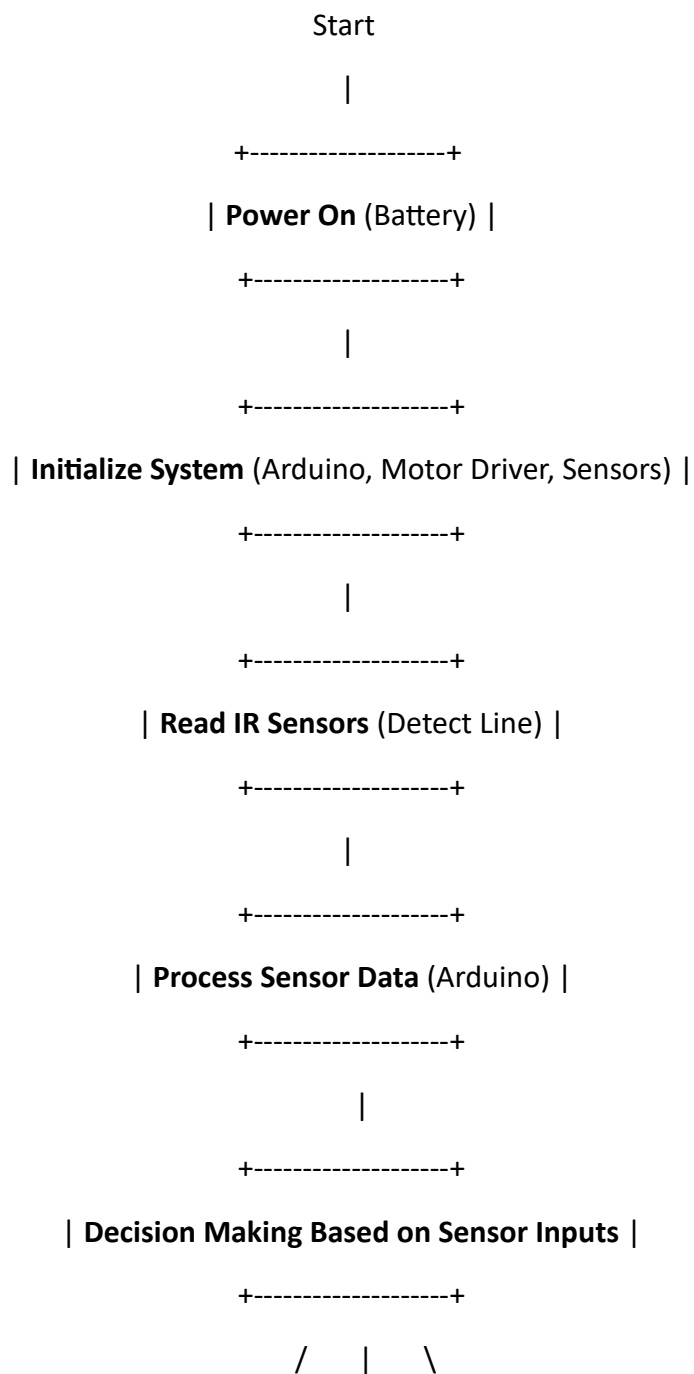
3.Glue Gun

4.Insulation Tape

5. Screw Driver (small)

6.Battery charger

❖ **Flowchart**



Left Forward Right

Turn | Turn

| | |

+-----+

| **Adjust Motor Speed** (Motor Driver - L298) |

+-----+

| | |

+-----+ +-----+

| Move Left | | Move Right |

| (Left Motor Slow, Right Motor Fast) | | (Right Motor Slow, Left Motor Fast) |

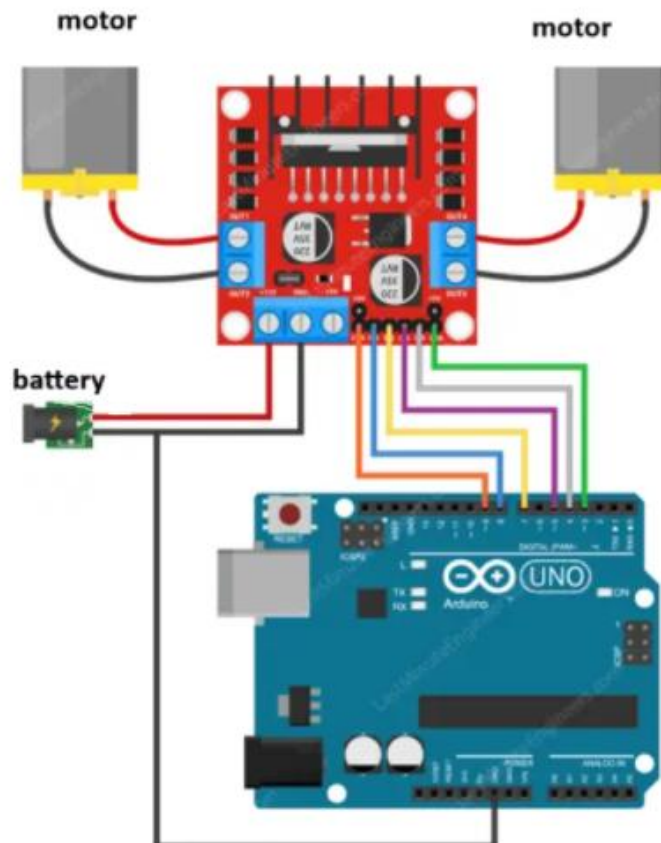
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|

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| Loop back to sensor reading |

+-----+



❖ Circuit Diagram

