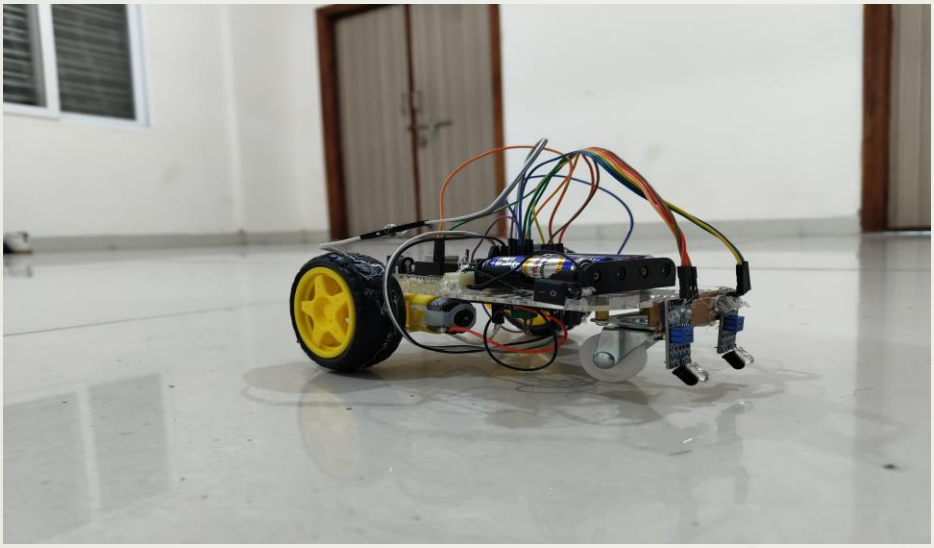
PH-102 PROJECT

LINE FOLLOWER ROBOT



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INTRODUCTION

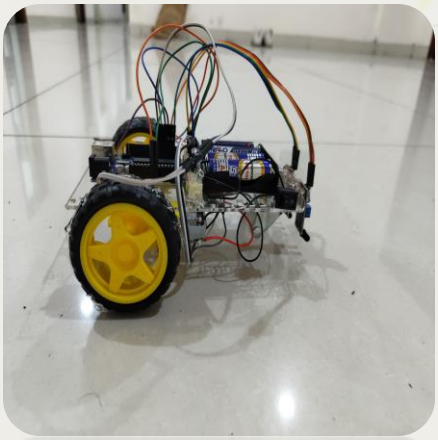
- Line Follower Robot (LFR)- is a simple autonomously guided robot that follows a line drawn on the ground to either detect a dark line on a white surface or a white line on a dark. The LFR is quite an interesting project to work on! In this tutorial, we will learn how to build a black line follower robot using Arduino Uno and some easily accessible components.
- Line follower Robot is a very simple robot that follows a line, either a black line or a white line.
- Basically, there are two types of line follower robots: one is a black line follower which follows the black line and the second is a white line follower which follows the white line. Line follower actually senses the line and follows it.

Components used-

- Arduino Uno - 1Nos
- L293D motor driver- 1Nos
- IR sensor module -2 Nos
- 1.5 V battery-4 Nos
- Motor wheel - 2 Nos
- Castor wheel - 1 Nos
- Wires
- Screw
- Motor- 2 Nos
- Breadboard
- Chassis

Working Of Line Follower Robot

- It is based on the principle of reflection of light.
- Reflection of light on the white surface is maximum and minimum on the black surface because the black surface absorbs maximum amount of light.
- IR Sensor is used for detecting the line.
- To detect the line, we place two IR sensors one on the left and other on the right side of the robot



Basic Circuit

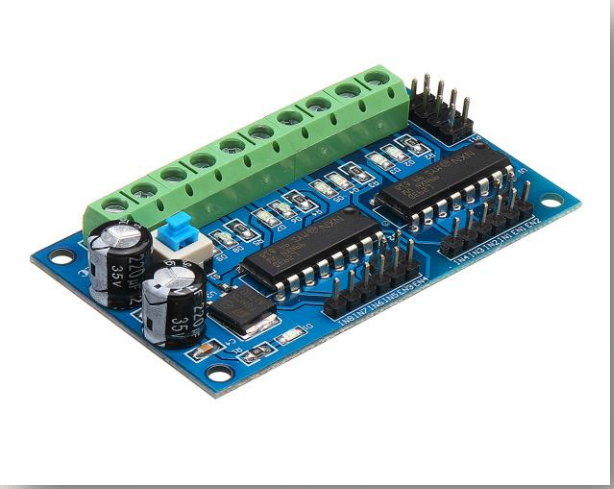
- The circuit consists of mainly four parts: Two IR sensors, one motor drive, two motors, one Arduino, a battery and a few connecting wires. The sensor senses the IR light reflected from the surface and feeds the output to the onboard op-amp comparator. When the sensor is situated over the white background, the light emitted by the sensor is reflected by the white ground and is received by the receiver. But when the sensor is above the black background, the light from the source doesn't reflect to it. The sensor senses the intensity of reflected light to give an output. The sensor's output is fed to the microcontroller, which gives commands to the motor driver to drive the motor accordingly. In our project, the Arduino Uno is programmed to make the robot move forward, turn right or turn left and stop according to the input coming from the sensor. The output of the Arduino is fed to the motor driver. If the sensor, pointing to the ground, is over a bright surface like white, it will receive a lot of reflected light, but if it is on a dark surface, it will receive little reflected light.

Arduino UNO-

The driver section consists of motor driver and two DC motors. The motor driver is used for driving motors because Arduino does not supply enough voltage and current to the motor. So, we added a motor driver circuit to get enough voltage and current for the motor. Arduino sends commands to this motor driver and then it drives motors. Every one of the 2 sensors detects the brightness under them and depending on these readings, the Arduino can know where the line is in relation to the middle of the robot, where it should be. Since the Arduino UNO has 5 analog inputs.

L293D Motor Driver

L293D is a monolithic integrated, high voltage, high current, 4-channel driver. Basically this means using this chip you can use DC motors and power supplies of up to 16 Volts, thats some pretty big motors and the chip can supply a maximum current of 600mA per channel, the L293D chip is also what's known as a type of H-Bridge. The H-Bridge is typically an electrical circuit that enables a voltage to be applied across a load in either direction to an output, e.g. motor.



IR Sensor-

IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. The line follower IR sensor is capable of following a black line on a white surface autonomously and with no external control. It is made up of an infrared LED and a phototransistor placed next to each other. The LED acts as a transmitter, and the phototransistor acts as a receiver.

Battery Operated (BO) Motor-

BO (Battery Operated) Motor is lightweight DC geared motor which gives good torque and rpm at lower voltages. This motor can run at approximately 100 rpm when driven by a single Li-Ion cell. Great for battery operated lightweight robots. It can do reverse and forward directions.

Castor Wheel-

The wheel automatically aligns itself to the direction of travel, thus used in line follower robots. This castor wheel is a spherical wheel that can move omnidirectional and constructed with a spherical ball mounted inside a PVC fixture.

Working of Line Follower Robot

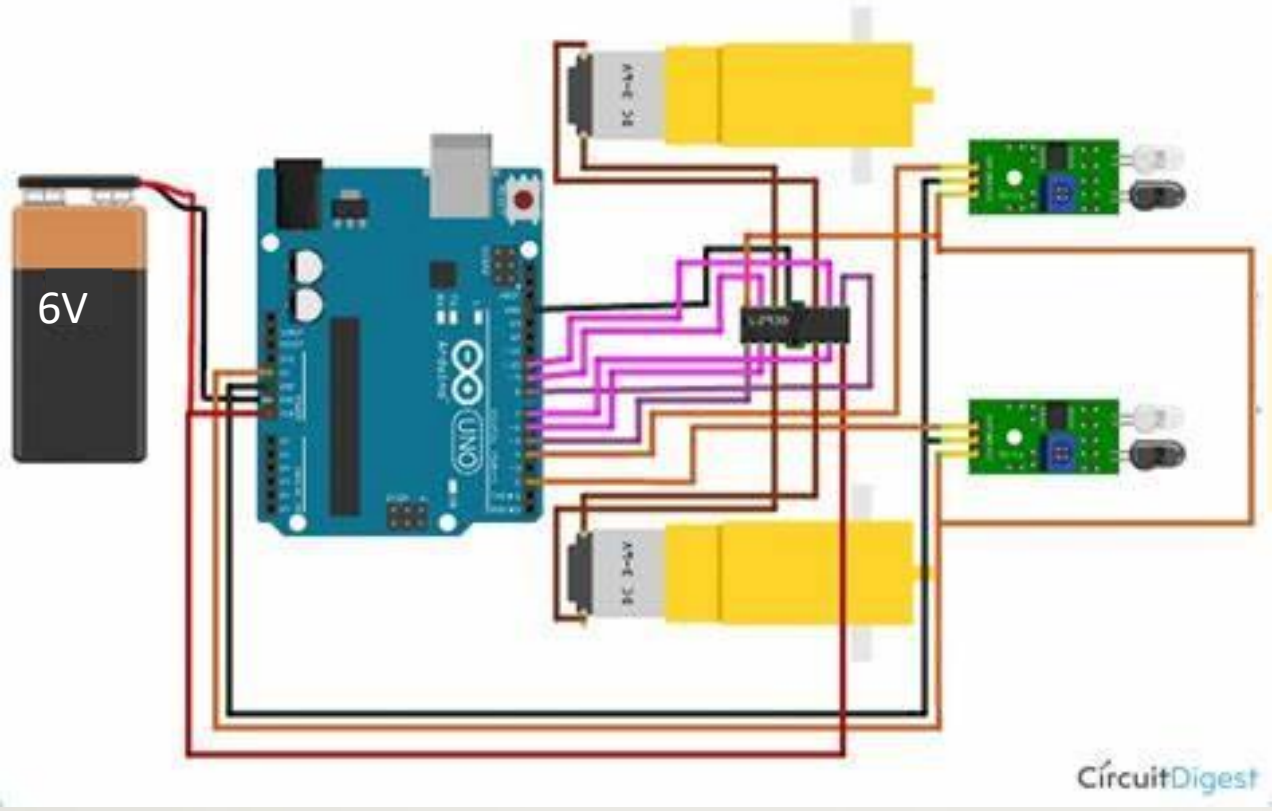
The concept of the line follower robot is related to the transmitting and receiving of light. The white colour reflects all the light that falls on it whereas the black colour absorbs all the light.

In this line follower robot, we have used IR transmitters and receivers (also known as photodiodes). When IR light falls on a white surface, it gets reflected back towards the IR receiver, generating some voltage changes that are analyzed by the Arduino.

When IR light falls on a black surface, it gets absorbed by the black surface, and no rays are reflected back thus, the IR receiver doesn't receive any rays.

In this project, when the IR sensor senses a white surface, an Arduino gets HIGH as input, and when it senses a black line, an Arduino gets LOW as input. Based on these inputs, an Arduino Uno provides the proper output to control the line follower.

Input		Output				Movement Of Robot
Left Sensor	Right Sensor	Left Motor		Right Motor		
LS	RS	LM1	LM2	RM1	RM2	
0	0	0	0	0	0	Stop
0	1	1	0	0	0	Turn Right
1	0	0	0	1	0	Turn Left
1	1	1	0	1	0	Forward



Applications of Line Follower Robot

- Material handling: Transporting goods in warehouses and factories
- Quality control: Inspecting products on assembly lines
- Agriculture: Planting seeds, applying fertilizers, and performing field tasks
- Domestic applications: Floor cleaning and other household tasks
- Guidance applications: Providing path navigation in public spaces
- Educational purposes: Teaching robotics and programming principles

CONCLUSION-

- In conclusion, line-following robots are increasingly becoming helpful in various applications, such as industrial automation, automobiles, domestic applications, and guidance applications. They use sensors to detect the line, and the robot's speed and direction are modified accordingly. Additionally, line-following robots help automate repetitive tasks, provide guidance, and detect potentially hazardous situations. With their increasing popularity, the applications of line-following robots are expected to increase.

CONTRIBUTIONS

- Dev Agarwal- Assembling,Report
- Diya Seal- Coding,Report
- Eakamjit Singh- Purchasing,Assembling
- Gunjan Verma- Wiring,Report
- Harsh Alok Sharma- Coding,wiring

Refrences-

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