

# Line Follower Robot

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## ABSTRACT

Line Following is one of the most important aspects of robotics. A Line Following Robot is an autonomous robot which is able to follow either a black line that is drawn on the surface consisting of a contrasting color. It is designed to move automatically and follow the line. The robot uses arrays of optical sensors to identify the line, thus assisting the robot to stay on the track. The array of four sensor makes its movement precise and flexible. The robot is driven by DC gear motors to control the movement of the wheels. The Arduino Uno interface is used to perform and implement algorithms to control the speed of the motors, steering the robot to travel along the line smoothly. This project aims to implement the algorithm and control the movement of the robot by proper tuning of the control parameters and thus achieve better performance. In addition the LCD interface is added in order to display the distance travelled by the robot. It can be used industrial automated equipment carriers, small household applications, tour guides in museums and other similar applications, etc.

## I. INTRODUCTION

A line following robot is a mobile machine employed to sense and follow the black lines that are drawn on the white surface. As this robot is developed using a breadboard, it will be very simple to construct. This technique can be incorporated into the Automated Guided Vehicles (AGV) for providing the easy way of operation.

Unlike room-exploration robots that often get stuck against chairs and carpet edges, you don't have to chase after a well-designed line-following robot. Most line following robots have two motors, two front sensors, and a basic electronic circuit for autonomous control. But, a great thing about this type of robot is that it is easy to make small changes for added complexity. Simple improvement is to install the robot in a decorative container, along with colourful LEDs. More advanced designs add various sensors and a

programmable microcontroller for faster speed, smoother turning, or maze-solving.

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The line follower is a self-operating robot that detects and follows a line that is drawn on the floor. The line follower robot using Arduino is a self-operating system that detects and follows a track drawn on the floor. The track consists of a black path drawn on a white surface.

### 3.1. Basic Operation

- Capture line position with optical sensors mounted at the front of the robot. For this a combination of IR-LED and Photodiode called an optical sensor has been used. This makes the sensing process of high resolution and highly robust.
- Steer robot requires steering mechanism for tracking. Two motors governing wheel motion are used for achieving this task.
- This system has an LCD display panel to

show the distance that it covers.

- On the detecting no black surface robot move in a circular motion until line is found

### 3.2 Optical Sensors

- The robot uses photodiode sensors to sense the line; an array of four IR- LEDs (TX) and Photodiode sensors (Rx), facing the ground used in this setup. An analogy signal is obtained in output, depends on the amount of light reflected back, which is provided to the comparator to produce 0s and 1s which are then fed to the Arduino.
- The sensors on the left named as L1, L2 and R1, R2 on the right side. Assumptions should be considered that when a sensor is on the line it reads 0 and when it is off the line it reads 1. The Arduino correspondence to the algorithm given below decides the next movement, trying to position the robot such that all sensors read 0. With sensors, robots can react and respond to changes in their environment in ways that appear intelligent or life-like

There have been plenty of applications of mobile robots for transporting materials. Some of the projects have already been commercialized. Companies like CaddyTrek and Stewart Golf sell following golf bags, which free up golfers to concentrate on the game. DonkiBot, an autofollowing trolley robot invented by Omorobot Inc., are raising fund on kickstarter. These products are mainly targeting high-end users. Taking Stewart Golf as an example, its robots are sold at £1,499, which is around HKD16,000. These automated robots have always been luxury products and price is yet to be brought down to an affordable level for normal people. Some of the academic research applies mobile robot to shopping trolley in supermarkets. Most of the design are based on the idea of human following robot, which the trolley can follow human with luggage loaded. Here are some common components used for automated following robot.

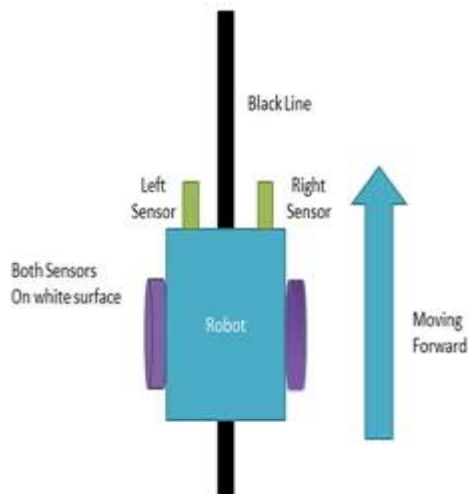
The Line follower robot is a mobile machine that can detect and follow the line drawn on the floor. Generally, the path is predefined and can be either visible like a black line on a white surface with a high contrasted color or it can be invisible like a magnetic field. Therefore, this kind of Robot should sense the line with its Infrared Ray (IR) sensors that installed under the robot. After that, the data is transmitted to the processor by specific transition buses. Hence, the processor is going to decide the proper commands and then it

sends them to the driver and thus the path will be followed by the line follower robot. TABAR is a line follower robot designed and tested in order to attend at Tabrize line follower robots competition. But it encounter with some technical and mechanical problems. In this Paper, we have illustrated the process of design, implementation and testing TABAR, a small line follower robot designed for the line follower robots competition. The technical and mechanical issues and problems also have investigated.

## II. CONCLUSION

In this project, we have designed a line following robot. This robot does not need any remote controller or any controller like Bluetooth, Wi-Fi, GSM, driver etc, it will run automatically with following a line. We have not used any microcontroller. This robot is very low cost but very effective for various purposes. Our project can be used in various sectors like in medicine delivering in hospitals, delivering products in any places, spying, and surveillance and soon. In future we can add several sensors, camera etc to get more features.

The Robot follows a specific line path simultaneously. This line follower robot with multiple modes compatibility works perfectly fine as it is designed to do. And thus attempt will be made to solve the unplanned and unauthorised parking problems in the resident area using prototype valet parking robot. The slot type and state of the slot will be identified using Sharp IR Sensor. And simultaneously we can perform the operation of Buzzer beep operation, object identification, Lcd display, robot direction control operation and will finally execute parking near to the end.



Line following principle of the robot

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