IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES

ISSN PRINT 2319 1775 Online 2320 7876

*Research paper*  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

# Line Following and Obstacle Avoiding Robot

**N. Srivani[1*,a], B. Jitendra sai[1,b], B. Pushyami[2,c], D. Vasthalya[3,d], B. Sneha[4,e]**

[1,2,3,4,5] UG Scholar, Department of CSE, Seshadri Rao Gudlavalleru Engineering College, Gudlavalleru, A.P, India,.

*Corresponding author Email: jitendrasaiboddu@gmail.com

**Abstract :** The Line follower and Obstacle Avoiding robot is basically a kind of robotic machine that can recognize and adhere to the contrasting-colored painted line on the floor. In most cases, the track is predetermined and can be seen as a black line on a white surface or a white line on a black surface, or any two highly contrasting colors. Hence, the Robot of this kind should detect the line with the help of Infrared Ray (IR) sensors that mounted in the front of robot facing down. The robot also detects obstacles and avoid them according to the requirements. We use Arduino board which makes our task much easier to dump the code and run the machine. The data is relayed to the hub by dedicated transmission cables. Therefore, the hub that contains the main processor will be deciding the required commands and then it relays the information to the to the Motor driver Shield and hence, The route will be taken by avoiding the obstacles on the way if any by the Line Follower and Obstacle avoiding robot.

**Keywords:** Line follower, Obstacle avoider, Infrared sensor, Ultrasonic sensor, Buzzer, Motor shield.

## INTRODUCTION

Robots are machines that are often created to eliminate human labour when it is necessary. Robot has enough intellect to occupy the entire available space. To guide the robot via a black line drawn on the white surface, it will travel in the direction the user specifies. The use of automatic parking has grown in popularity. Automatic parking technology can efficiently and safely accomplish parking tasks without a driver, enhance driving comfort, and significantly lower the risk of parking accidents. avoidance of obstacles Robots are made to prevent accidents while navigating over uncharted territory. Robot that avoids obstacles detects them in its route, avoids them, and then continues going. Robot navigation techniques include things like following a wall, recognition of edge, line-following, and many others. Edge detection is a more generic and widely used approach for obstacle avoidance. The necessity for the robot to halt in front of an obstruction to produce a more precise measurement is a drawback of obstacle avoidance based on edge detection.

Every mobile robot includes some sort of collision prevention, from simple algorithms that recognise an impediment and cause the robot to halt in order to prevent a collision to more complex algorithms that allow the robot to avoid collisions altogether. The latter methods require both the identification of a barrier and some type of quantitative measurement pertaining to the obstacle's size, making them more difficult. Any obstruction in front of it is detected by an ultrasonic sensor, which then transmits an instruction to the microcontroller. In order to move smoothly while operating and avoid collisions, the robots may be able to solve some of the navigational challenges outlined above. If the IR sensor were used Infrared radiation is used by infrared sensors to gauge an object's distance.

## LITERATURE SURVEY

The "line follower and obstacle avoidance bot using Arduino" was created by Aamir Attar, Aadilansari, Abhishek Desai, Shahid Khan, and Dipashrisonawale to construct an autonomous machine that intelligently identifies the impediment in its way and steers based on the actions that user sets for it.As a result, this method offers an alternative to the current system by substituting robotic technology for trained personnel This means that it may be used in the domains of marketing, research, and educational. At the intermediate level, line-following and obstacle-avoidance robot research can aid students in building their communication, technical, and collaborative abilities. Such a robot's design is

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

relatively adaptable, and different techniques may be used for different implementations. It demonstrates how IR and ultrasonic sensors cooperate to complete the task of following a line and dodging obstacles, if any. Under diverse operational and functional strategies, a variety of approaches have been examined and studied, along with their benefits and drawbacks. It is therefore possible to draw the conclusion that features like the mobility, lightweight design, and user-friendly interface of smartphones running the Android operating system have surpassed technology's complexity, particularly programmable gloves, static cameras, etc., rendering them obsolete. Although recent studies in this area have created cordless motion controlling a common occurrence, collaborative efforts are still needed to give it more attention in uses such as furniture, wheelchairs, nurse robots, tabletop displays, etc.

**IMPLEMENTATION**

Here, we initially choose a setup to create a line follower using just two infrared sensors and an Arduino Uno connected through a motor driver IC. In this regard, A block diagram was used by us. The link for the creation of the line follower, which adheres to a white surface while following a black line, is shown in the block diagram.

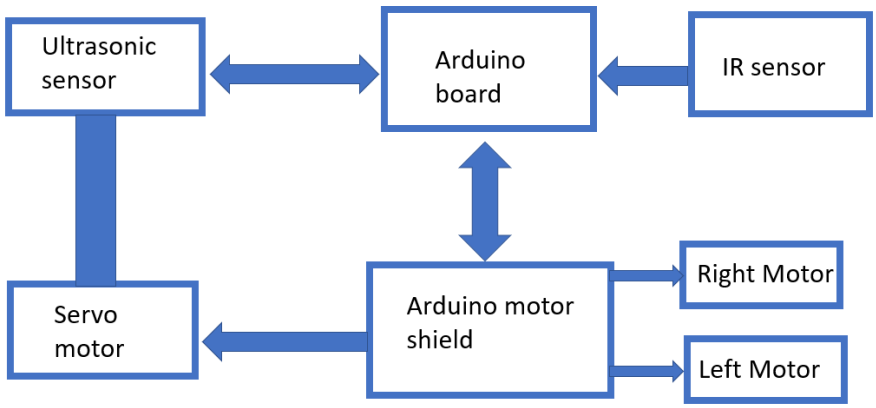


**Fig. 1.** Block diagram of model

The ultrasonic sensor uses a sonar system to measure distance to an object, similar to how bats do it. Neither sunshine nor dark objects have an impact on its operation. The signal is brief and high frequency and is sent by the ultrasonic sensor. If they identify an item, they return the echo signal that is input to the sensor through the Echo pin by reflecting it. First, the operator sets the Trigger and Echo pins to a low beginning position before moving the robot forward.

**1. Components**

**1.1 The Body or Chassis:**

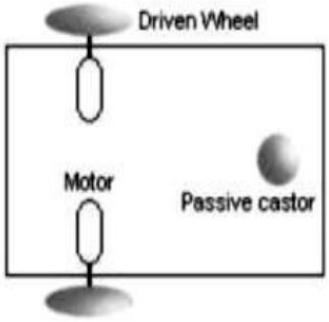


Fig. 2. Chassis

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

We can use any type of material for chassis of our model as long as it is strong and rigid to hold the components that are placed on top of it. In the present scenario we used carbon fiber board that is pre-cut for the required slots and holes.

**1.2 ARDUINO UNO:**


Fig. 3. Arduino Uno

The Microchip ATmega328P microprocessor serves as the foundation for the Arduino Uno, a microcontroller board made by Arduino.cc that is free source.The board has many groups of digital and analogue feedback (I/O) pins, allowing it to connect to other circuits and expansion shields. Despite the fact that there are other variations of Arduino boards, this handbook concentrates on the Arduino Uno. Electronics projects may be built using the open-source Arduino platform. The Arduino system consists of a configurable pcb board and an Interface that runs on your PC that you can use to write and upload code to the actual board.

**1.3 MOTOR DRIVER SHEILD:**

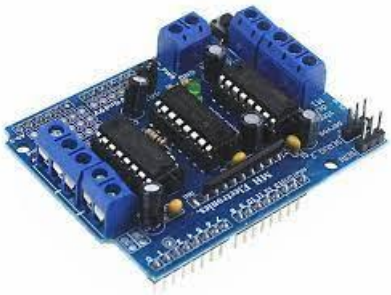

Fig. 4. Motor shield

Based on the L293D, a Half-bridge driver intended to drive inductive loads like DC and stepping motors, the Arduino Motor Shield can drive these types of motors. You may use your Arduino board to independently controlling the direction and speed of two Motors.Technically, the shield is equipped with two L293D ICs, making a total of four DC motors controllable. Both two-wheel and four-wheel robot platforms may use this.You may utilise the shield's power supply to power Arduino as well, or you can use separate power sources for the two devices. A power jumper must be installed on the shield if they will be using the same power source.

**1.4 SHARP INFRARED RAY SENSOR:**

Fig. 5. Infrared sensor

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

In order to detect a certain light wavelength in the infrared (IR) spectrum, IR sensors employ a particular light sensor. You may measure the received light's intensity by using an LED that emits light at the same wavelength that the sensor is looking for. To determine the location of a line follower in relation over to robot position, infrared ray sensors are utilised. In order to operate along a line, IR sensors are frequently utilised in the creation of line-following robots.

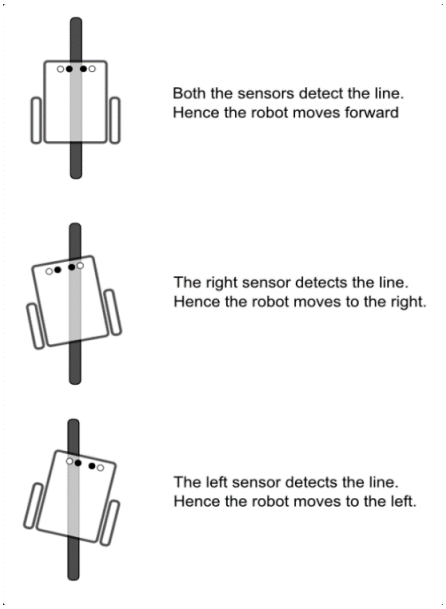


**Fig. 6.** Working of Infrared sensor

To determine the location of a line follower in relation over to robot position, infrared ray sensors are utilised. In order to operate along a line, IR sensors are frequently utilised in the creation of line-following robots.

**1.5 ULTRA SONIC SENSOR:**

**Fig. 7. Ultrasonic sensor**

Avoidance of Obstacle Sensors There are numerous sensors that can be used for obstacle detection. Their main objective is to identify and avoid barriers in the robot's construction, we are using ultrasonic sensors. The frequency signals from the ultrasonic sensors are continuously emitted; when there is an obstruction, The sensor interprets these signals as input when they are directed back.

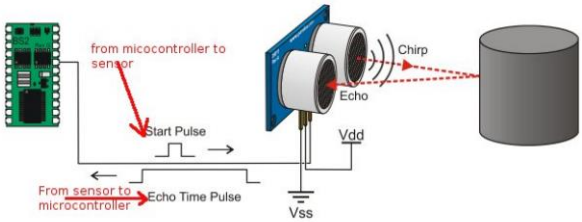


Fig. 8. Working of Ultrasonic sensor

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

To begin the measurement, the controller will give the Ping sensor a signal. After that, the Pulsein command is started by the controller while the Ping sensor waits. The sensor will transmit a 40 kHz tone at the same time as sending a strong signal to the controller.This calculation of time indicates the amount of time required for sound to reach an item and return.

**1.6 SERVO MOTOR:**


Fig. 9. Servo motor

A servo is made up of a motor (either DC or AC), a potentiometer, a gear assembly, and an electronic control circuit. In order to lower the motor's RPM and enhance its torque, we first employ a gear assembly. Imagine that the potentiometer knob is in such a position that no electrical signal is produced at the output terminal of the potentiometer while the servo motor shaft is in its original position. Now, another input port of the error detection amplifier is provided an electrical signal. The difference between these two signals, one of which is generated by a potentiometer and the other by a different source, will now be analysed by a feedback mechanism, and an output will be given in the form of an error signal.

**1.7 MOTOR:**

Fig. 10. DC motor

A revolving electrical device called a direct current (DC) motor transforms electrical energy from direct current (DC) into mechanical energy. As DC voltage is given to an inductor's terminal, the coil within the DC motor generates a magnetic field that causes rotational motion. An iron shaft that is covered with a coil of wire is located inside the motor. Two fixed North and South magnets are located on either side of this shaft, creating both an attracting and a repulsive force that results in torque.

**1.8 BUZZER:**

Fig. 11. Buzzer

ISSN PRINT 2319 1775 Online 2320 7876

*Research paper*  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

A mechanical, electromechanical, piezoelectric, or other sort of audio signalling device, such as a buzzer or beeper, is also possible. This is mostly used to transform audio signals to sound.It may produce varied sounds like alarm, music, bell, and siren depending on the various designs. Below is a diagram illustrating the buzzer's pin arrangement.

**CIRCUIT DIAGRAM**

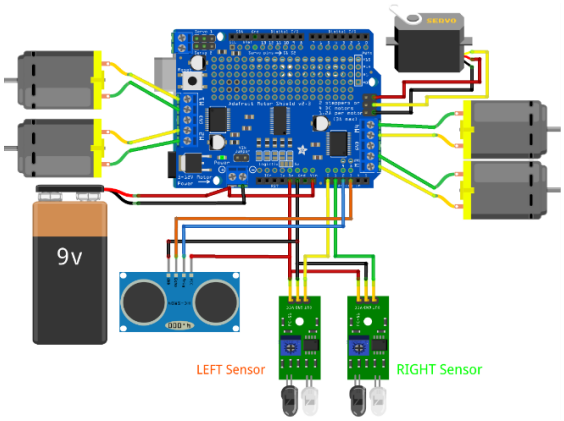


Fig. 12. Circuit diagram

**Procedure for line sensing**

A type of design that is comparable to a light follower robot is the line follower robot. Here, the sensor is employed to detect a border in addition to knowing light.Therefore, any light-detecting device might be utilised for the robot's navigation to proceed its assigned track by customising the colour of the line and its boundaries. One pair of infrared ray sensors were mounted below the robot according to its design. In order to identify a white background with a black line, an infrared ray sensor will first provide a wavelength, after which another infrared ray sensor will receive the information and decide whether to follow the black line.

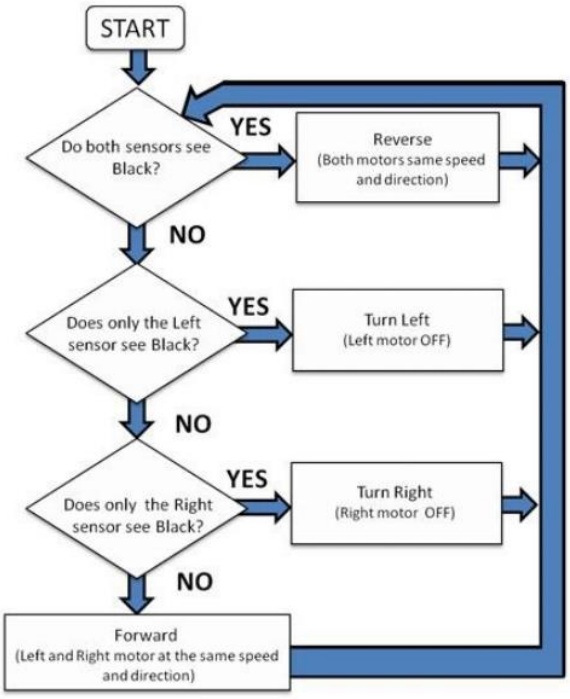


Fig. 13. Flow chart for line following

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

**Procedure for object avoidance**

We should coordinate Arduino board and using an ultrasonic sensor we construct a robot that avoids obstacles. The connections are all established in accordance with the circuit schematic. The project's operation is described below. When the robot is turned on, all the motors function normally, and it starts to move. The robot's proximity to the reflecting surface is continually measured by the ultrasonic sensor throughout this period. The Arduino handles the processing of this data. The robot pauses and scans left and right using a servo motor and an ultrasonic sensor to determine a new distance if there is less than 15 cm between it and the barrier.

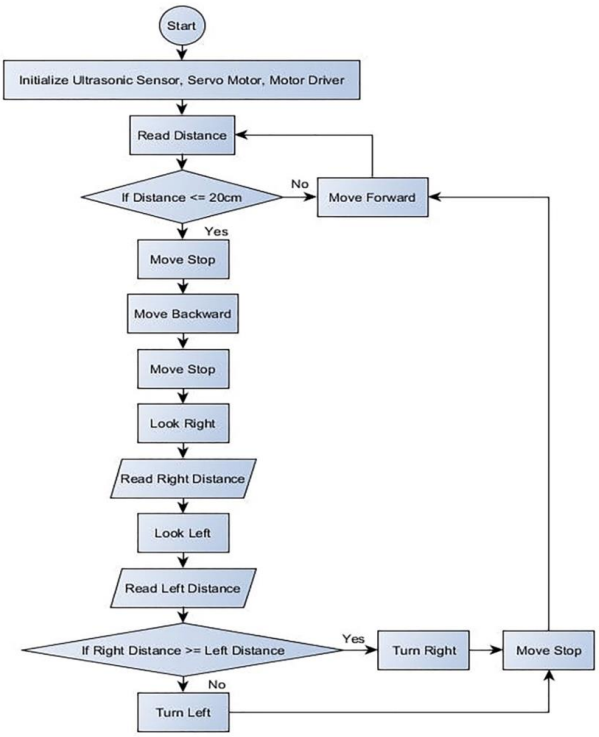


Fig. 14. Flow chart for obstacle avoiding

The robot will get ready to turn to the left if the left side's distance is greater than the right side's. However, it slightly retreats before turning on the left wheel motor in the opposite direction. Similar to this, the robot gets ready to rotate to the right if the right distance is greater than the left distance. The robot maintains going forward during this procedure without running into any obstacles.

**ROBOT**

**Applications**

1) Almost all mobile robot navigation systems can make use of obstacle-avoiding robots.
2) They are suitable for home tasks like robotic vacuuming.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 12, Dec 2022

3) They can be employed in hazardous conditions where human entry would be lethal.
4) Industrial automated equipment carriers.
5) Automated cars.

**Conclusion**

This project created a robot that can follow a line while also spotting and dodging obstacles in its route. The Arduino framework for information processing was used to build the robot, and its software equivalent assisted in connect with the machine to convey movement instructions. Two sets of IR sensors are employed to follow lines, while ultrasonic distance sensors, which have a larger range of detection, were utilised to identify obstacles. After the boot - up of the code, the robot is completely autonomous and doesn't need any user input to function. When put in an area with obstacles that was new to it, it moved by precisely following the line, avoiding every barrier.

**References**

[1] Amir attar, aadilansari, abhishek desai, shahid khan, dip ashrisonawale “line follower and obstacle avoidance bot using arduino” International Journal of Advanced Computational Engineering and Networking, vol. 2, pp. 740-741, August 1987
[2] Paul Kinsky,Quan Zhou “Obstacle Avoidance Robot” Worcester polytechnic institute.
[3] Pakdaman, M, Sanaatiyan, M.M., “Design and Implementation of Line Follower Robot”, Proceedings of IEEE conference, pp 2-4, Dec. 2009.
[4] David Cook, “Robot Building for Beginners”, 2nd ed., Apress, pp 247-250, January, 2010.
[5] Parallax Inc., “PING))) Ultrasonic Sensor”, pp 1- 6, September 2007