LINE FOLLOWER AND OBSTACLE AVOIDANCE BOT USING ARDUINO

[1]AAMIR ATTAR, [2]AADIL ANSARI, [3]ABHISHEK DESAI, [4]SHAHID KHAN, [5]DIPASHRI SONAWALE

E-mail: [1]aamirattar95@gmail.com, [2]ansariadi1246@gmail.com, [3]abhishekdesai56@gmail.com, [4]49masko@gmail.com, [5]deepasonawale@gmail.com

Abstract - This paper is designed to build a line follower and obstacle avoidance bot using IR sensor and ultrasonic sensor. The IR sensor is meant to trace a particular line and ultrasonic sensors are meant to detect obstacles which it encounters. ROBOT has sufficient intelligence to cover the maximum area of space provided. It will move in a particular direction specified by the user and avoids the obstacle which is coming in its path. Autonomous Intelligent Robots are robots that can perform desired tasks in unstructured environments without continuous human guidance. The path can be visible like a black line on the white surface (or vice-verse). The base of the robot is Arduino UNO R3 which is a microcontroller board based on the ATmega328 (datasheet).

I. INTRODUCTION

We proposed a bot that follow a path and avoids the obstacle which comes in its path this bot is introduced because in many of the industries we have seen that many heavy components which they have to move for one place to another place which is not possible without the help of machines. With this we got idea and we introduce the bot named as Line follower and obstacle avoidance bot using Arduino. Line follower robot is a system which traces white line on a black surface or vice-versa. Obstacle avoidance robot is design to allow robot to navigate in unknown environment by avoiding collisions. Obstacle avoiding robot senses obstacles in the path, avoids it and resumes its running. In this paper a line tracer or follower has been presented which will trace a white line on a black surface or vice-versa. We have make use of sensors to achieve this objective. We have used two B.O.MOTORS i.e battery operated motors. The reason behind using BO motors is it consumes less power supply and can work properly on 9 volt battery. The construction of the robot circuit is easy and small. The main component behind this robot is ATmega328p microcontroller which is a brain of this robot. The idea proposed in this paper is by using machine vision to guide the robot. The field of machine vision has growing at a fast pace. Machine vision applications can be divided into four types from a technical point of view. They can be used to locate, measure, inspect and identify. The robot proposed in this paper is guided with the help of machine vision. The best part of our project is that if any obstacle is encountered by the robot the robot automatically stops and bluetooth module HC-06 comes into the picture and user can control the robot manually.

II. RELATED WORKS

1. Obstacle Avoidance Robot:-

This paper was proposed by [1], Kriti Bhagat, Saylee Deshmukh, Shraddha Dhonde, Sneha Ghag.This project is design to build an obstacle avoidance robotic vehicle using ultrasonic sensors. A micro-controller (AT mega 8) is used to achieve the desired operation.

2. Micro-Controller Based Obstacle Avoiding Autonomous Robot:-

This paper was proposed by [2], Subhranil Som, Arjun Shome. Robot uses 8051 microcontroller to move and avoid the obstactle which coming through path.

3. Design and Fabrication of Line Follower Robot:-

This paper was proposed by[3], M. S. Islam & M. A. Rahman. In this a 700gm weight of a 9W LDR sensor based line follower robot which always directs along the black mark on the white surface.

4. Sensor Based Black Line Follower Robot:-

This paper was introduced by [4], Prananjali Koppad, Vishnu Agarwal.In this robot uses IR sensor to follow certain black line.

5. Implementing a Line Tracing Robot as an effective Sensor and Closed Loop system:-

This paper is proposed by [5], S. Akash, Bibek Kabi , Mr. S.Karthick. This study aims to investigate "the use of computer controlled line follower robots in public transport".

6. An intelligent line-following robot project for introductory robot courses:-

This paper is proposed by[6], Juing-Huei Su, Chyi-Shyong Lee, Hsin-Hsiung Huang, Sheng-Hsiung Chuang & Chih-Yuan Lin. The line-following robot devised in this article for educational purposes includes not only accurate line detection algorithms with analog outputs of reflective optical sensors, but

also home-made encoders, which help record all information about the racing track.

7. Arduino Based Bluetooth Controlled Robot:-
This paper was introduced by [7], Subankar Roy, Tashi Rapden Wangchuk, Rajesh Bhatt. This paper uses a bluetooth module along with arduino board to control the robot.
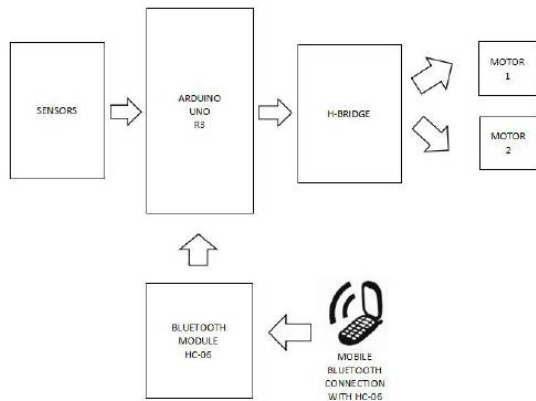
III. SYSTEM OVERVIEW

Fig.1: Block Diagram of Line following and obstacle
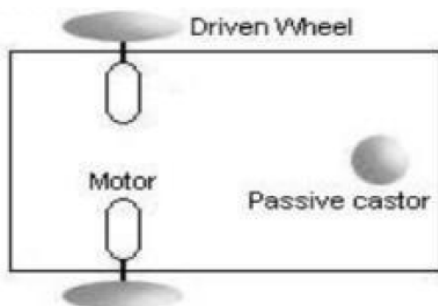
i. THE CHASSIS AND THE BODY:-

Fig.2: The Chassis

Some good materials can be used for designing robot chassis such as wood, plastic, aluminum and brass alloys. We must pay attention to the resistance, weight and mechanical ability for choosing one of them.
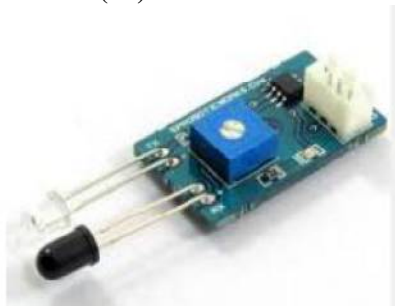
ii. INFRARED (IR) SENSORS:-

Fig.3: IR Sensors

An infrared sensor is an electronic device that emits in order to sense the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiations.
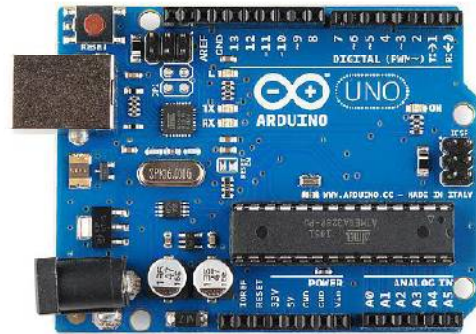
iii. ARDUINO UNO R3:-

Fig.4: Arduino Uno R3

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board and IDE that runs on your computer, used to write and upload computer code to the physical board. The Arduino IDE uses a simplified version of C++, making it easier to learn to program.

iv. BO MOTORS:-

BO motor gives good mechanism and rpm at lower operating voltages, which is the biggest advantage of these motors. Small shaft with matching wheels give optimized design for your application or robot.
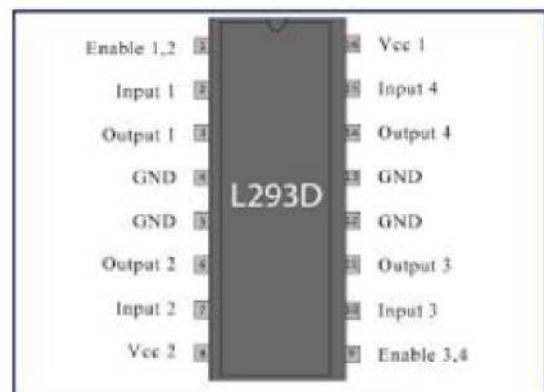
v. MOTOR DRIVER (H-BRIDGE):-

Fig.5: Motor Driver L293D

Motor Driver acts like the current amplifier. It controls the f low of current in the motor. Arduino board is not capable of providing direct current to the motors so to amplify current motor driver is used. L293D can rotate the motor in the forward and reverse direction.

vi. BLUETOOTH MODULE HC-06:-

Fig.6: HC-06

The HC-06 module only acts like a slave. So it can only be controlled by a master device.

IV. WORKING OF LINE FOLLOWER AND OBSTACLE AVOIDANCE

Concept of working of line follower and obstacle avoidance is related to light. We use here the behavior of light at black and white surface. When light falls on a white surface it is almost full reflected and in case of black surface light is completely absorbed. Following figure shows the reflection of light on black and white surface. We have used IR transmitter and IR receivers also called as Photo diodes. They are used for sending and receiving light. IR transmits infrared lights. When infrared rays falls on white surface, it's reflected back and catches by photodiodes which generates some voltage changes. When IR light falls on a black surface, light is absorb by the black surface and no rays are reflected back, thus photo diode does not receive any light or rays.
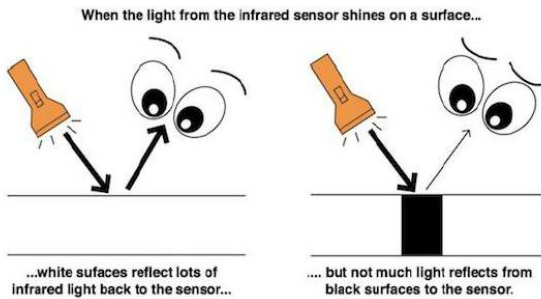

Fig.7: Reflection of light on black and white surface

The whole line follower robot can be divided into 3 sections:

"SENSOR SECTION", "CONTROL SECTION", "DRIVER SECTION".

- ➢ **Sensor section:** This section contains IR sensors, Ultrasonic sensors and LED's. These section is used to sense the particular path or obstacle which comes in between its path.

- ➢ **Control section:** Control section consists of Arduino UNO R3 which is used for controlling whole process of line following

and obstacle avoidance. Arduino reads every pin from each component and acts accordingly.

- ➢ **Driver section:** Driver section consists of Motor driver and two BO motors. Motor driver is used for driving motors because Arduino does not supply enough voltage and current to motor. Arduino sends commands to this motor driver and then it drives motors in any direction as we want. Working of line follower and obstacle avoidance robot is very interesting. Then Arduino drives the motor according to sensors' output.
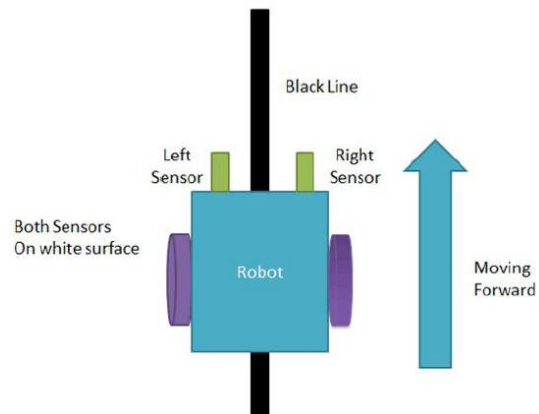

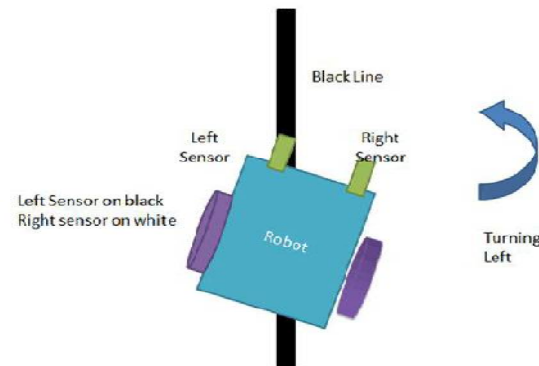**Fig.8: When both left and right sensor senses white then robot move forward.**

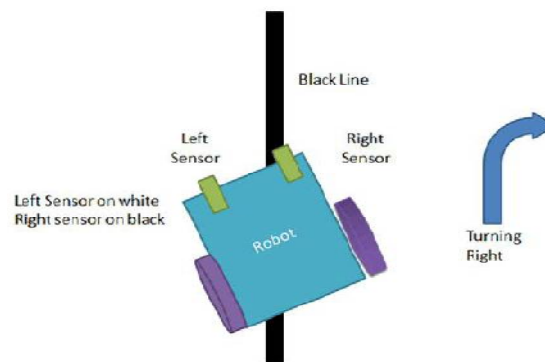**Fig.9: If left sensor comes on black line then robot turn left side.**

Fig.10: If right sensor sense black line then robot turn right side until both sensor comes at white surface. When white surface comes robot starts moving on forward again. And if no line detected robot will stop.
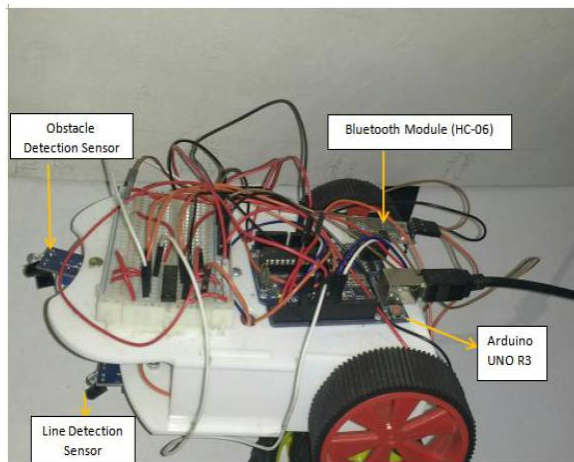
V. RESULTS

Fig.11: Detailed Labelling of Components Used.

The figure shown below shows the working of the Robot which follows a specific line and encounters the obstacle coming in its path simultaneously. As it detects obstacle, the bluetooth module as shown in fig.6 enables and the user manually avoids the obstacle with the help of an Android Device.
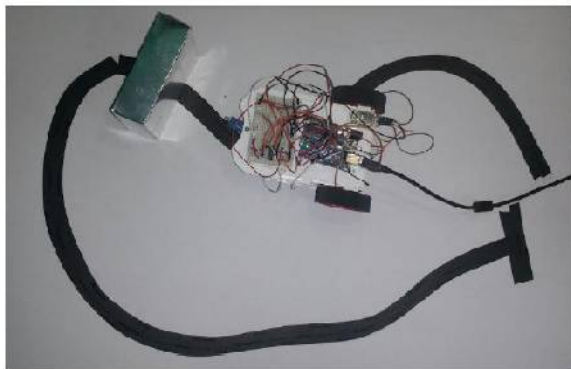

Fig.12: While Following Line Robot Encounters Obstacle

Table1: Working of Robot

Input		Output				Movement of Robot
Left Sensor	Right Sensor	Left Motor		Right Motor		
		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

VI. FUTURE WORK

This paper is all about Line Follower and Obstacle Avoidance Bot using Arduino which will follow a specific line or path and avoids obstacles which it encounters. In future this project can be enhance by connecting Bluetooth module and a camera so that the user can see the detected obstacle on his screen by sitting at just one place.

CONCLUSION

The goal of our project is to create an autonomous robot which intelligently detects the obstacle in its path and navigates according to the actions that we set for it. So what this system provides is an alternate to the existing system by replacing skilled labor with robotic machinery, which in turn can handle more patients in less time with better accuracy and a lower per capita cost.

REFERENCES

[1] Kriti Bhagat, Saylee Deshmukh, Shraddha Dhonde, Sneha Ghag publications of International Journal of Science, Engineering and Technology Research (IJSETR), Volume 5, Issue 2, February 2016.

[2] Subhranil Som, Arjun Shome by publication Subhranil Som Int. Journal of Engineering Research and Applications, ISSN: 2248-9622, Vol. 4, Issue 6 (Version 3), June 2014.

[3] M. S. Islam & M. A. Rahman published by Asian Journal of Applied Science and Engineering, Volume 2, No 2 (2013).

[4] Prananjali Koppad, Vishnu Agarwal published by International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, IJERTV3IS090023 Vol. 3 Issue 9, September-2014

[5] S. Akash, Bibek Kabi , Mr. S.Karthick published by International Journal of Recent Trends in Engineering, Vol 2, No. 7, November 2009.

[6] Juing-Huei Su, Chyi-Shyong Lee, Hsin-Hsiung Huang, Sheng-Hsiung Chuang & Chih-Yuan Lin published by World Transactions on Engineering and Technology Education 2010 WIETE Vol.8, No.4, 2010

[7] International Journal of Engineering Trends and Technology (IJETT) – Volume 32 Number 5- February 2016. Subankar Roy #1, Tashi Rapden Wangchuk#2, Rajesh Bhatt#3

★ ★ ★