Line Follower Alphabot Using Arduino Micro Controller

[1] M. Srilekha, [2] Noureen Fathima, [3] G.Anusha, [4] D. Shravana Chary
[1] Assistant professor, [2][3][4] Student
Balaji Institute of technology and science Warangal, Telangana,

Abstract: -- This paper has been designed to build a Line following Robot using IR sensor to follow a designated path which is provided and runs over it. ROBOT has sufficient intelligence to cover the maximum area of space provided. It will move in a particular direction Specified by the user to navigate the robot through a black line marked on the white surface. Autonomous Intelligent Robots 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-versa) or it can be invisible like a magnetic field. Sensing a line and manoeuvrings the robot to stay on course while, constantly correcting wrong moves using feedback mechanism forms a simple yet effective closed loop system. The base of the developed robot is Arduino UNO R3 which is a microcontroller board based on the ATmega328 (datasheet).

Keywords: Line follower, IR sensor, Robot, Arduino, ATmega328.

I. INTRODUCTION

Robot is a machine that is usually designed to reduce the amount of human work where it is applicable. It is usually developed for reducing risk factor for human work and increase comfort of any worker. Robotics has greatly advanced in the developed countries. High performance, high accuracy, lower labor cost and the ability to work in hazardous places have put robotics in an advantageous position over many other such technologies But as for developing countries like Bangladesh it is still quite out of reach. In this paper a line tracer or follower has been presented which will trace a white line on a black surface or vice-versa [2]. We have make use of sensors to achieve this objective. 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 We have made a robot that has several works to perform besides following a line [1]. It can be assured that the robot can detect three ways round obstacles while following a black line and a switch is added to make it smarter and more efficient and easier to operate. Our robot revolves around itself when it is somehow removed from the black line; and it starts following a black line on a white surface.[5]So our line follower robot is being called a line follower with several modes to operate Other use of this robot includes entertaining when it just follows a line without going to other direction. 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. [6]

II. BLOCK DIAGRAM

Here firstly, we chose a configuration to develop a line follower only using two infrared sensors with connection of Arduino Uno through motor driver IC. We followed a block diagram on thi regard. The block diagram illustrates the connection for the development of the line follower which follows a black line on white surface.[3][4]
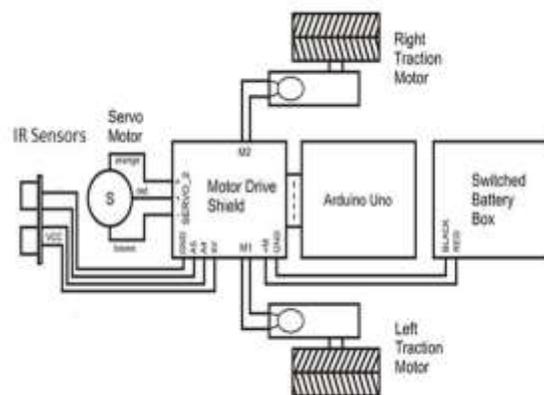
Fig.1. Block diagram of a line follower robot

After that, we have used the following block diagram for connecting three sonars with our line follower for obstacle detection purpose for our line follower.

Fig.2. Overall Block Diagram

III. FLOW CHART

The system for the line follower is designed using a flow chart defining, how it will be following its designated line in its path. This flow chart contains the method, how the robot is taking decisions on its pathway [7]. Line follower robot is mainly dependent on sensor system and its process is slow. The robot is made to be able to reach faster towards its destination so that it becomes speedier and more effective for its work.
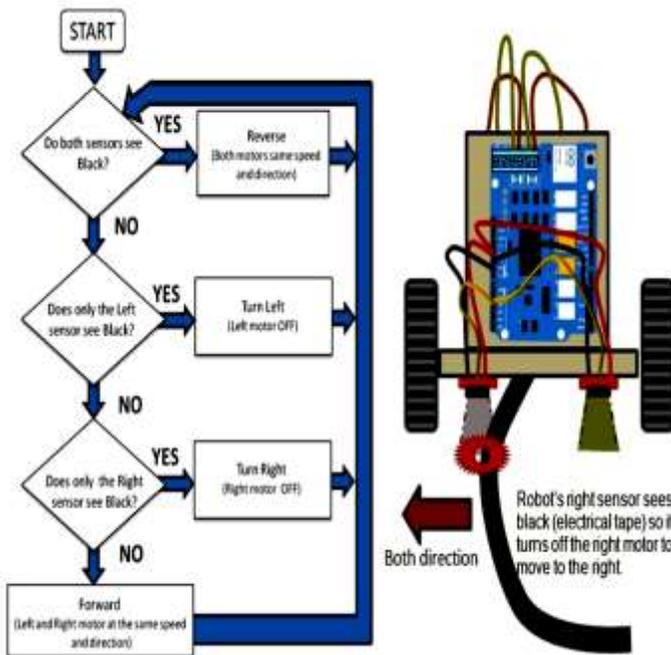
Fig.3. Flow chart of line follower

IV. EQUIPMENTS USED

THE CHASSIS AND THE BODY
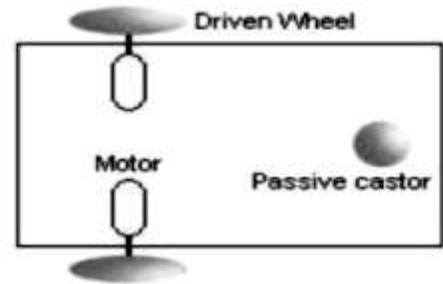
Fig.4: The Chassis

Here Some good materials can be used for designing robot chassis such as wood, plastic, aluminum and brass alloys.[9] We must pay attention to the resistance, weight and mechanical ability for choosing one of them.

ARDUINO UNO R3

Fig.5: Arduino Uno R3

Arduino is an open-source platform used for building electronics projects[8]. 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.

IC L293D

The most common method to drive DC motors in two directions under control of a computer is with an Hbridge motor driver. H-bridges can be built from scratch with bi-polar junction transistors (BJT) or with field effect transistors (FET), or can be purchased as an integrated unit in a single integrated circuit package such as the L293. The L293 is simplest and inexpensive for low current motors, For high current motors, it is less expensive to build your own H-bridge

from scratch. Motor driver is basically a current amplifier which takes a low-current signal

from the microcontroller and gives out a proportionally higher current signal which can control and drive a motor. L293D IC generally comes as a standard 16-pin DIP (dual-in line package). This motor driver IC can simultaneously control two small motors in either direction; forward and reverse with just 4 microcontroller pins.

LINE SENSOR

Infrared Ray Sensors are used to find out the position of a line follower with respect to the robot position. For line sensing operation, IR sensors are the one which are widely used for the development of a line follower robot. There are some basic things to follow where white surface of the black line reflects light and the black line receives it after the transmission. Two resistors R1 and R2 are used which limits current. Other resistors (R3, R5, R6, R8) forms individual voltage divider networks which is in connection with the designed LDR's. When the sensor is properly classified, both LED/LDR pairs will run over the white surface. In this condition, sufficient amount of light gets reflected back to the LDRs. So, their resistance will be low. So the voltage dropped across the LDR will be low. When the robot is drifted to one side, the sensor in the opposite side falls over the black line and the intensity of light reflected back to the corresponding LDR will be low. As a result, the resistance of the LDR shoots up and the voltage dropped across it will be high. The voltages dropped across the right and left LDRs (nodes marked R and L in the above circuit) are given as input to the analogue input pins A3 and A4 of the Arduino board. The line sensors are made using LDR and LED for making a line follower robot. A 1K resistor across the LED, a series connection of 10K resistor and 10K variable with the LDR are major resistive and sensor connections. These sensors are soldered in a board (Chassis) and then we use that for our system. It is powered by (4*1.5) V battery.
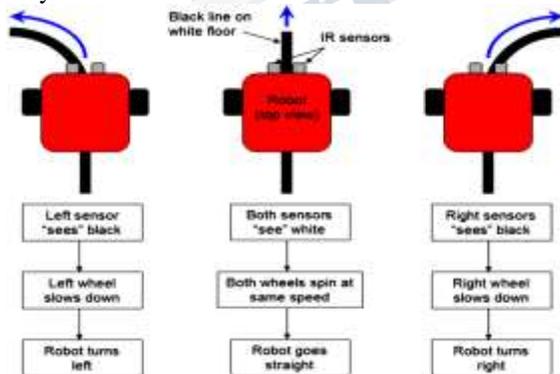

Fig. 6.Line sensing decision

V. PROCEDURE OF SENSING THE LINE

The line follower robot is a kind of a design which is similar as a light follower robot. Here, besides sensing the light, the sensor is used for detection of a line. Therefore by individualizing the color of line and its enclosing, any light sensitive sensor could be used for navigation of the robot to follow its designated track. The design of the robot was made like; it had one pair of Infrared ray sensor fitted underneath the robot. So Infrared ray sensor will first be sending a wavelength for detecting black line and then other infrared ray sensor will be receiving the information and take decision forfollowing a black line on white surface. With the supply from an 9V DC power adapter the whole sensor and the motor driver IC and the motors and arduino are powered. Making the setup lessprone to power failure The outputs of the sensor circuits are connected as in the analog inputs of the arduino board.

VI. RESULTS

The figure shown below shows the working of the Robot which follows a specific line path simultaneously. This line follower robot with multiple modes compatibility works perfectly fine as it is designed to do. There were many different pathways but the robot was still able to sense the line and follow the roadmap. The designated tasks for the line follower robot with multiple modes are successfully examined and this group who made this robot is very much active about the project
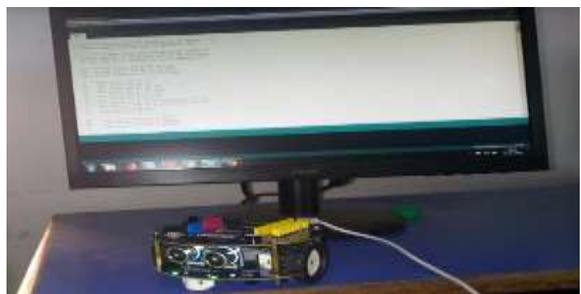
VII. CONCLUSION

The goal of our project is to create an autonomous robot which intelligently detects its path and navigates according to the actions that weset 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 lowerper capital cost. The robot that has been constructed can be differentiated from the other line followers existing these days'. The special features of this robot's construction are- It is pretty much cost efficient to build which makes it smarter. Thus, the purpose of making the line follower robot with sensing compatibility was fulfilled.

VIII. FUTURE WORK

This paper is all about Line Follower Alphabot using Arduino which will follow a specific line or path and 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. We will use PWM technique for improving line following. We used two sensors for this line following robot but in next we will use five sensor arrays for detecting black line quickly. We will be introducing several other color sensors in the further development process where our follower will be able to detect other different colors also and we want to make it better using previously mentioned way.[10]

REFERENCES

[1] Line follower robot. Retrieved from http://www. engineersgarage. Com /contribution /line-follower- robot

[2] How to make a line follower robot. Retrieved from http://www.instructables. Com /id /

[3] Retrived from circuitstoday.com www.duino4projects. com, techfeasta. com,

[4] Retrieved from techblog.pulkit.eu

[5] www.robotsreloaded. Com /p /line- following- robot-without.html

[6] Mobile Robot. Retrieved Fromhttps :// en.wikipedia. org /wiki /Mobile_ robot

[7] letsmakerobots.com

[8] http:// www. instructables. com, www.arduino.cc, electronics. stackexchange.com

[9] Design and fabrication of line following robot. Retrieved from http://journals.abc.us.org/index.php /ajase /article /view /4.2pdf

[10] Android based autonomous colored line follower robot. Retrieved from doi.org/10.15623/ijret.2014.0315072

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

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

[13] 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

[14] International Journal of Advanced Computational Engineering and Networking, ISSN: 2320-2106, Volume-5, Issue-4, Aprl.-2017

[15] A Novel Design of Line Following Robot with Multifarious Function ability, Dhaka-1229, Bangladesh, 2016