



AN ADVANCED LINE FOLLOWER ROBOT USING ARDUINO

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ABSTRACT

The main objective is to design a line follower robot is to carry products in the manufacturing process in industries. In this paper, we mainly focused on the design to work the line follower efficiently with lighter weight. The line follower robot designed with 5 sensors to make the robot move in even complex paths. This paper discussed the mechanical and technical issues with the line follower robot and applications in various fields. In the working model, we used black detector infrared sensors So that speed of response of the robot is high. This paper gives an brief idea about all the components used to prepare a line follower robot

Keywords: *Arduino UNO, 7805 voltage regulator, Infrared sensors (Black Detector), Battery 12V, Breadboard, Motor Driver*

1. INTRODUCTION

Line follower is a machine that can follow a path. The path can be black or white surface.

- In the early year about 1800 robots were built for entertainment purpose. They were named as robots only they operated based on linkages. Later automatic draw loom was invented by Joseph Maria in the year 1801 and draw loom was controlled by lifting of thread in fabric factories. This was the first robot to store a program and control a machine. After that there were introduced into robotics.
- The Artificial arms were developed by George Devol Jr in the year 1954 which lead to modern robots. In 1950 Isaac

Asimov gave laws for robots and these were:

1. A robot may not harm or injure a human beings
2. A robot must obey the orders of human beings except orders conflicting first law
3. A robot must protect its own existence and it should obey first and second law

High performance, high accuracy, lower labour cost and the ability to work in hazardous places have put robotics in an advantageous position over many other such technologies. In this paper a line tracer or follower has been presented which will trace a black line on a white surface or vice-versa. We have make use of sensors to achieve this objective. The main component behind this robot is ATmega328 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. This robot follows a line without going to other direction. The construction of the robot circuit is easy and small. This can also be used in many applications such as automatic valet parking in efficient way. The rapid increase in urban car ownership not only increases the burden of urban traffic but also exacerbates the problem of insufficient parking spaces. The increased driving distance in the parking process increases energy consumption and exacerbates parking difficulties, which increasing the number of minor accidents, such as scuffing and collisions

2. BLOCK DIAGRAM OF LINE FOLLOWER

A Line Follower Robot mainly works on the principle that as the IR sensors gives input signal to Arduino and According to code, it Arduino gives output signal to the motor driver so that motors will be controlled and makes the robot to follow the black line accurately After that, we have used the following block diagram for connecting two sensors with our line follower for obstacle detection purpose for our line follower

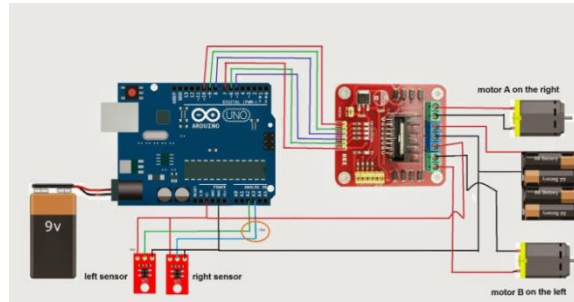


Fig. 1 – Block diagram

3. ASSEMBLY

- Step 1:

Prepare a Chasis for the Line Follower Robot in such a way that it is very light weight plastic fiber in the dimensions of 20cm length, 11.5cm width and 0.5cm thickness

- Step 2:

Arrange all the components with glue gun according to the connections given in the code keep the sensors as 1 at middle position, 2 and 3 sensors are placed with a gap between 6cm, 4 and 5 sensors are placed at the either side.

- Step 3:

Give the sensors connection of VCC and GND to the breadboard and OUT to the Arduino Digital input

- Step 4:

Give 12V battery terminals to breadboard where the 7035 regulator is placed so that it will convert to 5V and gives to Arduino board supply and to IR sensors

4. COMPONENTS USED

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4.1 Arduino:

- Arduino designs microcontroller based development boards are known as Arduino modules. They are open source Prototyping platform which comes in development board packages.
- The common program approach is using Arduino IDE, which will be written in C program language.
 - Ram: 2kb
 - Operating Voltage: 5V
 - Input Voltage: 7-12 V
 - Number of analog inputs: 6
 - Number of digital I/O: 14 (6 of them pwm)

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

Arduino Uno Pinout - Analog IN

- The Arduino Uno has 6 analog pins, which utilize ADC (Analog to Digital converter).

These pins serve as analog inputs but can also function as digital inputs or digital outputs

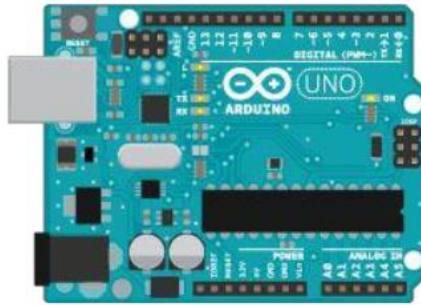


Fig. 2- arduino uno

4.2. IC L293D

The most common method to drive DC motors in two directions under control of a computer is with an H-bridge 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

4.3. L293D Module

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



Fig. 3- L293D Module

4.4. IR SENSOR

The concept of working of a line follower robot is based on the phenomenon of light. We know that white colour reflects almost all of the light that falls on it, whereas black colour absorbs most of the light. In case of a line follower robot we use IR transmitters and receivers also called photodiodes. They are used for sending and receiving light. IR transmits infrared lights. When infrared rays falls on white surface, it's reflected back and caught 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.

Here in this Arduino line follower robot when sensor senses white surface then Arduino gets 1, ie, HIGH as input and when senses black line arduino gets 0, ie, LOW as input

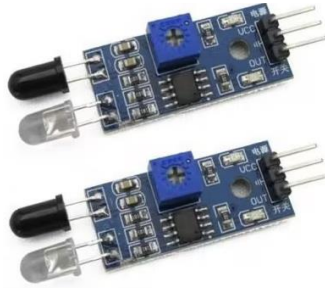


Fig. 4- IR sensor

5. ALGORITHM FOR LINE DETECTION

If we want the left motor to rotate in one direction, we apply a high pulse to IN1 and a low pulse to IN2. To reverse the direction, reverse the pulses to IN1 and IN2. The same applies to the right motor.

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Speed control is also possible with the L298N motor driver. All we need is feed PWM (Pulse Width Modulation) signals to the motor enable pins. The speed of the motor will vary according to the width of the pulses. The wider the pulses, the faster the motor rotates. In Arduino this can be done using `analogWrite(pinNumber, duration)`. Pins on Arduino with '~' support PWM

5.1 Circuit connections for L298N H-Bridge Motor Driver:

- Motor A wires are connected to motor terminal 1 and 2 of L298N, whereas Motor B wires are connected to motor terminal 3 and 4. IN1, IN2, IN3 and IN4 are connected to pin 2, 3, 4, 7 respectively.
- Now, Motor A and Motor B Enable should be connected to terminals on arduino which have ~ sign, so that speed of these motors can be controlled using PWM. Here, they have been connected to pin 5 and 6. Other connections are clear from the schematic

6. CONCLUSIONS

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 unauthorized 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

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