



Fabrication of Line Follower Robot

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ABSTRACT:

The robot is used to work without the requirements of human beings. The line follower robot is an autonomously working robot moves by following the path. The path is generally is painted or drawn on the floor visible on the surface or invisible line follower by using magnetic field. The robot senses the le on the surface by the optical sensors the optical sensing arrays helps the robot movements precisely to move on the line. The kinematics of robot Is important role in line follower robot for the movements by self-operating controlling system. The IR LED Lights which emit infrared rays are used to sense by reflection back of the infrared rays to the transmitter. The turnings and movements of the line follower robot is operated by the programming the Arduino board installed in the robot by the commands and the connections driving controls. The dc motor drives the movements to follow the line are operated by the integrated circuit micro-controller provides the control signal to drive the motors. The notification signals for the end of the tracing line by the piezo electrical buzzers. The applications of line follower robot are automated material handling, domestic purpose, automated carriers and transportation. The line follower robot is line tracing robot.

Keywords: *Optical IR Sensors, Line following, Arduino program controlling, integrated micro controller.*

1. Introduction

A Robot is any machine which is works automatically, i.e., it starts, decides its own way of work and stops on its own. It is actually similar to human being which has been designed to reduce human burden can be controlled mechanically, pneumatically or using hydraulic ways or using the simple electronic control ways The first industrial robot was Unimates but by George Devol and Joe Engel Berger in the lane 50's and early 60% Any robot in built on 3 basic laws defined by the Russian science fiction author Isaac Asimov they are

- A robot should not harm the human being directly or indirectly.
- A robot should obey human orders unless and until it violates the first law.
- A robot should protect its own existence provided the 1st two laws are not violated.

Line follower robot a line follower robot a robot which follows a certain path controlled by a feedback mechanism. These robots may be used to in various industrial and domestic purposes. Applications such as to carry goods, floor cleaning, delivery services and transportation. The line follower robot senses a black line by using a sensor and then sends the signal to Arduino. Then Arduino drives the motor with the motor driving sensor. without any external control and certain micro controllers according to sensors input. The two IR sensors in left and right. It is made up of an infrared LED and a phototransistor placed next to each other. The LED acts as a transmitter, and the phototransistor acts as a receiver. The project aims to create a line follower robot able to follow a path and reach its desired destination. Sensing the line robot while constantly correcting wrong moves using feedback from sensors forms a effective system. The line follower Robot can be controlled by with our without micro controllers, mobile based and radio frequency. Darker objects reflect less light, and are indicated by higher numbers. Lighter objects reflect more light, and are indicated by lower numbers and the robot can operated by the android applications by programming the Arduino component with software's in C++ software language.

Objectives: The robot must be capable of moving with following the line.

2. Literature review

Literature review was carried out throughout whole Project to gain knowledge and skills to make This project. [1] This Review suggests that 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. Working of line follower Robot without any Microcontroller.[2] This review suggests The line or path following robot can runs over a specific path with the help of sensors and specific logic used in the controller. Initially it will take some time for PCB designing, printing and hardware debugging.[3] We studied Surveillance systems using line control Robot fully functional prototype of a FLC-LFR Mobile surveillance camera monitoring is very important where it gives higher coverage region than an ordinary Surveillance.[4] In this review we learn about basic principles of electronics and the implementation

techniques which can be used for advanced project implementation. Basics of transistors are used for this and the motors are driven by this, the circuit is designed in such a way that we are able to use advance application of this robot.[5] In this review we study about basic line sensing system, design and fabrication of line follower robot and its electrical systems and circuits.[6] In this review we referred a photodiode sensor-based line follower robot which always directs along the black line on white surface. The electromechanical robot with max rpm 180 at no load and frictionless condition. [7] The study shows a robot is capable of following any curve or cycle. Highly efficient stepper motors can be used to control the speed of line follower robot. For better detection of obstacles along the line.

3. Components

Buzzer

A buzzer or beeper is an audio device, which may be mechanical, electromechanical, or piezoelectric used in line follower robot at end of the tracer line and start, stop of the robot.



Capacitor

Capacitors are used for storing energy, which can be used by the device for temporary power outages whenever they need additional power. Capacitors are used for blocking DC current after getting fully charged and yet allow the AC current to pass through the circuit of a circuit.

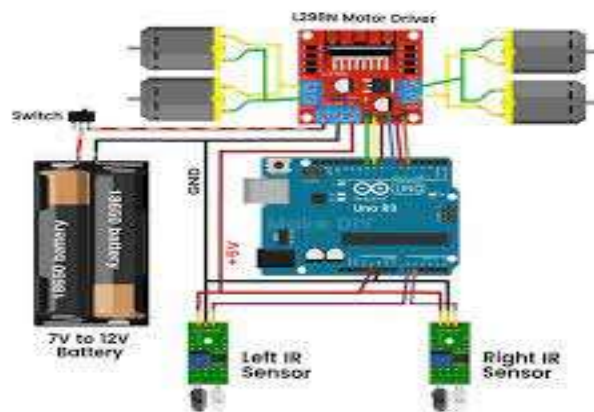


LED

A line follower infrared LED. It works by illuminating a surface with infrared light; the sensor then picks up the reflected infrared radiation and, based on its intensity.

Power Supply circuit

The Power Supply circuit is main power source to all driving components of robot, microcontrollers and sensors.



Arduino uno

The Arduino UNO is categorized as a microcontroller that uses the ATmega328 as a controller in it. Arduino Uno gives output to control the line follower robot.



DC Motor

A DC motor is an electrical machine that converts electrical energy into mechanical energy.



Bluetooth module

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project, etc. Just go through the datasheet for more details

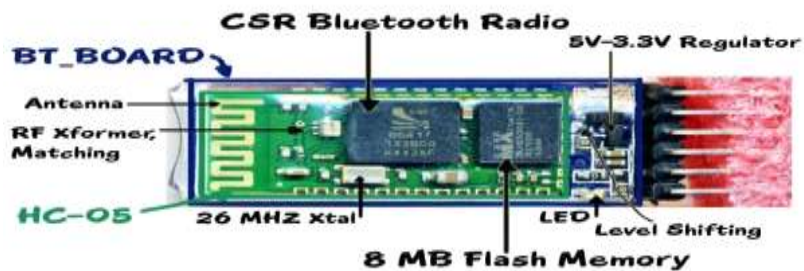
HC-05 Specification:

Range: <100m, Works with Serial communication (USART) and TTL compatible

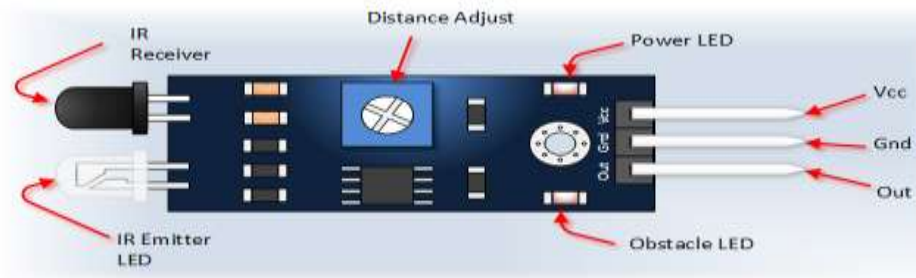
Supported baud rate: 9600,19200,38400,57600,115200,230400,460800, Bluetooth protocol: Bluetooth Specification v2.0+EDR, Frequency: 2.4GHz ISM band

Modulation: GFSK(Gaussian Frequency Shift Keying)

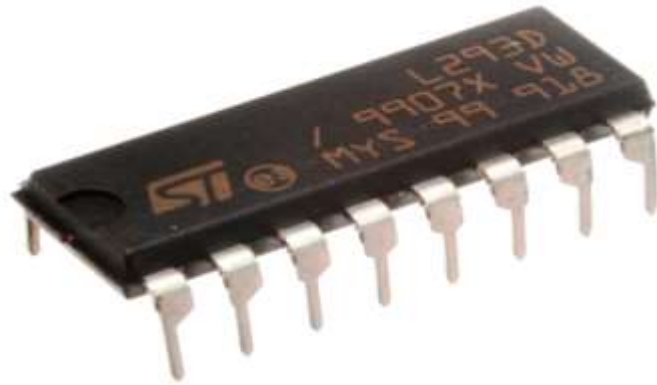
Emission power: $\leq 4\text{dBm}$, Class 2, Sensitivity: $\leq -84\text{dBm}$ at 0.1% BER, Speed: Asynchronous: 2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps, Security: Authentication and encryption, Profiles: Bluetooth serial port, Power supply: +3.3VDC 50mA, Working temperature: $-20 \sim +75\text{Centigrade}$



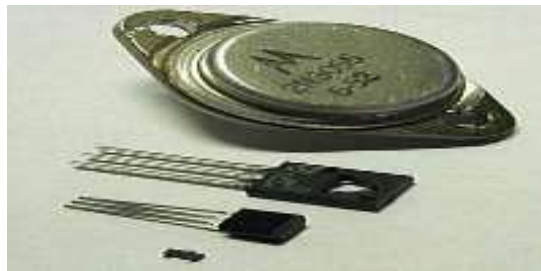
IR Sensor



L293D



Transistor



A transistor is a semiconductor device used to amplify and switch electronic signals.

Diode

4. METHODOLOGY

The line follower robot is an autonomously working robot moves by following the path. The path is generally is painted or drawn on the floor visible on the surface. The robot senses the surface by the IR sensors the optical sensing arrays helps the robot movements precisely to move on the line. The two IR sensors are fixed on the front of the robot with the diodes bottom. It follows the path by detecting the line. The robot direction of motion depends on the two sensors outputs. The battery switch on the circuit, sensor transmitter transmits the frequency, which reflected from the surface. Sensor receiver receives the frequency and gives it to microcontroller. The microcontrollers process the data and give the signal to Motor driver IC rotates the motors as per the signal receive and then the wheels rotate in desired direction. . Microcontroller controls the other operations. A typical line follower robot has two sets of motors, let's call them left motor and right motor. Both motors rotate on the basis of the signal received from the left and the right sensors respectively. The robot needs to perform 4 sets of motion which includes moving forward, turning left, turning right and stopping. The description about the cases is given below. Forward when both the sensors are on a white surface and the line is between the two sensors, the robot should move forward, i.e., both the motors should rotate such that the robot moves in forward direction. The right sensor detects the line which means that the robot should done in the direction. To turn the robot towards the right direction, the left motor rotates forward and the right motor rotates backwards and as a result towards the right direction. Both the sensors on the top of the line and they can detect the black line simultaneously, the micro controller is fed to consider this situation as a process for halt. Hence, both the motors are stopped, which causes the robot to stop moving. The motors are driven by the L293D which is operated by the Arduino uno component which is programmed to operate commands.

Program code:

```
// Arduino Line Follower Robot Code
```

```

#define enA 5//Enable1 L293 Pin enA
#define in1 6 //Motor1 L293 Pin in1
#define in2 7 //Motor1 L293 Pin in1
#define in3 9 //Motor2 L293 Pin in1
#define in4 10 //Motor2 L293 Pin in1
#define enB 8 //Enable2 L293 Pin enB
#define R_S 4//ir sensor Right
#define L_S 2 //ir sensor Left
void setup(){
pinMode(R_S, INPUT);
pin Mode (L_S, INPUT);
pin Mode (enA, OUTPUT);
pin Mode (in1, OUTPUT);
pin Mode (in2, OUTPUT);
pin Mode (in3, OUTPUT);
pin Mode (in4, OUTPUT);
pin Mode (enB, OUTPUT);
digital Write (enA, HIGH);
digital Write (enB, HIGH);
delay (1000);
}
void loop (){
if((digital Read(R_S) == 0)&&(digital Read(L_S) == 0)){forward();} //if Right Sensor and Left Sensor are at White color then it will call Forward
function
if((digital Read(R_S) == 1)&&(digital Read(L_S) == 0)){turn Right();} //if Right Sensor is Black and Left Sensor is White then it will call turn Right
function
if((digital Read(R_S) == 0)&&(digital Read(L_S) == 1)){turn Left();} //if Right Sensor is White and Left Sensor is Black then it will call turn Left
functio
if((digital Read(R_S) == 1)&&(digital Read(L_S) == 1)){Stop();} //if Right Sensor and Left Sensor are at Black colour then it will call Stop function
}
void forward(){ //forward
digital Write (in1, HIGH); //Right Motor forward Pin
digital Write (in2, LOW); //Right Motor backward Pin
digital Write (in3, LOW); //Left Motor backward Pin
digital Write (in4, HIGH); //Left Motor forward Pin
}
void turn Right () { //turn Right
digital Write (in1, LOW); //Right Motor forward Pin
digital Write (in2, HIGH); //Right Motor backward Pin
digital Write (in3, LOW); //Left Motor backward Pin

```

```

digital Write (in4, HIGH); //Left Motor forward Pin
}
void turn Left(){ //turn Left
digital Write (in1, HIGH); //Right Motor forward Pin
digital Write (in2, LOW); //Right Motor backward Pin
digital Write (in3, HIGH); //Left Motor backward Pin
digital Write (in4, LOW); //Left Motor forward Pin
}
void Stop () { //stop
digital Write (in1, LOW); //Right Motor forward Pin
digital Write (in2, LOW); //Right Motor backward Pin
digital Write (in3, LOW); //Left Motor backward Pin
digital Write (in4, LOW); //Left Motor forward Pin
}

```

5. Result

Our project is an idea of which has basically line detection system and will provide help in various fields like automatic material handling cost with less cost and flexible. The sensors used in this system are infrared sensor that senses the line and gives the feedback to the microcontroller unit. The objective of the line following robot is to follow a line on its given path which is obtained for which it uses IR sensors which detects the line and sends the information to LM324 comparator and then to L293D which drives the motors.

6. Future scope

The line follower developed is also sensing any type of obstacle in its way and can also control speed with the help of speed regulator. Further improvement can be done in the robot by using a greater number of IR sensors or an array of IR sensors. Research and development of these robots have been keenly studied and examined for many industrial applications. Line following robots can provide maximum effectiveness to in-house transportation of jobs inside a factory, which is traditionally done by forklifts and different types of cranes. A line follower consists of an infrared light sensor and an infrared LED. It works by illuminating a surface with infrared light; the sensor then picks up the reflected infrared radiation and, based on its intensity, determines the reflectivity of the surface in question.

7. REFERENCES

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