LINE FOLLOWER

A report submitted in partial fulfilment of the Academic requirements for the award of the degree of Bachelor of Technology

Submitted by

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UNDER THE COURSE

SOCIAL INNOVATION IN PRACTICE

CENTRE FOR ENGINEERING EDUCATION RESEARCH

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous) (NAAC Accredited with 'A+' Grade & NBA Accredited)

(Approved by AICTE, Permanently Affiliated to JNTU Hyderabad)

KANDLAKOYA, MEDCHAL ROAD HYDERABAD-501401

2022-2023

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CERTIFICATE

This is to certify that the report entitled "**LINE FOLLOWER**" is bonafide work done by P.KAVYASRI(21H51A6718), MD.SONU THAHREEN(21H51A6730), K.LIKHITH(21H51A6757), CH.PUNNETH (21H51A6755), M.SAMITH (21H51A6751) of II B.TECH I Semester in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology, submitted to Center for Engineering Education Research, CMR College of Engineering & Technology , Hyderabad during the Academic Year of 2022-23.

(Names of the Project Coordinators)

1. Ms. ARCHANA BATHULA Asst.professor, CSE
2. Mr. K. RAJU Asst. professor, ECE
3. Mr. K. RAVI NAIK Asst. professor, CSM

B. SURESH RAM

HOD CEER

DECLARATION

We, the students of II B. Tech I Semester of **Centre for Engineering Education Research** , **CMR COLLEGE OF ENGINEERING & TECHNOLOGY**, Kandlakoya, Hyderabad, hereby declare, that under the supervision of our course coordinators, we have independently carried out the project titled "**LINE FOLLOWER**" and submitted the report in partial fulfillment of the requirement for the award of Bachelor of Technology in by the **Jawaharlal Nehru Technological University, Hyderabad (JNTUH)** during the academic year 2022-2023.

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We would like to thank the Principal of CMRCET, Dr.V.A.Narayana, for his support in the course of this project work. We would like to thank our project coordinators Ms.Archana Bathula, Mr.K.Raju and Mr.K.Ravi Naik, for their valuable guidance in the course of this project work.

Finally, we thank all our faculty members and Lab Assistants for their valid support.

We own all our success to our beloved parents, whose vision, love and inspiration has made us reach out for these glories.

TABLE OF CONTENTS

ABSTRACT

The main aim of this Project is to design a robot which is capable of following line using line detection sensors. This simple robot is designed to be able to follow a black line on the ground without getting off the line too much. The robot has two sensors installed underneath the front part of the body, and two DC motors drive wheels moving forward. A circuit inside takes input signal from IR sensors and controls the speed of wheels' rotation. The control is done in such a way that when a sensor senses a black line, the motor slows down or even stops. Then the difference of rotation speed makes it possible to make turns.

The robot uses IR sensors to sense the line; an array of 2 IR LEDs (Tx) and sensors (Rx), facing the ground has been used in this setup. The output of the sensors is a digital signal which depends on the amount of light reflected back, this signal is given to the PIC Microcontroller.

Line follower is a machine that can follow a path. The path can be visible like a black line on a white surface (or vice-versa) or it can be invisible like a magnetic field. Sensing a line and maneuvering the robot to stay on course, while constantly correcting wrong moves using feedback mechanism forms a simple yet effective closed loop system. Practical applications of a line follower: Automated cars running on roads with embedded magnets; guidance system for industrial robots moving on shop floor etc.

The controlling device of the whole unit is PIC Microcontroller to which input and output modules are interfaced. The Microcontroller is programmed in Embedded C language which intelligently performs the specific task. Here, the Microcontroller gets input from the line sensor attached to the robot. This input is processed by controller and acts appropriately on the motors of the Robot.

CHAPTER 1

INTRODUCTION

Line follower is a machine that can follow a path. The path can be visible like a black line on a white surface Sensing a line the robot to stay on course, while constantly correcting wrong moves using feedback from the sensor forms a simple yet effective system. It can be used in automobile, industrial automations, guidance, etc.

As technology becomes increasingly important in today's world, it is invaluable to not only learn how to use technology, but also to understand how to create it. Since being the engineer one should have sound knowledge of the other discipline. Most of the projects have limted scope to only specific discipline. This would limit ones innovation and creativity. This project inspires to make connections across several disciplines rather than learning topics in isolation as it combines mechanical, electronic, electrical and programming skills.

It gives visual grasp of math and science.

It builds logical thinking.

It brings out innovation and creativity. It enhances problem solving skills.

CHAPTER 2

LITERATURE REVIEW

An embedded system is a combination of software and hardware to perform a dedicated task.

Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The project "**Line Following Robot"** using PIC16F72 Microcontroller is an exclusive project that can move the robot according to the instructions given by the above said microcontroller.

CHAPTER 3

PROBLEM DEFINITION

3.1 PROBLEM STATEMENT:

In the industry carriers are required to carry products from one manufacturing plant to another which are usually in different buildings or separate blocks. Conventionally, carts or trucks were used with human drivers. Unreliability and inefficiency in this part of the assembly line formed the weakest link. The project is to automate this sector, using carts to follow a line instead of laying railway tracks which are both costly and an inconvenience.

3.2 OBJECTIVE

The project "**LINE FOLLOWING ROBOT**" was designed a line following robot. This Robot automatically senses the presence of black line and the controlling was done in such a way that when a sensor senses the line, the motor slows down or even stops. Then the difference of rotation speed makes it possible to make turns. This system can be practically implemented in real time by adding sensors which help in detecting bombs inside the buildings. It also reduces man power. One can easily send any required things through it by adding extensions to it. It reaches the defined destination perfectly.

3.3 REQUIREMENT ANALYSIS:

The main blocks of this project are:

- PIC Microcontroller.
- IR sensors.
- DC motors with L293D motor driver.
- Robot chasis.
- Wheels.

3.31 SOFTWARE DESCRIPTION

This project is implemented using following software's:

- Express PCB – for designing circuit
- PIC C compiler - for compilation part
- Proteus 7 (Embedded C) – for simulation part

3.32 HARDWARE COMPONENTS

1.PIC16F72 MICROCONTROLLER

Fig 3.321pic16f72 microcontroller

PIC16F72 is a low-cost, low-power, high-speed CMOS Flash technology capable, 8-bit, fully-static Microcontroller unit that has 28 pins out of which 22 pins can be used as I/O pins.

2.L293D MOTOR DRIVER MODULE

Fig 3.322 l293d motor driver module

There are 2 OUTPUT pins, 2 INPUT pins, and 1 ENABLE pin for driving each motor. It is designed to drive inductive loads such as solenoids, relays, DC motors, and bipolar stepper motors, as well as other high-current/high-voltage loads.

3.DC MOTORS

Fig 3.323 DC motors

A DC motor is an electrical machine that converts electrical energy into mechanical energy. In a DC motor, the input electrical energy is the direct current which is transformed into the mechanical rotation.

4.IR PROXIMITY SENSOR

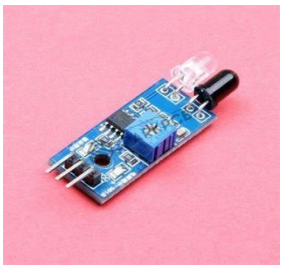


Fig 3.324 IR proximity sensor

In Proximity Sensors an IR LED and a Photodiode is used to find an obstacle. The IR LED emits light in forwarding direction when an obstacle is ahead the light reflects and the Photodiode is activated.

5.CAPACITOR

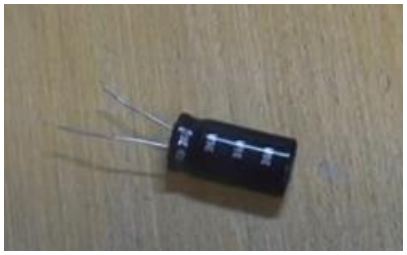


Fig 3.325 capacitor

Capacitors are commonly used in electronic devices to maintain power supply while batteries are being changed.

6.CHASSIS

Fig 3.326 chassis

Chassis is a outer design or body for a vehicle or a computer equipment.

7. 7*2 ROBOT WHEELS

Fig 3.327 car wheels

It is a general toy or robot wheels which is used for general toys or prototypes.

3.4 METHODLOGY:

After the detail literature survey through the books, periodical, journal, magazine,websites. The idea of the project is well defined. The logic is derived for the intelligence of the robot. This simple robot is designed to be able to follow a black line on the ground without getting off the line too much. The robot has two sensors installed underneath the front part of the body, and two DC motors drive wheels moving forward. A circuit inside takes input signal from IR sensors and controls the speed of wheels' rotation. The control is done in such a way that when a sensor senses a black line, the motor slows down or even stops. Then the difference of rotation speed makes it possible to make turns.

The robot uses IR sensors to sense the line; an array of 2 IR LEDs (Tx) and sensors (Rx), facing the ground has been used in this setup. The output of the sensors is a digital signal which depends on the amount of light reflected back, this signal is given to the PIC Microcontroller.

The controlling device of the whole unit is PIC Microcontroller to which input and output modules are interfaced. The Microcontroller is programmed in Embedded C language which intelligently performs the specific task. Here, the Microcontroller gets input from the line sensor attached to the robot. This input is processed by controller and acts appropriately on the motors of the Robot.

CHAPTER 4

4.1 CIRCUIT DIAGRAM:

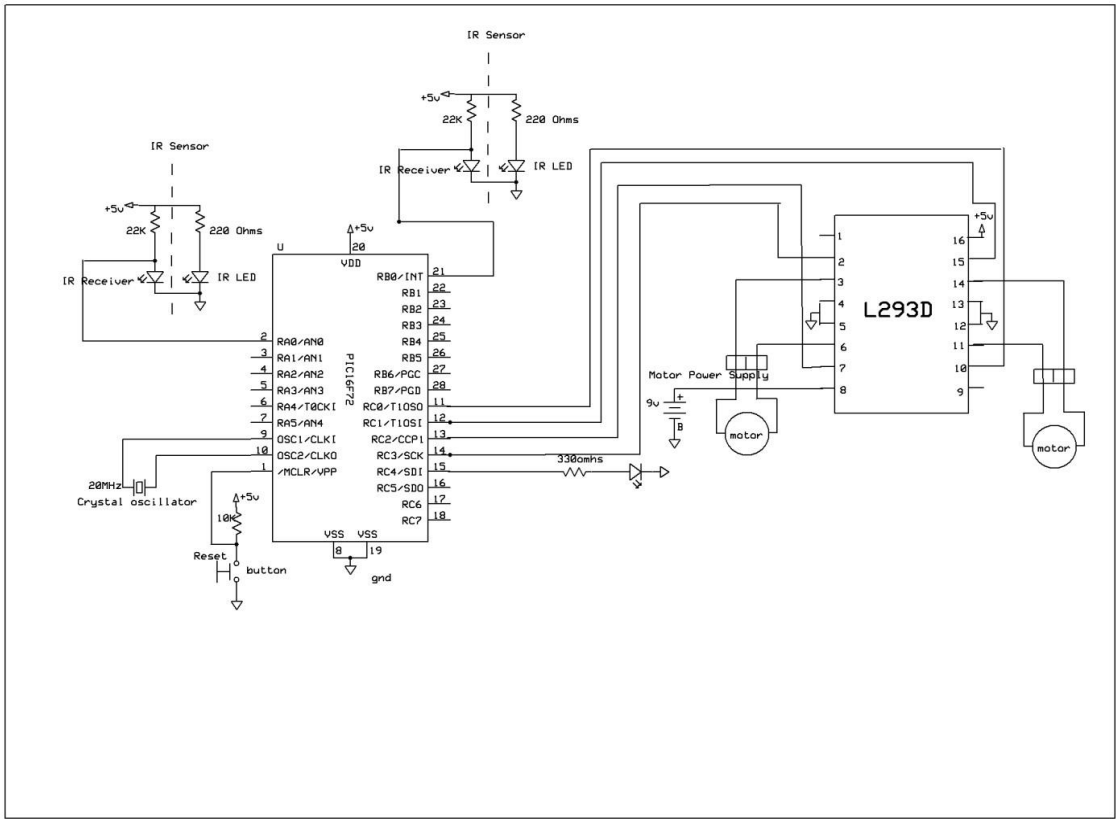


Fig 4.1.1 circuit diagram

4.2 BLOCK DIAGRAM:

BASIC BLOCK DIAGRAM OF LINE FOLLOWER

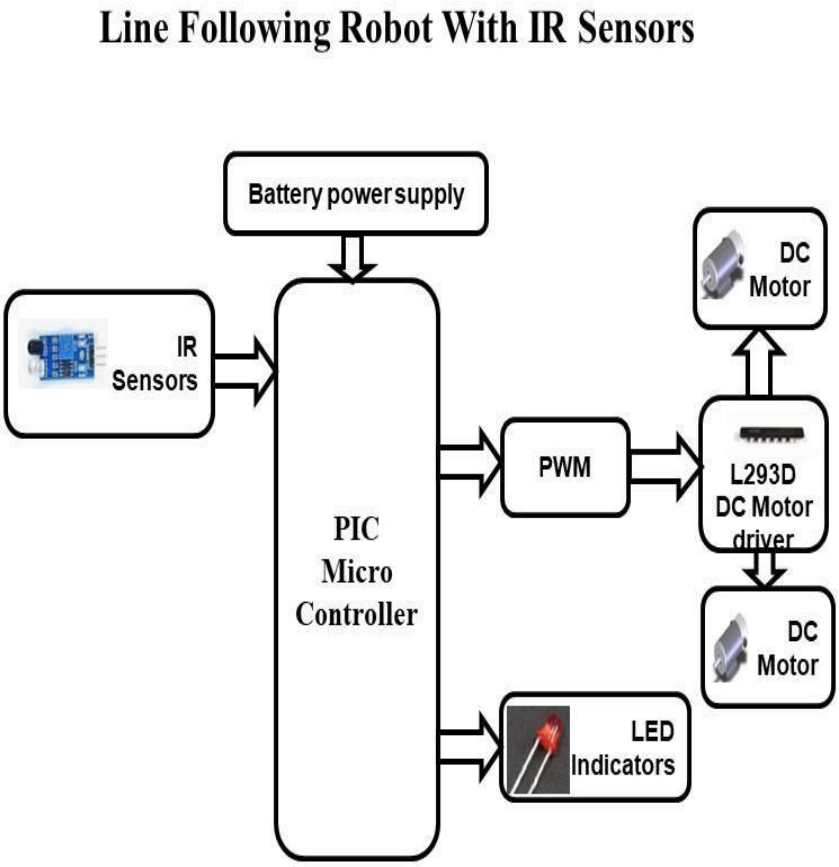


Fig 4.2.1 block diagram

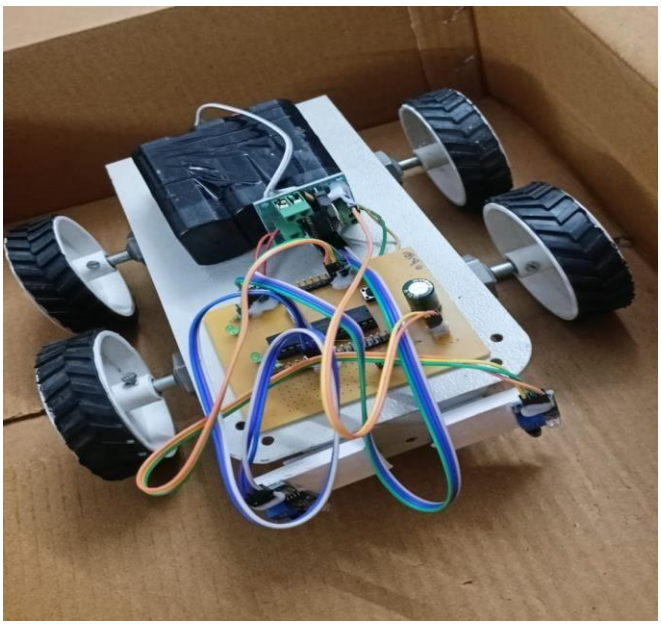
CHAPTER 5

5.1 IMPLEMENTATION:

Working of this “LINE FOLLOWER” is very easy. Whenever it senses a black line on the white surface of a path with help of IR sensors it detects the line or the path and follows it. The code dumped in the PIC micro controller and the sensors placed at the front end are the main requirements for this line following robot.

5.2 RESULT:

The project “**LINE FOLLOWING ROBOT**” was designed a line following robot. This Robot automatically senses the presence of black line and the controlling was done in such a way that when a sensor senses the line, the motor slows down or even stops. Then the difference of rotation speed makes it possible to make turns.



5.2.1 Line follower

5.3 CONCLUSION:

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

CHAPTER 6

FUTURE SCOPE

In the process of development of the line follower, most of the useful feature is identified and many of them was implemented. But due to the time limitations and other factor some of these cannot be added. So the development features in brief:

- This project can be extended using robotic arm for pick and place the objects.
- Also a video camera can be used of the person being detected get the photos.

CHAPTER 7

SOURCE CODE

```
#include <16F72.h> #use
delay(clock=20000000) void
Robot_Forward()
{
  output_high(pin_C0);
output_low(pin_C1);
output_high(pin_C2);
output_low(pin_C3);
}
void Robot_Left()
{
  output_high(pin_C0);
output_low(pin_C1);
output_low(pin_C2);
output_high(pin_C3);
}
void Robot_Right()
{
  output_low(pin_C0);
output_high(pin_C1);
output_high(pin_C2);
output_low(pin_C3);
```

```
}       void
main()
  {

    char ch;
    unsigned long flag = 0, count = 0;
  lcd_init();

    output_high(PIN_C5);
  output_high(PIN_C4);
  delay_ms(700);
  output_low(PIN_C5);
  output_low(PIN_C4);
  delay_ms(700);
  output_high(PIN_C5);
  output_high(PIN_C4);
  delay_ms(700);
  output_low(PIN_C5);
  output_low(PIN_C4);
  while(1)
    {
        if((!input(PIN_B0)) && (!input(PIN_A0)))
      {
        Robot_Forward();
      }
    else if((input(PIN_B0)) && (!input(PIN_A0)))
```

```
    {
      Robot_Left();
    }

    else if((!input(PIN_B0)) && (input(PIN_A0)))
    {
      Robot_Right();
    }

    delay_ms(100);
  }
}
```

CHAPTER 7

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CHAPTER 8

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