A
Project Report
On
'LINE FOLLOWER BOT'

SUBMITTED BY:

Student name   Exam. Seat No.

1. Nikhil Singh   S190083100

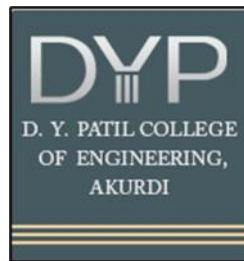2. Divya Jadhav   S190083053

3. Sanket Hajare   S190083046
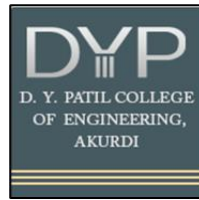
4. Aditya Korade   S190083076

PROJECT GUIDE:

Mrs. Tina Suratkar

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

D.Y. PATIL COLLEGE OF ENGINEERING

AKURDI, PUNE – 411044

D. Y. PATIL COLLEGE OF ENGINEERING

AKURDI, PUNE – 411044

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIO

CERTIFICATE

This is to certify that following students of S.E. Electronics & Telecommunication Engineering have successfully completed the project work under the subject "Project Based Learning"

'LINE FOLLOWER BOT

under my supervision and submitted the project report in partial fulfillment of requirement for Second year Engineering course under the Savitribai Phule Pune University during the academic year 2021-2022.

Student name	Exam. Seat No.
Nikhil Singh	S190083100
Divya Jadhav	S190083053
Sanket Hajare	S190083046
Aditya Korade	S190083076

Project Guide	Academic & Administrative Coordinator	H.O.D. E&TC
Mrs. Tina Suratkar	Dr. Mrs. Rutuja Deshmukh	

ACKNOWLEDGEMENT

We express our sincere gratitude towards all the faculty members who helped in making this project successful.

We would like to express our thanks to our guide **Mrs. Tina Suratkar.**

for her whole hearted co-operation and valuable suggestions, technical guidance throughout the seminar work.

Special thanks to our H.O.D. **Dr. Mrs. P Malathi and Academic & Administrative coordinator Dr. Mrs. Rutuja Deshmukh** for their kind support and encouragement.

Finally, we would like to thank to all our faculty & staff members of E&TC Department who helped us directly or indirectly to complete this work successfully.

Line follower bot

Abstract

This project 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. Automatic parking technology has become a popular research topic. Automatic parking technology can complete parking operations safely and quickly without a driver and can improve driving comfort, while greatly reducing the probability of parking accidents.

# **INDEX**

CHAPTER -1
INTRODUCTION

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. 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. 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.
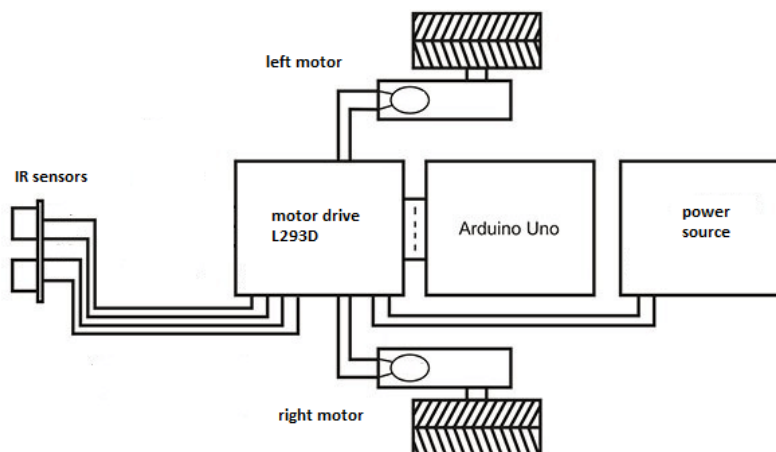
CHAPTER - 2

Block Diagram & Description

Block Diagram & Description
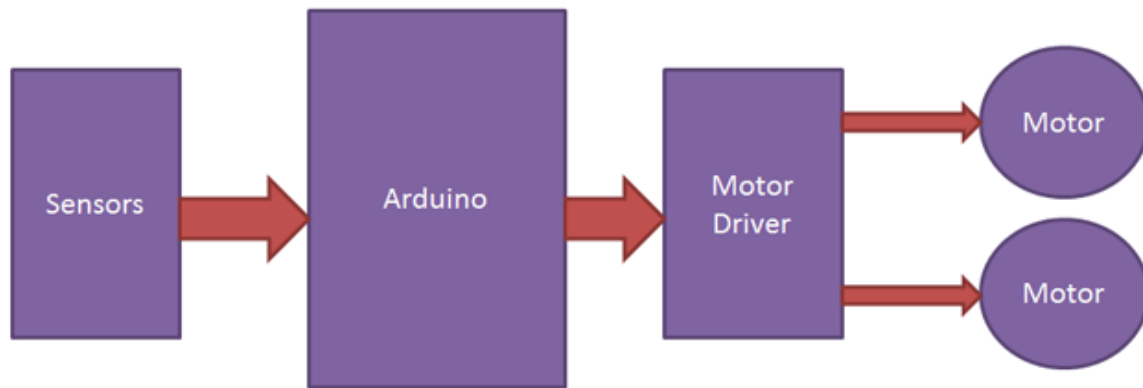
We chose a configuration to develop a line follower using two infrared sensors with connection of Arduino Uno through motor driver IC. We followed a block diagram on the regard. The block diagram illustrates the connection for the development of the line follower which follows a black line on white surface.

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.

CHAPTER – 3
Features

Features

The Line follower robot is a mobile machine that can detect and follow the line drawn on the floor. Generally, the path is predefined and can be either visible like a black line on a white surface with a high contrasted color or it can be invisible like a magnetic field
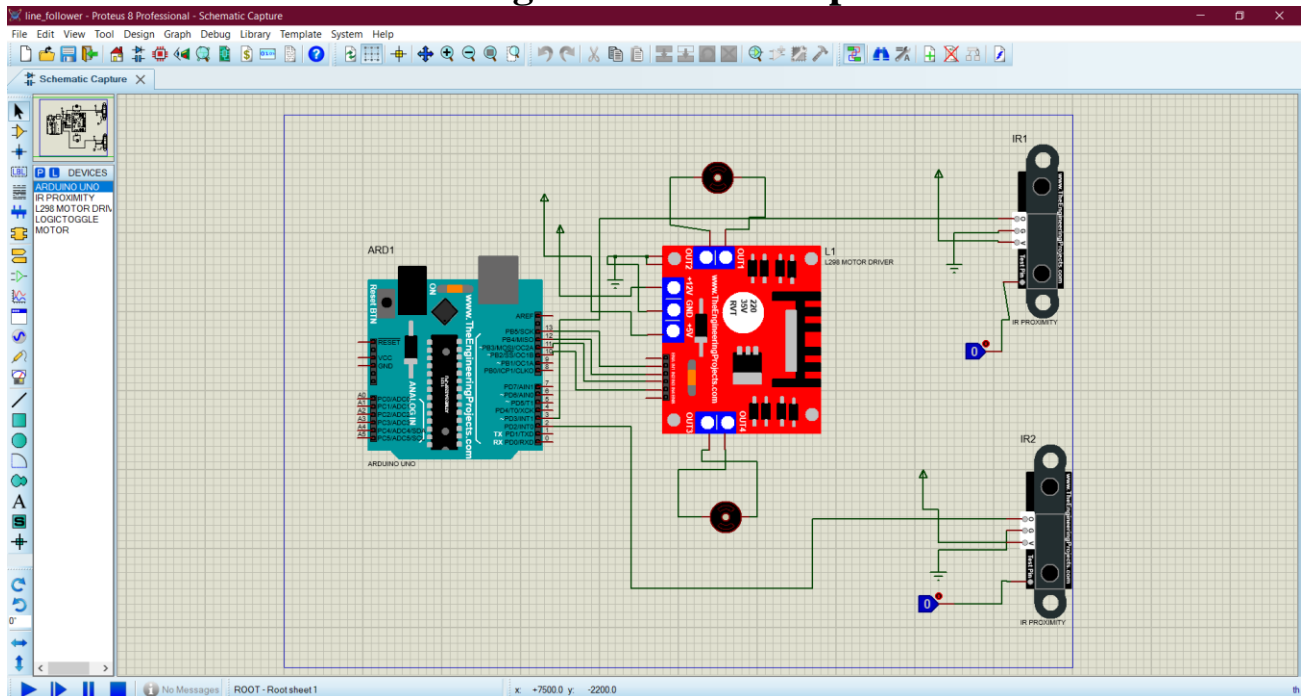
Features

1) These types of robot movement are usually automatic.

2) The system in the robot is like once install and forget.

3) Its relatively cheap.

4) This type of robot are simple to build.
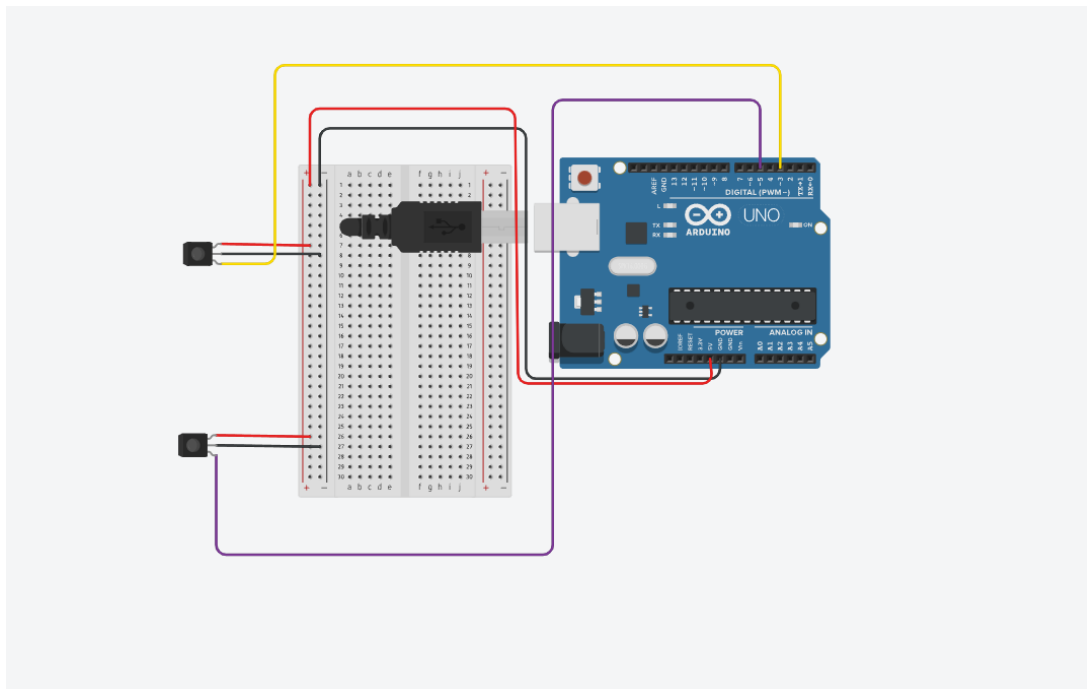
5) They can also be used for long distance.

CHAPTER – 4

Circuit diagram & Circuit operation

Circuit diagram & Circuit operation

Circuit diagram of whole project (PROTEUS simulation diagram)

Sensing part of the whole project (TINKERCAD simulation diagram)

CHAPTER 5
List of components

List of components

List of components and pricing

Sr. No	Name of component	Qty	Total price
1	Arduino uno	1	650
2	IR sensors	2	150
3	Bread board	1	60
4	Wheel	2	80
5	L293D motor drive	1	110
6	Jump wire	20	24
7	Motor	2	170(ideally 0)
8	Chassis	1	0
9	Chart paper	4	40
10	Cello tape	4	40
			Total=1324/-

Arduino R3

What Is Inside an Arduino?

Although there are many different types of Arduino boards available, this manual focuses on the Arduino Uno. This is the most popular Arduino board around. So, what makes this thing tick? Here are the specifications:

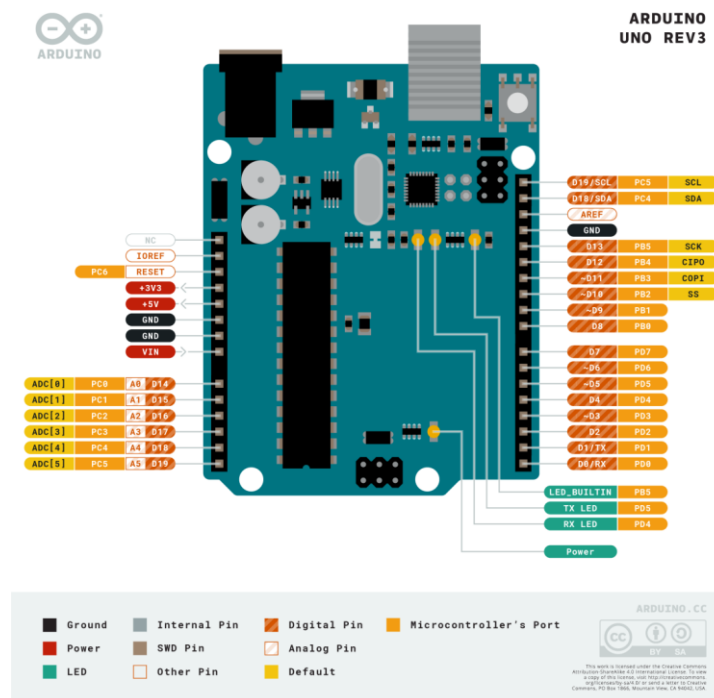Processor: 16 MHz ATmega328

Flash memory: 32 KB

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 - Power Supply

There are 3 ways to power the Arduino Uno:

Barrel Jack - The Barrel jack, or DC Power Jack can be used to power our Arduino board. The barrel jack is usually connected to a wall adapter. The board can be powered by 5-20 volts but the manufacturer recommends keeping it between 7-12 volts. Above 12 volts, the regulators might overheat, and below 7 volts, might not suffice.

VIN Pin - This pin is used to power the Arduino Uno board using an external power source. The voltage should be within the range mentioned above.

USB cable - when connected to the computer, provides 5 volts at 500mA.

There is a polarity protection diode connecting between the positive of the barrel jack to the VIN pin, rated at 1 Ampere. The power source you use determines the power we have available for your circuit. For instance, powering the circuit using the USB limits you to 500mA.

5v and 3v3 -They provide regulated 5 and 3.3v to power external components according to manufacturer specifications.

GROUND - In the Arduino Uno pinout, you can find 5 GND pins, which are all interconnected.

The GND pins are used to close the electrical circuit and provide a common logic reference level throughout your circuit. Always make sure that all GNDs (of the Arduino, peripherals and components) are connected to one another and have a common ground.

RESET - resets the Arduino.

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.

L293 motor drive

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 starch.

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.

IR sensor Module

Infrared Ray Sensors is 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.

PMDC Motors

In a Permanent Magnet DC (PMDC) motor, permanent magnets located in the stator provide the magnetic field, instead of it being created in stator windings. PMDC motors are generally smaller but still offer an impressive output performance, making them an excellent choice for use in mobility, patient care, industrial and leisure products.
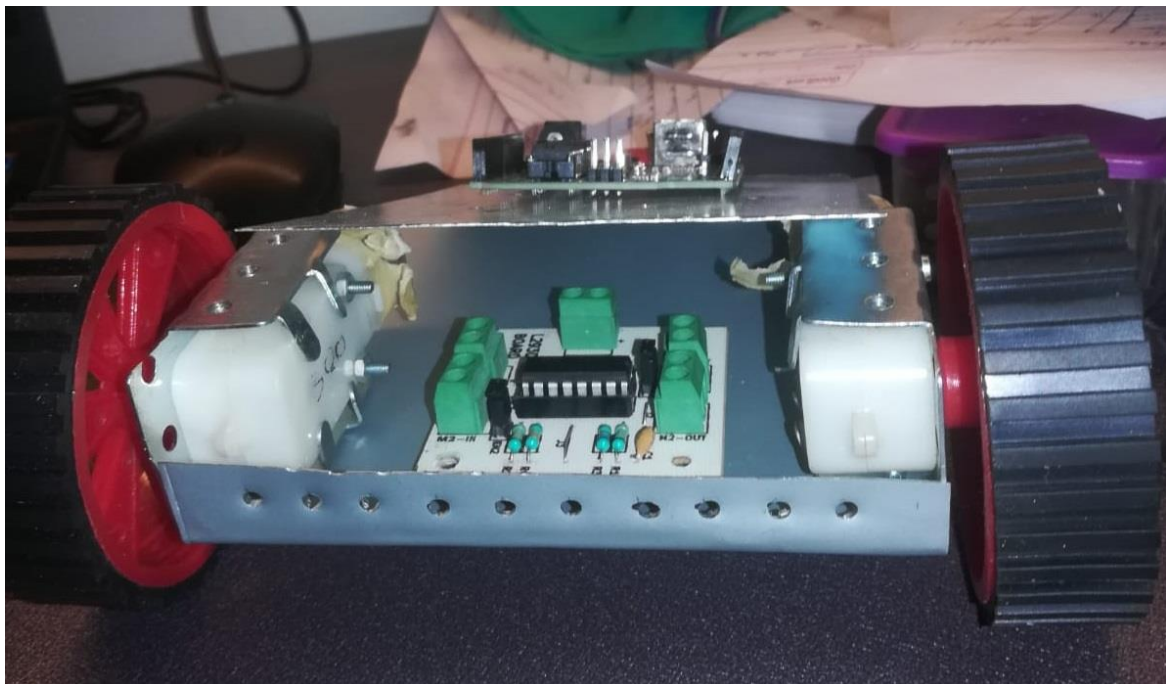
CHAPTER - 6
Results

Results
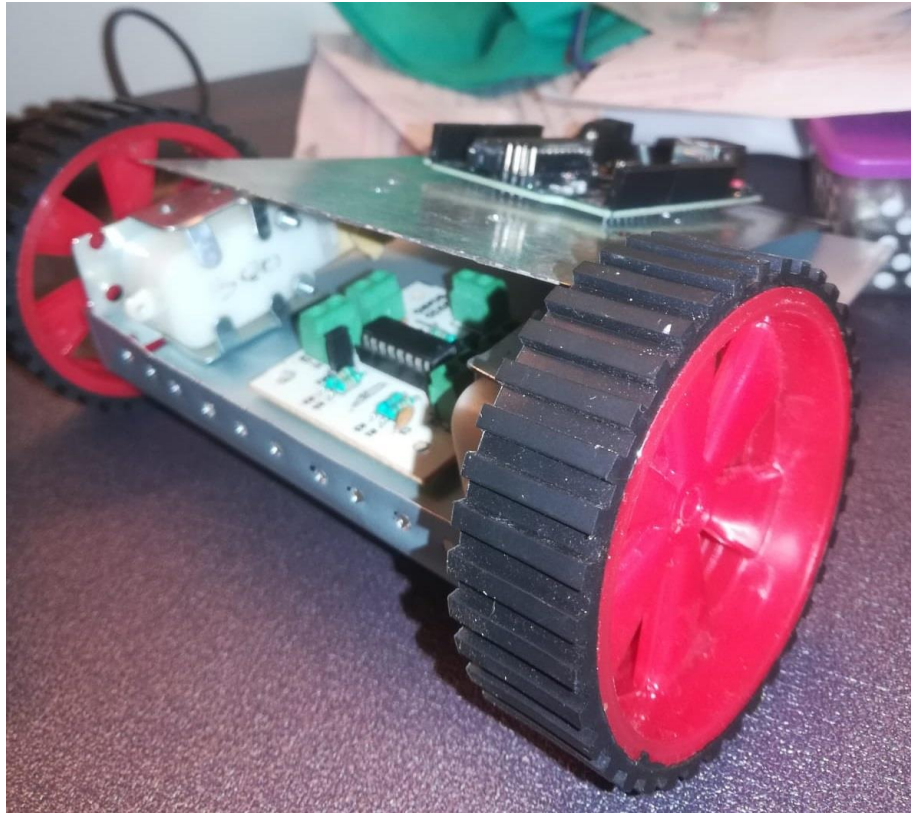
Top-view

Front-view

CHAPTER - 7
Applications

Applications

The line follower robots are one of the most basic robots used to follow black line on white background or vice versa. These robots may be used to in various industrial and domestic applications such as to carry goods, floor cleaning, delivery services and transportation.

Depending on that below are some applications which we have listed down.

1. **Industrial Applications:** These robots can be used as automated equipment carriers in industries replacing traditional conveyer belts.

2. **Automobile applications:** These robots can also be used as automatic cars running on roads with embedded magnets.

3. **Domestic applications:** These can also be used at homes for domestic purposes like floor cleaning etc.

4. **Guidance applications:** These can be used in public places like shopping malls, museums etc. to provide path guidance.

CHAPTER - 8
Future scope

Future scope

The line follower bot is developed in order to run along predefined path, the speed can be changed by using PID (proportional integral derivative controller) sensors and adding up more complex algorithm. Further improvement can be done in the robot by using more number of IR sensors or an array or IR sensors. Further the robot can be programmed with fuzzy logic to find its own path among given set of path from source to destination which will be shortest of all. With that we can use it for industrial purpose.

In the process of further development of the line follower, most of the useful feature is identified and many of them were implemented. But due to the time limitations and other factor some of these cannot be added.

So the future development features in brief are:

1. Use of color sensor.

2. Use of CCD camera for better recognition and precise tracking the path..

CHAPTER - 9
Conclusion/s

Conclusion/s

The line follower bot is automobile system that has ability to recognize its path, move and change the robot's position toward the line in the best way to remain in track. This project report presents a photodiode sensor based line follower robot design of 200gm Weigh which always directs along the black line on white surface. The electromechanically Robot dimension is 13X12X6.5 cm3 with max speed of motors at input of 9 volt. The robot is able to detect its path in case it is out of path. The line following robot project challenged the group to cooperate, communicate, and expand understanding of electronics, mechanical systems, and their integration with programming. The successful completion of every task demonstrated the potential of Mechatronic systems and a positive group dynamic.

We came across lots of things including limitations. And they are stated in here.

Limitation

1. Line follower robot requires 2-3 inches broad line.

2. It may not move properly if the black line drawn is of low intensity.

3. The IR sensors may sometimes absorb IR rays from surroundings also.

CHAPTER - 10
Data sheets of electronic components