"LINE FOLLOWER ROBOT"

A

Project Report

submitted

in partial fulfillment

for the award of the Degree of

Bachelor of Technology

in Department of Computer Science and Engineering

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Swami Keshvanand Institute of Technology, Management & Gramothan, Jaipur

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that Mr/Ms Harshdeep Walia a student of B.Tech(Computer Science & Engineering) 8th semester has submitted his/her Project Report entitled ”Line Follower Robot” under my guidance.

Mentor

Name.....

Designation.....

Signature.....

Coordinator

Name.....

Designation.....

Signature.....

DECLARATION

We hereby declare that the report of the project entitled ”LINE FOLLOWER ROBOT” is a record of an original work done by us at Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur under the mentorship of ”Mr.Ankit Kumar” (Dept. of Computer Science and Technology) and coordination of ”Mr.Ankit Kumar” (Dept.of Computer Science and Technology). This project report has been submitted as the proof of original work for the partial fulfillment of the requirement for the award of the degree of Bachelor of Technology (B.Tech) in the Department of Computer Science and Technology.It has not been submitted anywhere else, under any other program to the best of our knowledge and belief.

Team Members **Signature**

(Harshdeep Walia,16ESKCS717) Team Member1

(Shivam Soni,16ESKCS350) Team Member2

Acknowledgement

A project of such a vast coverage cannot be realized without help from numerous sources and people in the organization.We take this opportunity to express our gratitude to all those who have been helping us in making this project successful.

We are highly indebted to our faculty mentor MR Ankit kumar .He/She has been a guide, motivator source of inspiration for us to carry out the necessary proceedings for the project to be completed successfully. We also thank our project coordinator MR Ankit Kumar for his co-operation, encouragement, valuable suggestions and critical remarks that galvanized our efforts in the right direction.

We would also like to convey our sincere thanks to Prof. Dr. Mukesh Gupta, HOD, Department of Computer Science and Engineering, for facilitating, motivating and supporting us during each phase of development of the project.Also, we pay our sincere gratitude to all the Faculty Members of Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur and all our Colleagues for their co-operation and support.

2 **Team Members**:
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Chapter 1

Project Chapter

1.1 Introduction

Line supporter is a machine that can follow a way. The way can be obvious like a dark line on a white surface.Sensing a line and moving the robot to remain on course, while continually amending incorrectly moves utilizing input from the sensor frames a straightforward yet compelling framework. It tends to be utilized in vehicle, modern computerizations, direction, and so on

1.2 Background

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 limited 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. The robot designed

in a such way that it not only track the path and follow it but also visualize the distance travelled through the LCD displays.

1.3 Motivation

How ants consistently travel in a line, following ani nvisible course looking for food, or back home. How on streets the paths is followed to evade mishaps and gridlocks. Ever thought about a robot which follows line? An ideal or close to consummate copy of nature? After all the reason for mechanical technology is to reproduce regarding machines what one see around to illuminate a issue or satisfy a necessity. The region will be profited by the venture

*** Industrial mechanized hardware transporters**

*** Entertainment and little family unit applications.**

*** Tour guides in exhibition halls and other comparable applications.**

*** Second wave surveillance tasks.**

1.4 Problem Description

In the business transporters are needed to convey items from one assembling plant to another which are for the most part in various structures or separate squares. Expectedly, trucks or then again trucks were utilized with human drivers. Shakiness and shortcoming in this aspect of the mechanical production system shaped the most fragile connection. The task is to mechanize this segment, utilizing trucks to follow a line as opposed to laying railroad tracks which are both exorbitant and a burden.

1.5 Objectives

The destinations of the task are:

The robot must be fit for following a line.

It ought to be fit for taking different degrees of turns.

The robot must be harsh toward natural factors

It must permit alignment of the line's dimness edge.

Scalability must be an essential worry in the plan.

It likewise shows the separation went by it through LCD show

1.6 Limitations

The framework has confined to the accompanying impediment.

Choice of line is made in the equipment deliberation and can't be changed by programming. Calibration is troublesome, and it is difficult to set an ideal worth. Few bends are not made proficiently, and must be kept away from. The turning span ought to be of least 100m to take smooth U-turning of robot. The width of the way should be of 45mm with the goal that it can cover least 3 sensors. The way ought to be plane and snag free. The guiding component isn't handily actualized in immense vehicles and outlandish for non-electric vehicles

1.7 Organisation of Report

This report is a narrative conveying the thoughts produced, ideas applied, exercises done It contains four parts. Coming up next is a depiction of data in this proposal.

Section 1 gives an overall review of the venture and the utilization and significance of self-governing robots on the planet. The targets, extent of undertaking, issue explanation are additionally depicted in this section.

Section 2 depicts the equipment advancement unit in line after robot. This part portrays about sensor clusters, Arduino, engine driving framework, it additionally depicts the venture system and clarifies equipment advancement for the plan of the robot.

Section 3 contains the cycle clarification with working calculation, flowchart and sketch of the Arduino.

Section 4 contains all the outcomes got from the product explores that incorporate the calculation executed in a program.

Section 5 will sum up the last year venture. The end, recommendations or proposals for enhancements that can be actualized in future are examined inside this part.

1.8 Summary

Line Follower is one of the most significant parts of mechanical technology. A Line Following Robot is a self-ruling robot which can follow either a dark or white line that is drawn on the surface comprising of a differentiating shading. It is intended to move naturally and follow the plotted line. It improves interdisciplinary way to deal with mechanical,electronic, electrical and programming abilities. The utilization of the undertaking is go from the singular homegrown machine to computerization and control part of huge industry. Human are smart normal machine however it has genuine limation of effectiveness and realiblity.Robots are made to supplant reliance of human power somewhat.

Chapter 2

Software Requirement Specification

2.1 Basic Operation

The essential activities of line devotee are as per the following: Capture line position with optical sensors mounted at front finish of the robot. For this a mix of IR-LED and Photodiode called an optical sensor has been utilized. This make detecting cycle of high goal and high heartiness.

Steer robot requires directing instrument for following. Two engines overseeing wheel movement are utilized for accomplishing this errand. This framework has LCD show board to show the separation that it covers.

On the recognizing no dark surface robot move in a round movement until line is found

2.1.1 Block Diagram

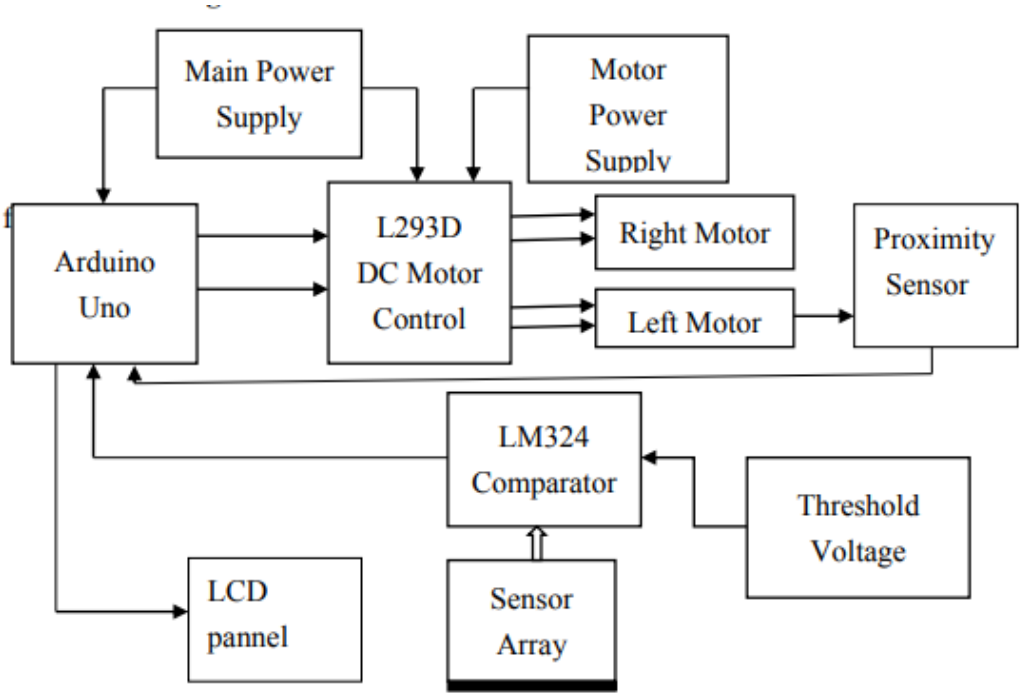


Figure 2-1: Block Digram of the Line following Robot.

2.2 Hardware Required

The hardware required is divided in the following category:

2.2.1 Input System

The detail of each components is discussed below.

2.2.1.1 Optical Sensors

The robot utilizes photodiode sensors to detect the line; a variety of four IR-LEDs (TX) and Photodiode sensors (Rx), confronting the ground utilized in this arrangement. A simple sign is acquired in yield, relies upon the measure of light reflected back, which is given to the

comparator to deliver 0s and 1s which are then taken care of to the Arduino.

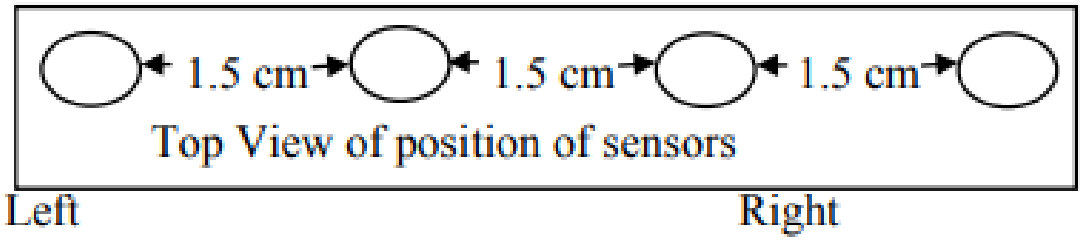


Figure 2-2: Arrangements of the Sensor

The sensors on the left named as L1, L2 and R1, R2 on the correct side. Supposition ought to be viewed as that when a sensor is on the line it understands 0 and when it is off the line it peruses 1. The Arduino correspondence to the calculation given beneath chooses the following development, attempting to situate the robot with the end goal that all sensors read 0. With sensors, robots can respond and react to changes in their condition in manners that seem shrewd or life-like.

2.2.1.2 Arrangement of Sensors

A variety of sensors organized in a straight column design is darted under the front of the robot. It finds the situation of line beneath the robot. Separation between two adjoining sensors is about 1.5 cm. We can utilize quite a few sensors. In the event that we have low number, at that point our robot development is not smooth and it might confront issues during sharp turns. In the event that higher number of sensors were, utilized robot development will get smooth and dependable for sharp turns; it requires complex programming for miniature regulator and requires more equipment, which is its drawback.

Accordingly, ideal number of sensors required.

2.2.1.3 Comparator

Comparator is a gadget, which analyzes two info voltages and gives yield high or low. In circuit chart it is ordinarily spoken to by a triangle having-Inverting (negative) Input, Non-Inverting (positive) Input (+), Vcc, Ground, Output. Properties of comparator:

In the event that V+ ¿ V Vo=Vcc (Digital High Output is 1)

In the event that V+ ¡ V Vo=0 (Digital Low Output is 0)

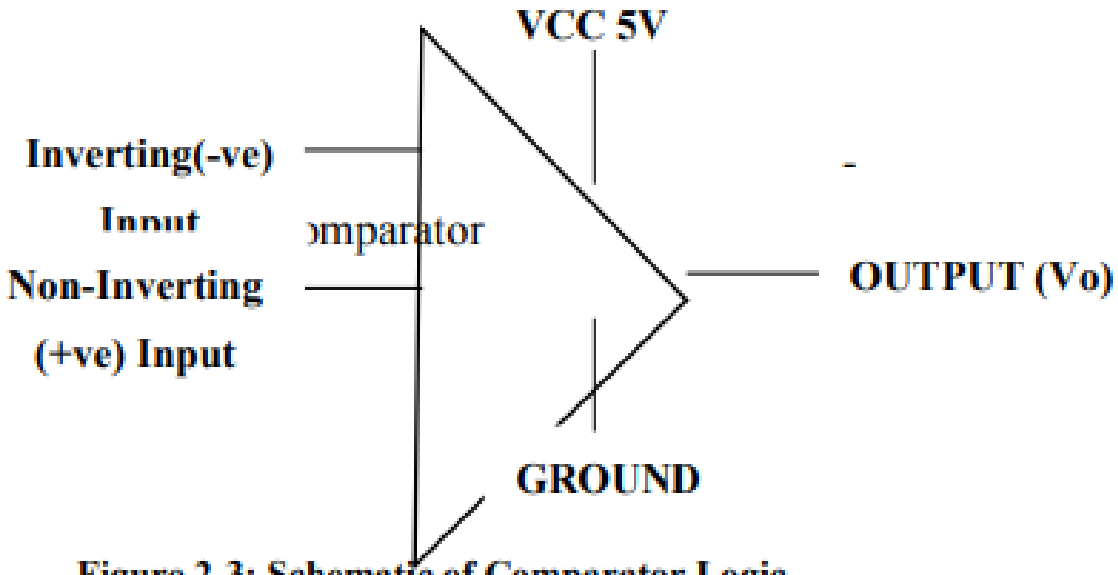


Figure 2-3: Schematic of Comparator Logic

2.2.1.4 Optical sensor

As shown above that two inputs are required for comparator. One input is from photoreceiver (like Photodiode),other is generated by resistor.The second voltage is reference voltage for that sensor.

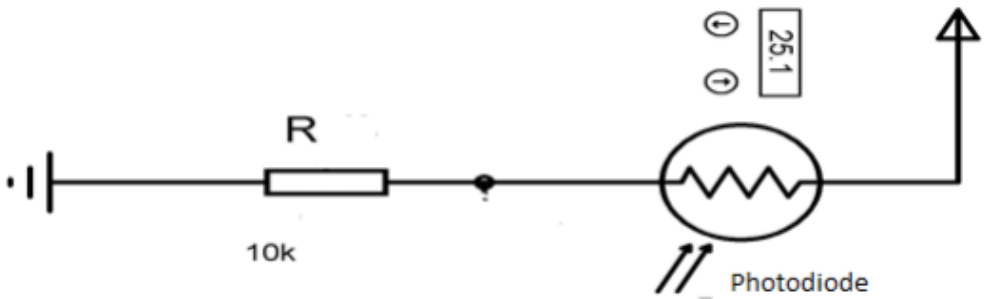


Figure 2-4: Optical Sensor schematic

2.2.1.5 Processing unit

Handling framework goes about as the mind of robot, producing wanted yield for relating contributions, in which microcontrollers are utilized. There are a few organizations these days that fabricate microcontrollers, for instance ATMEL enterprise, Microchip, Intel, Motorola and so on. We will utilize ATmega32L microcontroller in our robot. It is known as AVR1.

2.2.1.6 Arduino

Ardino is an open-source PC equipment and programming organization, venture and client network that plans and produces microcontroller-based units for building advanced gadgets and intuitive items that can detect and control objects in the physical world. The heart of Arduino

is the microcontroller. For Arduino Uno ATmega328 is used.It has particular of 8 bit CPU, 16 MHZ clock speed, 2 KB SRAM 32 KB streak Memoary, 1 KB EEPROM [2].

Features :-

14 advanced info yield pins (3,5,6,9,10 and 11 pins can produce PWM).

6 simple info pins

Voltage contribution from the 7 – 12 V

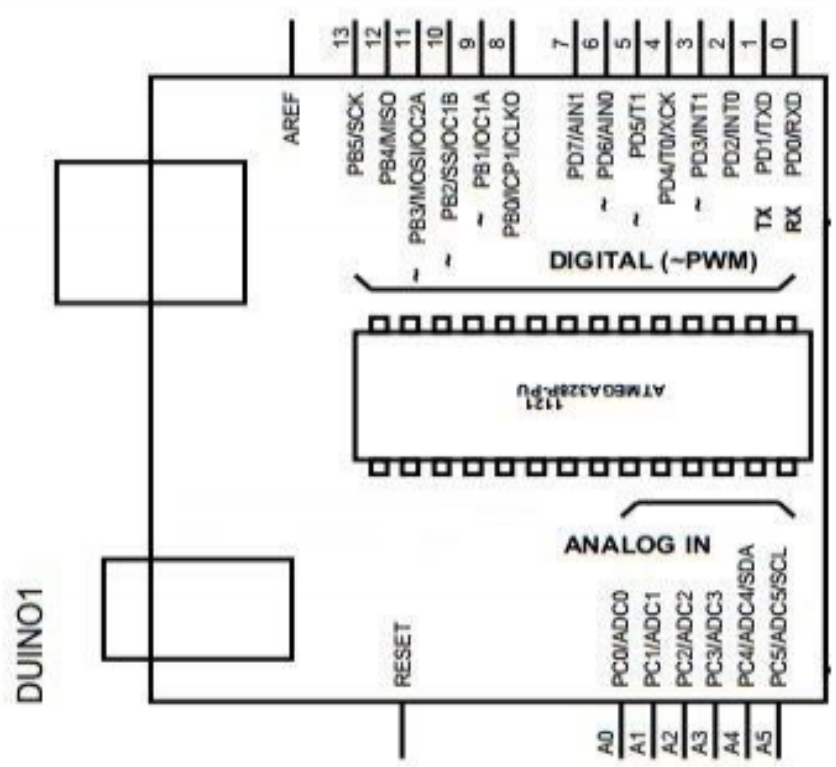


Figure 2-5: Arduino Uno Schematic

2.2.1.7 Output System

From Appendix datasheet

The output system is designed with the function of the following components.

2.2.1.8 Motor Driver

Motor driver is a current enhancing device; it can also be act as Switching Device. Thus, after inserting motor driver among the motor and microcontroller. Motor driver taking the input signals from microcontroller and generate corresponding output for motor.

2.2.1.9 IC L293D

This is an engine driver IC that can drive two engine all the while. Flexibly voltage (Vss) is the voltage at which engine drive. By and large, 6V for dc engine and 6 to 12V for gear engine are utilized, contingent on the rating of the engine. Coherent Supply Voltage choosing what estimation of information voltage ought to be considered as high or low .So if the intelligent gracefully voltage equivalents to +5V, at that point - 0.3V to 1.5V will be considered as Input low voltage and 2.3V to 5V is taken into consider as Input High Voltage. The Enable 1 and Enable 2 are the info pin for the PWM drove speed control for the engine L293D has 2 Channels .One channel is utilized for one motor.2

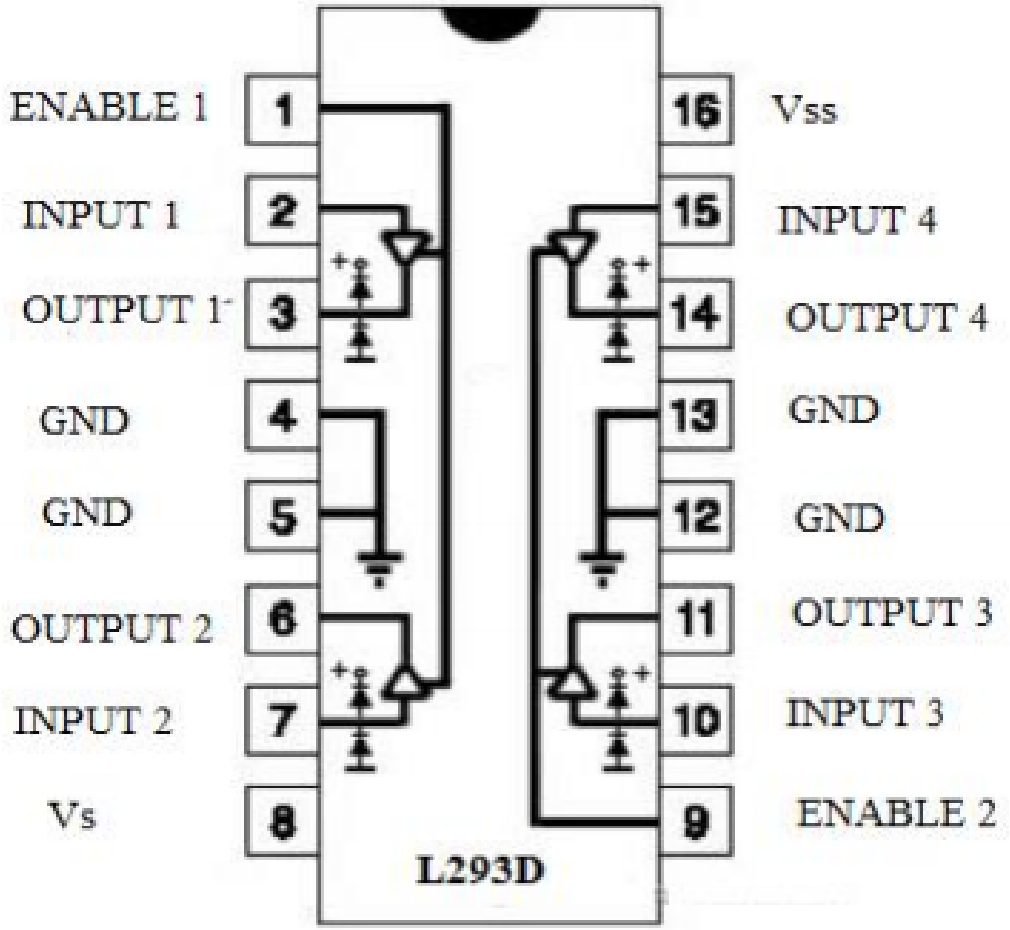


Figure 2-6: Pin Configuration IC L293D

2.2.1.10 DC Motor

Engine is a gadget that changes over any type of energy into mechanical energy or gives movement. In building a robot, engine normally assumes a significant function by giving development to the robot. All in all, engine working with the impact of conductor with current and the perpetual attractive field. The conductor with current normally creating attractive field that will respond with the attractive field produces by the lasting magnet to make the engine rotate.There

are commonly three fundamental kinds of engine, DC engine, even servomotor and stepper engine, which are continually being utilized in building a robot. DC engines are generally simple for controlling. One DC engine has two signs for its activity. Switching the extremity of the force gracefully across it can alter the course required. Speed can be fluctuated by changing the voltage across engine

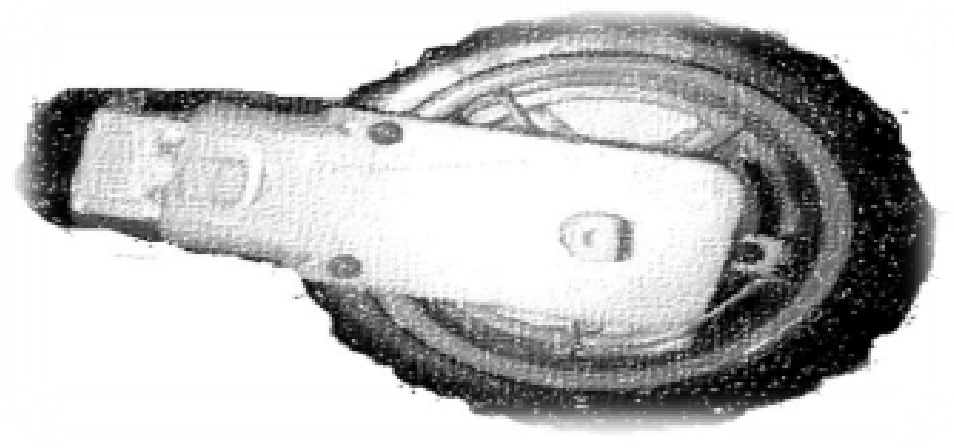


Figure 2-7: Low Volt DC Gear Motor attach with Wheel.

2.2.1.11 LCD Display

In our project it is used to display the distance travelled by the robot through the output from the tachometer system.

Figure 2-8: Schematic of LCD Panel

2.2.1.12 Proximity Sensor

The mix of IR-LED and Photodiode is utilized as the intelligent optical sensor. It create hinder when the IR-pillar is break to the photodiode. To make the IR breakbeam, IR LED is utilized with a low worth resistor so it sparkles splendid. The recipient is Photodiode which predispositions 'on' at whatever point the IR LED's light is identified. A sensor will be put contiguous the IR interface and turned on to create a heartbeat to the Arduino. The Arduino LCD interface is utilized to show the secured separation carefully.

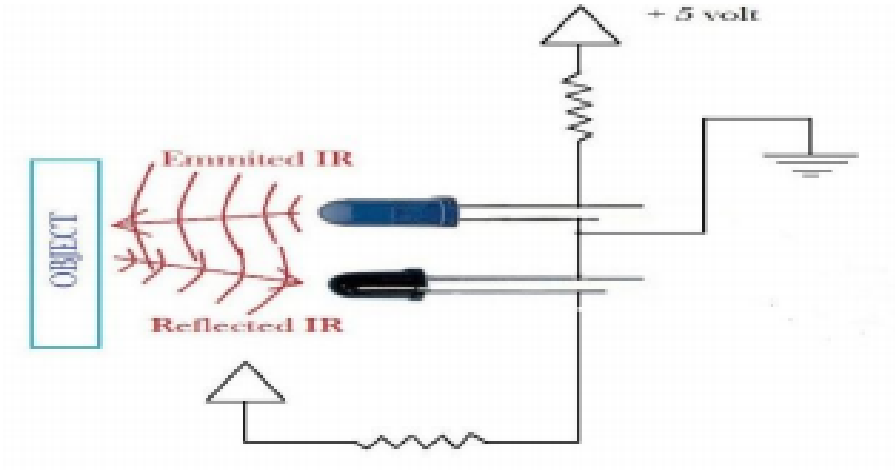


Figure 2-9: Proximity Sensor

2.2.1.13 Software Required

For the simulation of the circuit, Proteus® software is used. For coding and uploading the sketch, the Arduino 1.65 ® is used .

2.2.1.14 Summary

The framework is finished in to the three divison i.e is the Input framework, Processing System also, Output framework. Information framework involves the optical sensor, is a variety of 4 IR-LED and Photodiode sets masterminded in the structure straight lines. The yield from every sensor is taken care of into a simple comparator with the edge voltage (used to align the force level contrast of the line as for the surface). These 4 signals(from every photograph intelligent sensor) is given to a need simple contribution of the arduino. The control has 6 methods of activity, turn left/right, move left/right, and float left/right. The genuine activity is brought about by controlling the course/speed of the two engines (the two back wheels), in this way causing a turn

Chapter 3

Design and Implementation

3.1 Schematic

The schematic of the ”Line Following Robot” is appeared in the figure. The primary segment is the Arduino Uno. Schematic is drawn by utilizing Proteus The primary highlights consolidated into the equipment are given beneath:
Ardunio Uno.
The IR-LED with IR illuminance, changed to be intelligent sensor.
The LM324 quad comparator IC.
A potentiometer to align the reference voltage.
The H-connect engine control IC (L293D)
Motors, with coupled decrease gears.
Connectors to join the various sheets to frame one practical gadget.
A couple of IR-LED and Photodiode is utilized as nearness sensor for the planning techometer Every one of the equipment is dismembered and was planned/actualized independently for their useful and later consolidated as one entire application. This aided in the troubleshooting measures.

The schematic of the circuit is given in the following page.

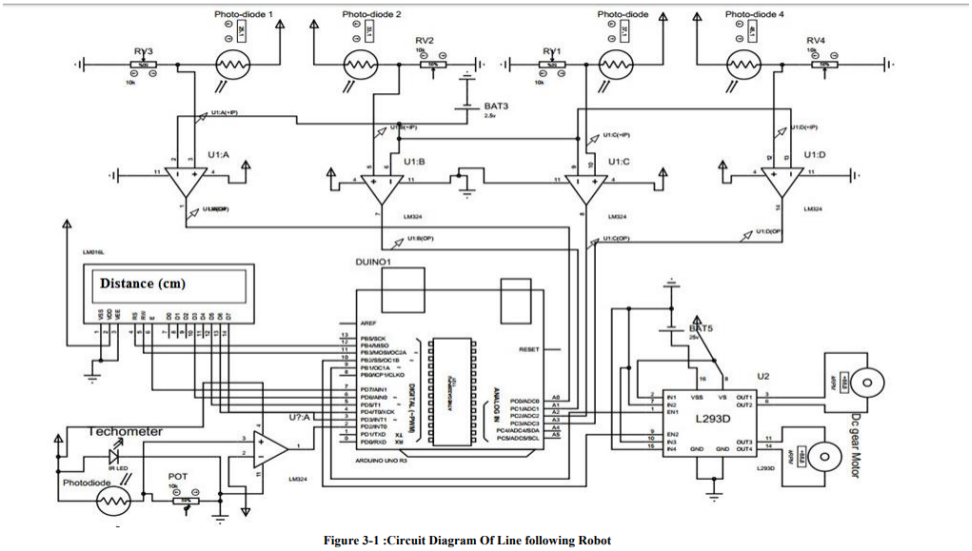


Figure 3-1 :Circuit Diagram Of Line following Robot

Figure 3.1: Circuit Diagram Of Line following Robot

3.2 Arduino Working Logic

Thus totally the microcontroller gets 4 inputs from the sensor circuitry, to the (A3 – A0) of Arduino to decide what to do when on the line. Below is the complete description about what each input mean and what needs to be done [4].

Table 1: Arduino Working Logic

Input				Output (PWM)		State In	Action
A0	A1	A2	A3	9	10		
0	0	0	0	255	255	All sensor in position	Go straight
1	0	0	0	255	191	Leftmost sensor is out of track.	Move right
1	1	0	0	255	127	Two sensor from the left is out of track	Turn right
1	1	1	0	255	64	Three sensor from the left is out of Track	Sharp turn right
0	0	0	1	191	255	Rightmost sensor is out of track	Move left
0	0	1	1	127	255	Two sensor from the right is out of track	Turn left
0	1	1	1	64	255	Three sensor from the left is out of Track	Sharp turn left
1	1	1	1	0	255	All sensor is out of track	Move circularly Until track is detected

3.3 Process Explanation

As shown in the data below, is a typical situation involved. At every sampled time the commands executed by the Arduino is also shown. From the below figure, it should be clear about the software requirements [5].

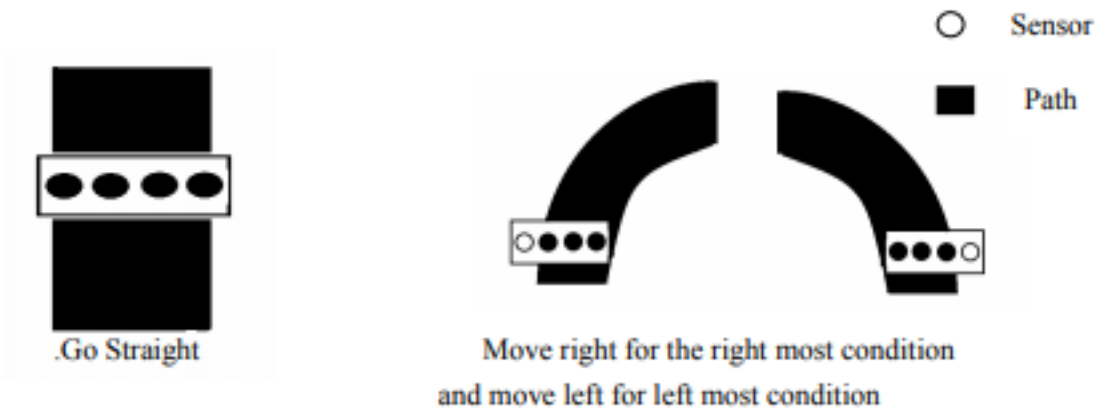


Figure 3-2: Line Following Process

3.4 Programming and Simulation

The program code goes about as the chief installed in the miniature regulator choosing about the yields for specific arrangement of inputs.The program is coded utilizing Arduino® 1.65.and is then assembled to shape a ".hex" document which would then be able to be scorched into the Arduino.The yield is likewise checked in recreation utilizing Proteus® [6] .

3.5 Summary

The logic behind the working of Arduino is to analyse the input from the sensor according to program fed to it and provide corresponding output to the the motor driver which finally drive the motor in such way that, it produce required motion. The differential steering system is implemented to turn the robot. In this system, each back wheel has a dedicated motor while the front wheels are free to rotate. To move in a straight line,both the motors are given the same voltage . To manage a turn of different sharpness, the motor on the side of the turn required is given lesser voltage as level ofsteering required

Chapter 4

Result and Analysis

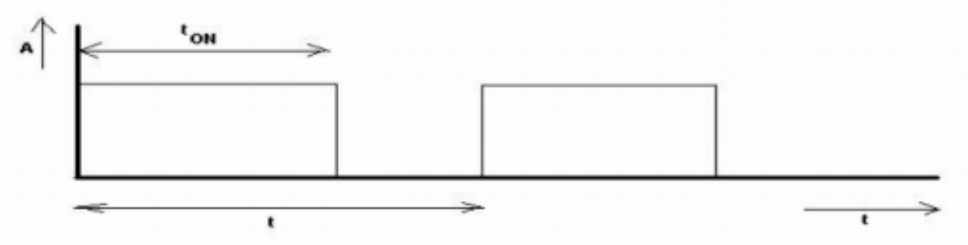
4.1 Introduction to Waterfall Framework

The handy investigation of the segments and the numerical estimation is performed at diverse stage. Dc engine are generally simple for controlling. One dc engine has two signs for its activity. Turning around the extremity of the force flexibly across it very well may be alter the course required. Speed can be fluctuated by shifting the voltage over the engine. The Dc engine don't have enough force to drive the robot legitimately. So as to tackle the issue the dc gear engine is which increment the force of the dc engine in the cost of the speed.

Mathematical Interpretation: Rotational power (Pr) is given by:
Pr= Torque (T) X Rotational Speed ()
t =pr/w
r is constant for DC motor for a constant input electrical power. Thus torque (T) is inversely proportional speed (w)
t 1/w

4.1.1 Speed Control

The speed of the dc motor is control by feeding PWM from Arduino to the enable pin of the L293D which change the voltage across the motor. Due to which speed is also decreased. On the command over the speed and the direction is also controlled.



calculation:

A= 12 P

Where is the duty cycle of the PWM control signal; this shows that by varying the duty cycle of the PWM control,we effectively vary the DC voltage supplied to the motors, thus controlling their speed. This is generated by the arduino built-in hardware [9].

4.1.2 Practical Result Analysis

Here the motor is tested under all condion in the lab. The reading of the motor RPM and the voltage across it is illustrated below. Inertia is neglected.

Table 2: Analysis of effect of PWM on RPM of Motor

Duty cycle (ρ)	Voltage Across Motor	RPM
0%	0	0
25%	3	16
50%	6	29
75%	9	45
100%	12	58

4.2 Digital Revolution Counter

A Digital RPM counter is an estimating instrument which can quantify the quantity of a turn machine carefully. The comparable idea is utilized in instrument called ”Tachometer”. It is a significant estimating gadget in the field of electrical designing and generally utilized in enterprises and laboratorial work. IR-Pair is the core of the framework which found the number of upset. It works by identifying the dark spot in the haggle advanced high to the arduino.

4.2.1 Calculation

The system is designed in such way that it updates the distance value in every 5 seconds. i.e. 12 times per minute

4.2.2 Practical Result Analysis

Here the build revulution counter is used as Tachometer tested under all condion in the lab with reference of standard Tachometer. The reading of the motor RPM is illustrated

Table 3: Comparison between standard Tachometer and Build Tachometer

Voltage Across Motor	RPM (Standard Tachometer)	RPM (Build Tachometer)	Percentage Error
3	70	75	6.25%
6	120	132	9.3%
9	184	173	6.67%
12	258	235	10.4%
15	330	284	12.4%

4.3 Summary

Heartbeat Width Modulation, or PWM, is a strategy for getting simple outcomes with advanced methods. Computerized control is utilized to make a square wave, a sign exchanged among on and off. This on-off example can reproduce voltages in the middle of full on (5 Volts) and off (0 Volts) by changing the bit of the time the sign invests on versus the energy that the sign spends off. The span of ”on schedule” is known as the beat width. To get changing simple qualities, change or adjust that beat width. Since, the assemble techometer can be utilized, as from the investigation the blunder rate inside limit, for the greatest rpm is to be estimated i.e 250 rpm.

Chapter 5

Kinematics of the Robot

The foundation of our plan is the differential directing framework which is recognizable from conventional life since it is the course of action utilized in a wheelchair. Two wheels mounted on a single pivot are autonomously fueled and controlled, subsequently giving both drive and directing. Extra latent wheels (generally casters) are accommodated uphold. The vast majority of us have a natural handle of the fundamental conduct of a differential controlling framework. On the off chance that both drive wheels turn pair, the robot moves in an orderly fashion. On the off chance that one wheel turns quicker than the other, the robot follows a bended way. In the event that the wheels turn at equivalent speed, yet in inverse bearings, the robot turns

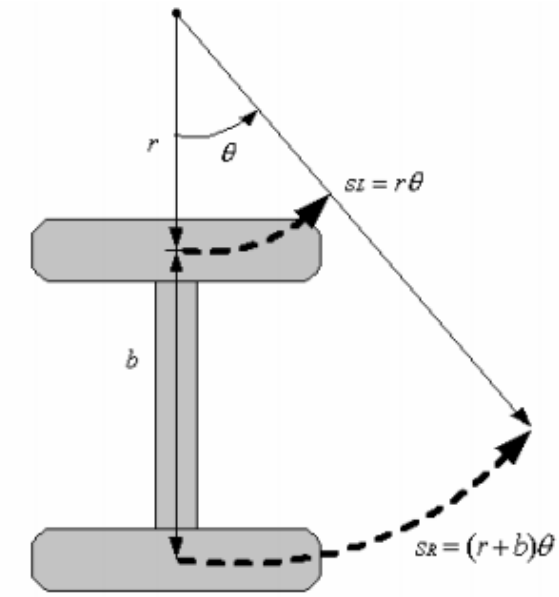


Figure 5.5-1: The Differential steering model

Where SL and SR give the displacement for the left and right wheels respectively, r is the turning radius. b is the distance between wheel, and is the angle of turn. SM is the speed at the center point as the main axle.

5.1 Mechanical Design

The chassis of the robot is made up of the acrylic glass since it can carry more load and have lighter in weight. The detail orthographic projection of the robot is drawn at the appendix.

Design of Path

The path consists of three U-turns of different radii. Among three, the system swiftly turn two U-turn and it goes out of track in one initial U-turn and retrace it's path.

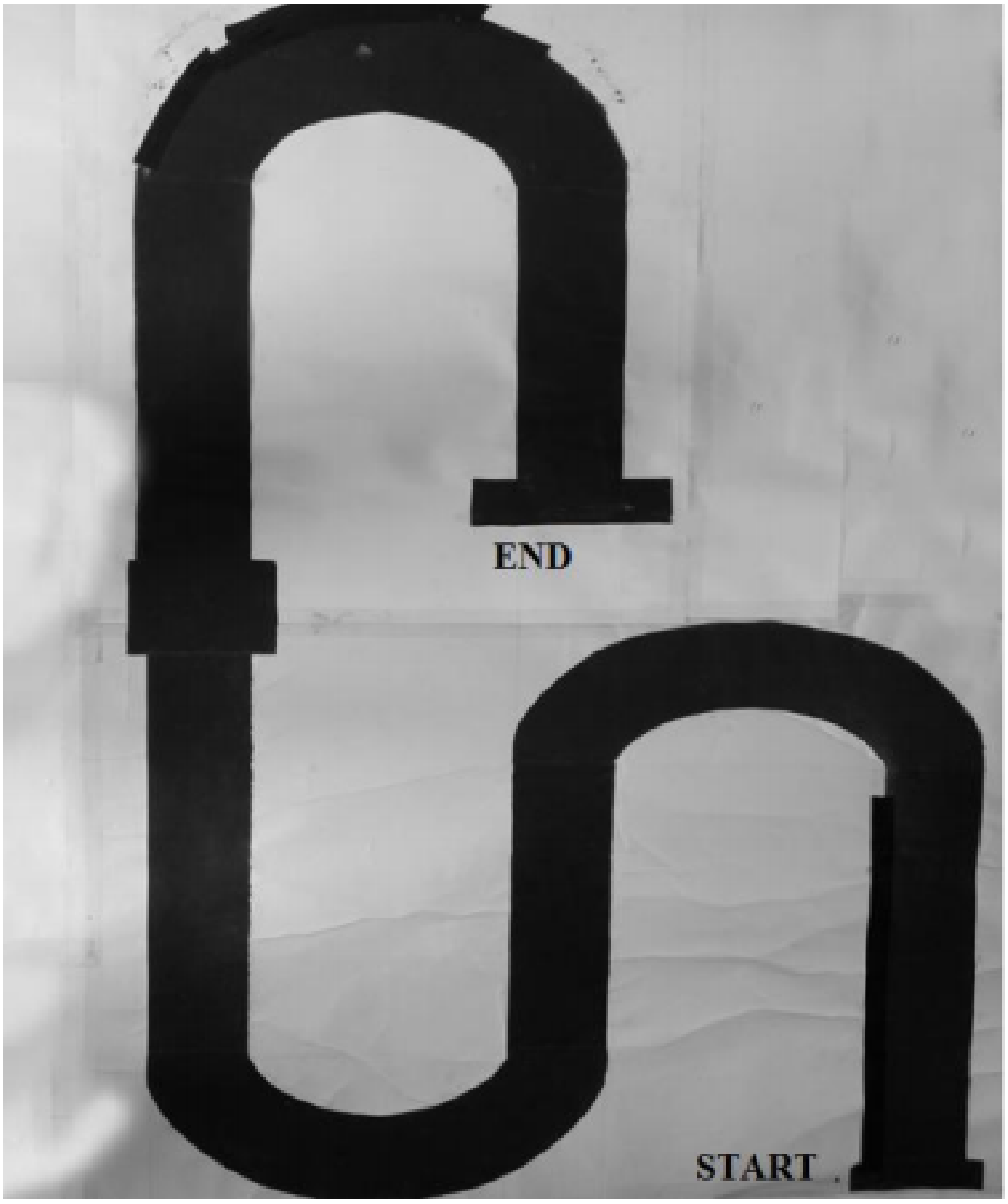


Figure 5-2: Path of the Line Following Robot

Picture of Line Following Robot

The picture of the line following robot is captured by the still camera at some angle and shown below

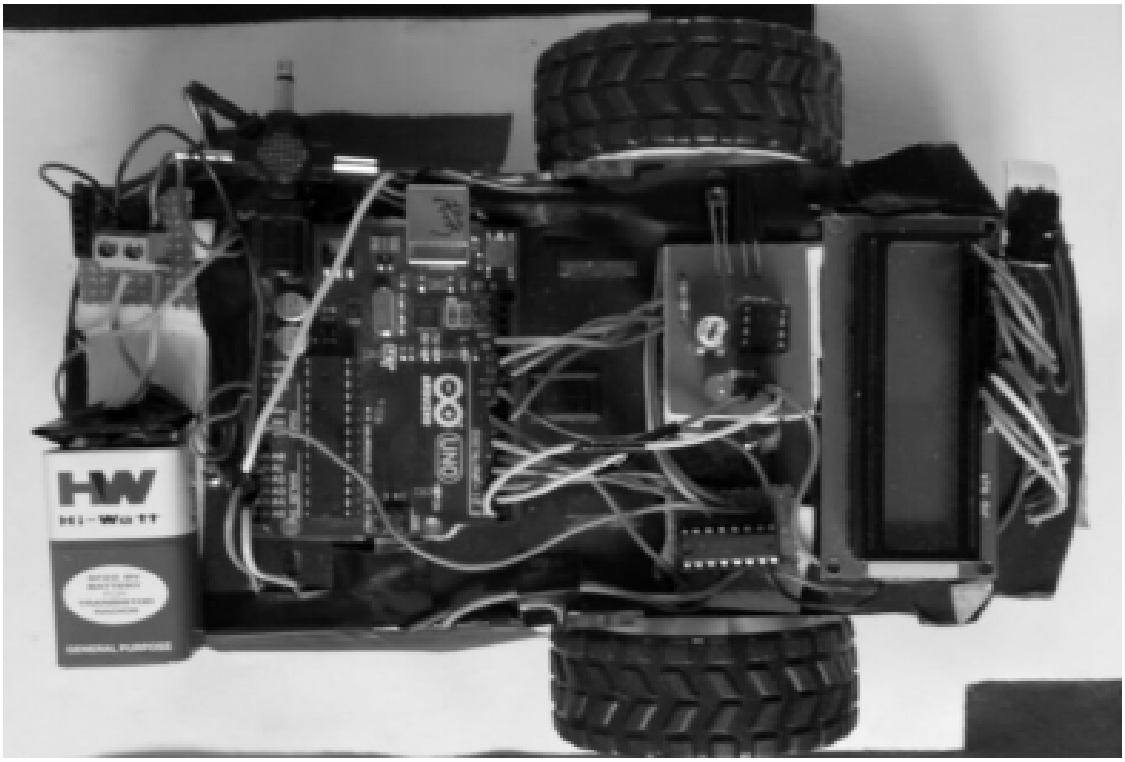


Figure 5-3: Top View of the Line following Robot

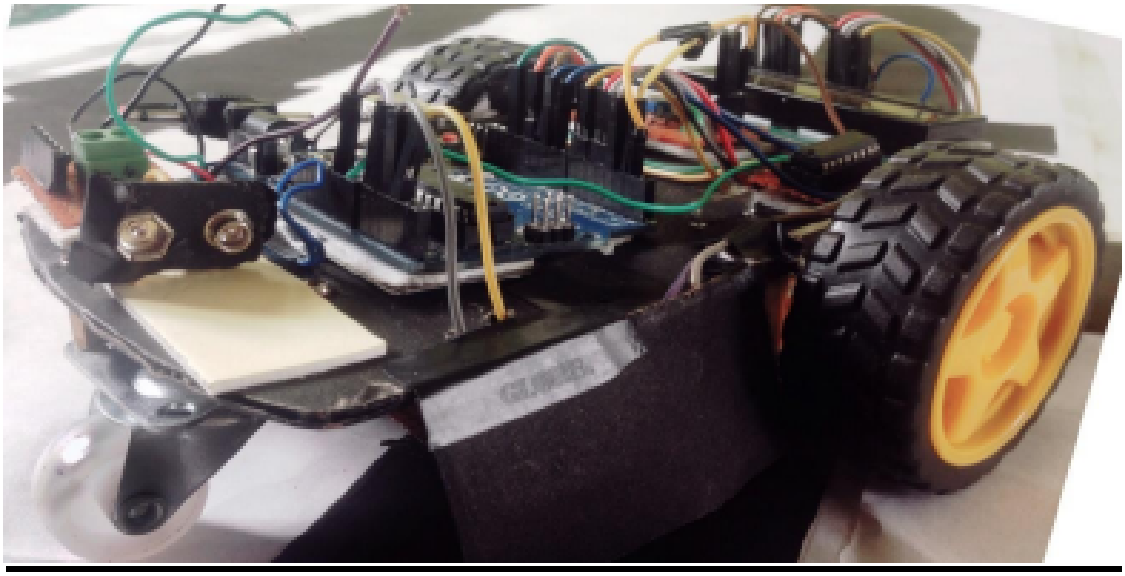


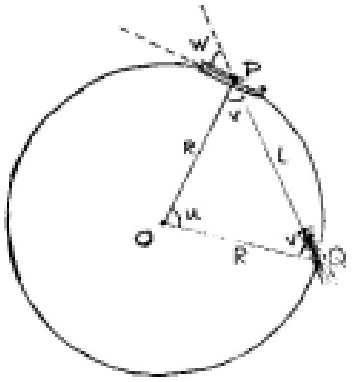
Figure 5-4: Side View of the Line Followinng Robot.

5.1.1 Turning Radius

The turning radius of a vehicle is the radius of the smallest circular turn (i.e. U-turn) that the vehicle is capable of making. The term 'turning radius' is a technical term that is commonly used to mean the full diameter of the smallest circle, but in technical usage the turning radius still is used to denote the radius

Calculation

The total length of the robot car is 172mm (approx 17.2mm.) the minimum turning radius that it can turn sharply.



The diagram in which robot car is making a turn. The situation is show in the figure above. The wheels are shown shaded in the figure. The front wheel's center is P and the rear wheel's center is Q. Let O be the center of the circle, along whose circumference the car moves. Let L=PQ be the length of the car and let R be the radius of the circle. Sharpest turn corresponds to smallest possible value of R. Note that PQ is a chord of the circle. Let us say that the front wheel can rotate at most by an angle w relative to the 'straight' position.

For triangle OPQ [11].

u + 2v = 1800

(1) also , w + v = 900

(2) From, cosine rule for OPQ:

L 2 = R2 + R2

– 2R2 cos(u) (3)

From eqn

(1), (2) and (3)

= 2 At the maximum value of sinw i.e 1 . The turning radius is found to be L/2 = 87.2mm. Now, the velocity of the automobile is the prime factor to determine the ability to take turn smoothly or not. So we have to derive the relation between the the turning radius and The velocity of the robot car

5.2 Summary

The main criteria of the mechnical design is mainly depends upon the differential steering mechanism, turning radius. The caculation of turning radius is necessary because it finds out the mechanical limitation for the types of the curve which is avoded. The turning radius for the design is found to be 100mm . So, in case of designing path the maximum turning radius mustn't be less than 100mm.

Chapter 6

TEST EXECUTION SUMMARY

A line adherent robot is an electronic framework that can recognize and follow a line drawn on the floor. The robot utilizes IR sensors to detect the line, a variety of 8 IR LEDs and sensors, confronting the ground has been utilized in this arrangement. An IR sensor can be fitted close to the patient's bed to which association has been made with the robot as well. The switch for it very well may be initiated by the gracefully individual in the microcontroller itself. In the event that the switch is squeezed, at that point a banner piece is set in the microcontroller, from which the robot follows the line and reaches close to the patient and give the medication to the patient. A closeness sensor can be joined with the robot so it identifies any deterrent present in their manner and can alert. The capacity to get somebody nonstop is the best thing that this framework can do. This aides and improves the activity of material flexibly and furthermore decreases the manual routine work done by the medical clinic staff. This innovation centers around the conveyance of protected, opportune, productive, successful, persistent focused medical care.

Chapter 7

PROJECT SCREENSHOTS

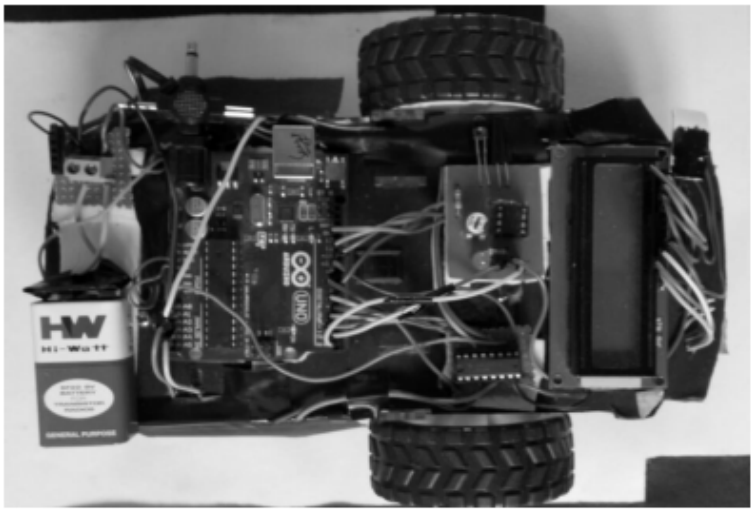


Figure 5-3: Top View of the Line following Robot

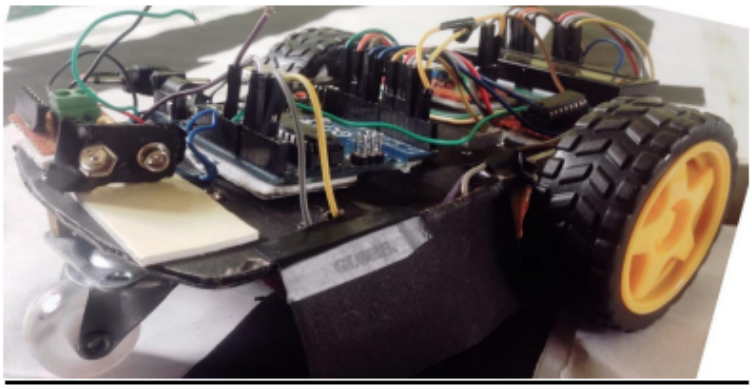


Figure 5-4: Side View of the Line Followinng Robot.

Chapter 8

PROJECT SUMMARY AND CONCLUSIONS

8.1 Conclusion

The line following robot is car framework that has capacity to perceive it's way , move what's more, change the robot's situation toward the line in the most ideal manner to stay in track. This undertaking report presents a photodiode sensor based line adherent robot plan of 200gm gauge which consistently coordinates along the dark line on white surface.The electromechenical robot measurement is 19210070 mm3 with max rpm 180 at no heap and frictionless condition. The base turning range for the framework is 100mm at speed of 24.2 cm/s. The robot can recognize it's way in the event that it is out of way.
The line following robot venture moved the gathering to collaborate, impart, and grow comprehension of hardware, mechanical frameworks, and their incorporation with programming. The effective culmination of each errand exhibited the capability of mechatronic frameworks and a positive gathering dynamic

8.2 Future Work

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:

* Use of color sensor.

* Use of ccd camera for better reconigsation and precise tracking the path..

GANTT CHART

Table 5: Gantt Chart

Task	Sept. 2015	Nov. 2015	Dec. 2015	Jan-Feb. 2016	March 2016	April-May 2016	June-July 2016
Study of possible project							
Project Title Selection							
Literature Review							
Proposal Writing And Defense							
Circuit design and implementation of the circuit							
Mid-Term Report							
Hardware and PCB development							
Testing and evaluation of the system							

	Work Accomplished
	Work Remaining

Chapter 9

FUTURE SCOPE

- Software control of the line type (dark or light) to make automatic detection possible.
- “Obstacle detecting sensors” to avoid physical obstacles and continue on the line.
- Distance sensing and position logging transmission.

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[4] *Development and Applications of Line Following Robot Based Health Care Management System Deepak Punetha, Neeraj Kumar, Vartika Mehta, International Journal of Advanced Research in Computer Engineering Technology (IJARCET), Volume 2, Issue 8, August 2013*