

Fabrication of Mobile Robot using PID

G. Vasumathi, J. Dhanasekar, V. Priya,

Abstract : PID line follower is a mobile robot. The term PID stands for Proportional, Integral and Derivative. This paper describes the working of PID control and how it is implemented in the line follower robot to govern its motion. The mobile robot should follow the black or white line which is plotted on a surface by the help of IR sensor array. It consists of H-bridge circuit to drive the DC motors. These are all done by a pre-programmed ATMEGA16 microcontroller called Arduino.

Keywords- Mobile Robot, H-Bridge Circuit, Arduino And IR Sensor Array.

I. INTRODUCTION

Normally a line follower robot has two IR sensors one on the left-hand side and another on the right-hand side of the robot to detect the line. But in PID line following robot the array of IR sensors are used. This robot uses the PID algorithm to calculate its position on the black line and maintain its position at the centre of the line, which is the target position of the robot. [1],[3],[5]

PID control loop plays a vital role in the programming part because the robot knows its position by this algorithm. So, this part is very interesting and slightly difficult to construct it. In IR sensor array analog output is used to detect the line because the analog output is better than the digital one. The motion part of the robot is done by the help of H-bridge motor driver circuit called L293d circuit. This robot has many applications in medicine, Automation, and in space researches.

II. BLOCK DIAGRAM

The Figure 1 shows the block diagram of the system. In this system the control unit consists of microcontroller ATmega16 (Arduino). The IR sensor array gives the input analog signal to the microcontroller. The output motor driver circuit. [2],[4],[6]

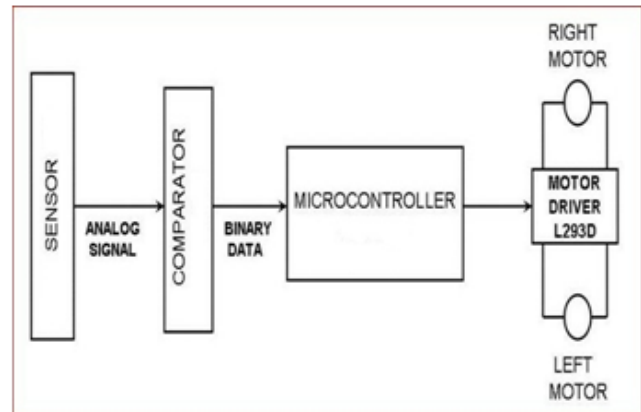


Fig.1.Block Diagram

III. HARDWARE

A. Arduino UNO

Arduino UNO board was developed in the year of 2005. It is a microcontroller which has 14 digital input or output with 6 PWM pins and 6 analog input pins. It has a simple programming platform to communicate with the microcontroller.



Fig. 2.Arduino UNO board

B. IR Sensor Array

IR Sensor array consists of IR receiver and transmitter in the parallel position. It acts like an input device for the robot. It gives the analog reading to the microcontroller to find the position of the robot.

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G.Vasumathi Department of Mechatronics ,Bharath Institute of Higher Education & Research,TamilNadu Email: vasu.bala06@gmail.com

J.Dhanasekar., Department of Mechatronics ,Bharath Institute of Higher Education & Research,TamilNadu Email: Jdhanasekar81@gmail.com

V.Priya, Department of Mechatronics ,Bharath Institute of Higher Education & Research,TamilNadu Email: priyayagna14@gmail.com



Fig 3.IR Sensor Array

. Motor Driver

Motor driver circuit is used to drive the motors of the robot. It has six inputs and four outputs. In has two enables input pins to control the speed of the motors. [7],[9], [10]

IV. PRINCIPLE OF WORKING

The connections for the robot are shown by below figure.

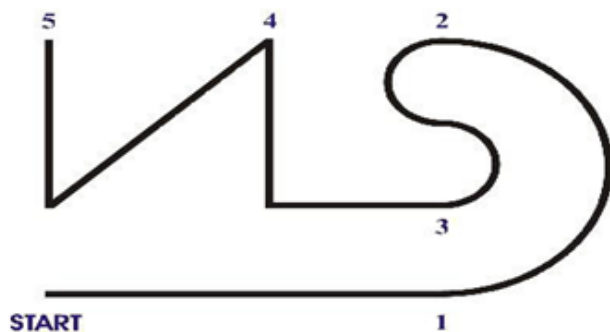
The analog signals of the IR sensor array is fed into the arduino board to calculate the position of the robot by using the below PID formula is given below.

$$\text{position} = \text{int}(\text{sensors_average} / \text{sensors_sum});$$

After finding its position of the robot the speed of the motors is controlled to correct he position of the robot. It can be done by using the below formula.

$$\text{motor_speed} = \text{max_speed} + \text{error_value};$$

Finally, the robot is tested in the track which has all types of turns. The errors on turning the 90 degree cuts should be corrected by changing the value of the kp, kd and ki constants.



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AUTHORS PROFILE



Vasumathi. Assistant, Professor, Department of Mechatronics Bharath Institute of Higher Education & Research, TamilNadu



Dhanasekar, J., Assistant Professor, Department of Mechatronics Bharath Institute of Higher Education & Research, TamilNadu



Priya V Assistant Professor, Department of Mechatronics Bharath Institute of Higher Education & Research, TamilNadu

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