

“Internet of Thing Approach towards the Line Follower Robot”

Ansh Jain¹, Manan Shastri², Krish Vora³, Saad Khan⁴,
Mukesh Patel School of Technology Management & Engineering,
Maharashtra, India^{1, 2, 3, 4},
ansh.jain9090@gmail.com¹
manan1094@gmail.com²
krishvora007@gmail.com³
saadsmith.sk@gmail.com⁴

Abstract

One of the major key aspects in domain of robotics is the line following robot. These robots work of the principle of contrasting color which either follow a black or a white line. Following the plot line is a feature which is taken up by the robot. The path which is followed by the robot can generally be of dark band on light area or can be a undetected magnetic sphere or it can be invisible magnetic field. The users provided path will be the one which will be followed by the robot and it has been formed to avoid obstacles. No human directions are needed by the autonomous intelligent robots to follow the duty in any sort of conditions. It needs to have combined knowledge from different departments of engineering such as mechanical, electrical and computer engineering. Line follower robots are based on LDR sensors and fabrication which are engineered to follow up the black mark on any white surface. To follow up the track many type of sensors are being used by AI robots. These sensors abet the robot to follow the lines. We are using DC motors to direct the movement of AI robots.

1. Introduction

Defining Line Sensing Robot- We has designed the line follower robot in order to follow the black line without getting away the path. We have used two sensors in the forepart of the structure along with a pair of DC motors which are forward going in the robot. The input signal and controlling of the rate of wheel spin is the work of the circuit formed inside. The sensors control the robot in a way that if sensors get to know about the black line they can either slow down their speed or stop down. Variation between the wheel spin cause the droid to turn; Example, we can consider that if the sensor anyway senses the dark coloured line to the right of wheels and it will be turning to upright direction [1].

Sensing of the Dark Line- The sensors that are used are Reflective Object Sensors, OPB710F these are available at the labs. Singe sensors are formed by and infrared emitting diode and a NPN Darlington phototransistor. The output current is produced when the light is emitted from the diode and it comes back to the phototransistor, which depends on the amount of infrared light which is responsible for triggering the starting current of the phototransistor [2]. In our case, we can see that the sum of light that is reflected is much lower than of the light background, hence the black line is detected anyhow by current measurement. (The current is then converted into voltage)

Controlling DC Motors- In general we do not apply the persistent voltage over the DC motor instead altogether continuously start and stop the motors with a fixed value of voltage that is applied to the motors. It is made possible by sending of trains of PWM pulses to the energy of MOSFET in order to turn it on and off. Then with its dependency on duty cycle of PWM pulses the motor keeps the record of average voltage. The average voltage and rate of spinning is in proportion to each other. It is easier to control the DC motors with the use of PWM method than straight away controlling the voltage over it. The only thing which we may do is to modulate pulse width or we can say duty cycle. Also a power MOSFET takes a bit of energy in switching [3].

2. Basic Function & Methodology

Key features of line follower-

1. With the ease of optical sensors set on forepart of the droid help it to recognize the path.
2. Tracking is only possible with the help of steering mechanism. To complete the task there are two motors which are controlling the wheels are assigned.

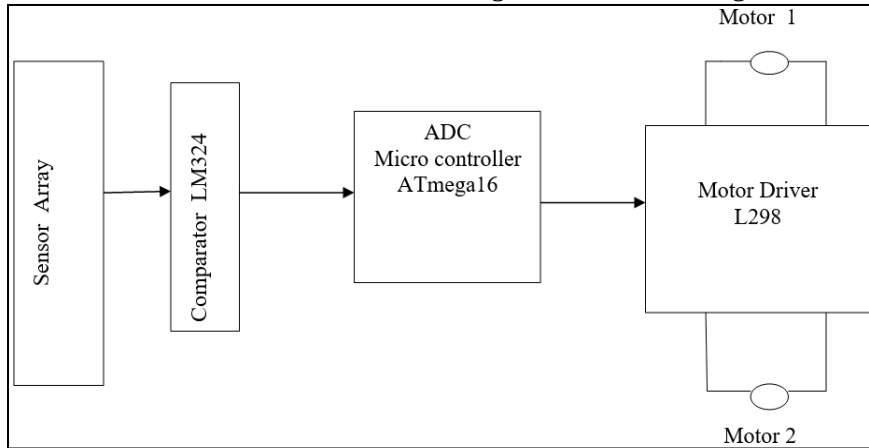
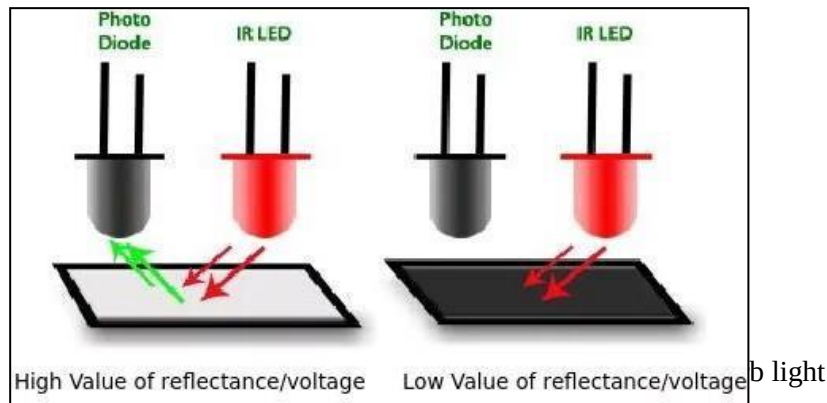


Figure 1: Block Diagram LF Robot

3. Input System

Two crucial components of Infrared reflective sensors contain one emitter (IR Led) along with a single receiver photo transistor. Two conditions of the receiver can be a light coloured surface which reflects the light and recognized by the receiver or it will be inefficient to reflect the light and rather will absorb it in the case of dark plane area [1] [4].



The electrical resistance of photo diode comes down if Infrared light falls upon the diode (it comes down from 150 kohm to 10 kohm if no noise is there). To notice the changes and the resistance people generally make the application of voltage divider circuit [5].

IR Sensor- The work of infrared sensors is to detect the infrared light of 400-700nm from a specific body or band and convert the light energy into electrical energy. The pair of Infrared sensor includes of emitter and locator. Colour of emitter is azure whereas the discoverer can have dark silver and of light grey colour.

Infrared Emitter- Made from Gallium Arsenide an Infra-red emitter is a light releasing diode. It is used to detect the IR energy at wavelength 880nm and emitting the identical power. The infrared phototransistor can be seen as transistor with a base voltage known by the sum of light which hits the transistor. Therefore it behaves like variable current originator. The more quantity

of IR light will give rise to more currents to pass throughout the collector emitter leads. The variable current moving from the resistors produces the drop in the voltage in the pull up resistor. The output of device can be measured as the voltage [2] [6].

Infrared Detector- The infrared detector also known as photo detector detects the power from emitter while transforming it to electrical power. Major theory entangled in the transmutation of light energy to electrical energy is the photoelectric effect. The outcome is withdraw from the negative terminal of IR detector and bought to a micro controller by its analogue to digital transformer or LM335 is comparator for it that is to be used for the process [7].

4. Output System

Motor driver-Motor driver can act as two kind of devices either current enhancing device or as a diverter. Once the input from motor driver inside the motor and micro controller then the motor jockey takes in load from the actions of microcontroller then it give rise to the likewise yield for the motor.

ICL293D- ICL293D motor driven IC can firmly a pair of motors at a same time. Percent of Voltage upon which we are willing to run the motor is known as the Supply Voltage (Vss). We are generally using 6V for DC motor and around 6-12 V for gear motor, which depends upon the rating of the motor. The deciding factor of value of input voltage that is Logical Supply Voltage shall either contemplated as high or low. In case we think to set the Logical Supply Voltage equal to +5V then -0.3V to 1.5V will be taken as the Input Low Voltage and 2.3V to 5V will be considered as the Input High Voltage. L293D consists of 2 paths among which single one can be utilized for a separate motor [8].

-> Path 1: Pin no. 1- 8

-> Path 2: In no. 9 - 16

We use the enable pin to either cause or switch on the channel active. The enable pin is also known as Chip Inhibit Pin. All input (Pin no 2,7,10 and 15) of the L293D IC is harvested by the microcontroller (ATmeg32). For eg we have connected (Pin 2,7,10-15) of L293D IC (Pin no. 14, 15, 16 and 17) of ATmega 32 within our robots, as on the Pin no. 15 and 16 of ATmega32 we may give rise to PWM. The output (Pin no. 3,6,11 and 14) of the L293D IC moves in into upright and left hand motor.

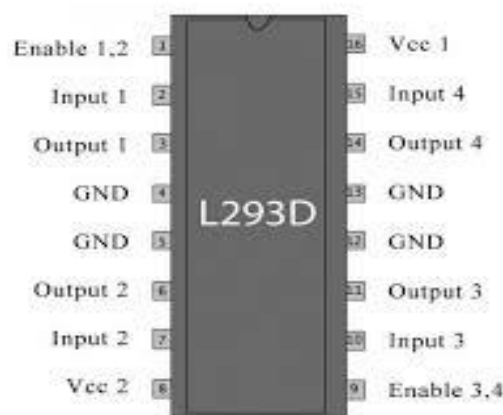


Figure 3. Structure IC (L293D)

5. Working Methodology

Line follower droid has the potential to maintain a three way direction-

1. Forward direction

2. Upright direction
3. Left hand direction

Forward Direction- When the response of middle sensor is lower than the other two sensors the activity of robot is inclined more to the forward direction. The right and left detecting sensors continue to remain on white surface and reflect the emitted radiation thus allowing the robot to move forward in straight direction.

Right Direction- While turning to right direction the right sensor will be more on the black line as compared to the other two sensors which will be following the white surface. When this data is processed the right side wheels will turn to right direction and left wheels would become free until the middle sensors make any response.

Left Direction- While turning to left direction the right sensor will be more on the black line as compared to the other two sensors which will be following the white surface. When this data is processed the left side wheels will turn to left direction and right wheels would become free until the middle sensors make any response [9].

A. Advantages

1. Automatic Movement of Robot
2. Proper and Forget structure
3. Efficient in covering lasting range of distance
4. Used for defence
5. Build Simplicity

B. Disadvantages

1. When on different line thickness and angle speed slows down and it becomes instable.
2. The droid is only efficient in working only on dark strip of 1or 2 inches which is placed on light coloured surface.

6. Result

On the track of a black line the line follower robot has been successful. Multiple dark bands are upward the light area but in different directions but yet the droid is capable of following the actual path without any deviation still Droid is capable enough to recognize the path and stick to it while possessing a tendency to carry almost 500gm of load above it.

Conclusion

To conclude, the paper to make automatic detection possible software of the band kind (black or white) could be made also to stop from deviation of path we can use "obstacle detecting sensors". With the help of this idea Transmission, position logging and distance sensing is simple. It useful in hospital like to carry therapeutics in a hospital we can use smarter version of line follower. We can use this technology for the purpose of managing public transport and for map reading in automobiles.

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