3.3 L293D Motor Drive Module

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).The l293d can drive small and quiet big motors as well, check the Voltage Specification at the end.

Concept

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

Working of L293D

There are 4 input pins for l293d, pin 2,7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.

In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

L293D Logic Table.

Lets consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.

- Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 0 | Idle [No rotation] [Hi-Impedance state]
- Pin 2 = Logic 1 and Pin 7 = Logic 1 | Idle [No rotation]

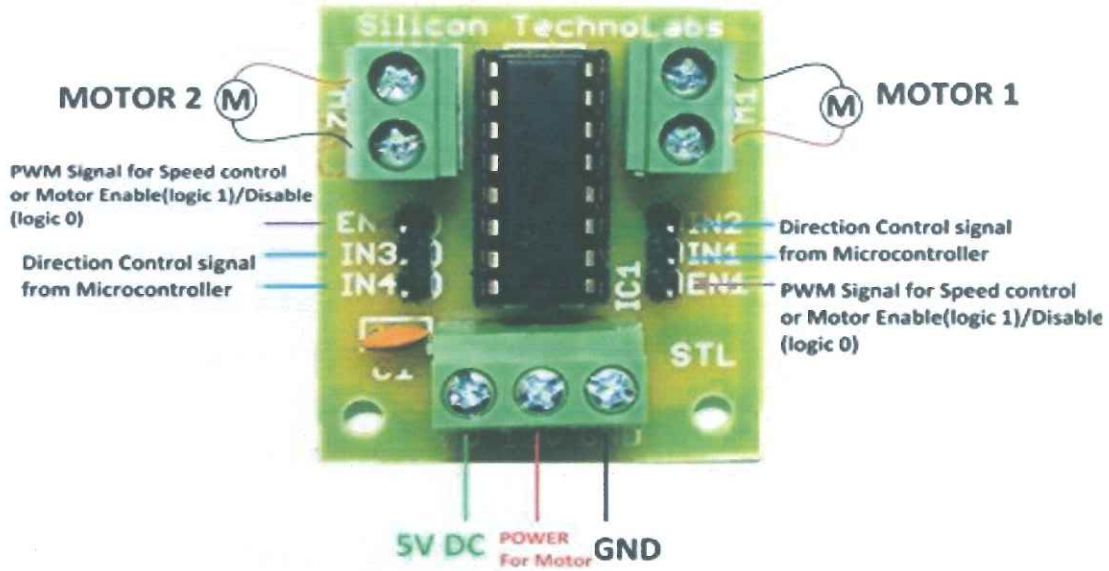
In a very similar way the motor can also operate across input pin 15,10 for motor on the right hand side.

Voltage Specification

VCC is the voltage that it needs for its own internal operation 5v; L293D will not use this voltage for driving the motor. For driving the motors it has a separate provision to provide motor supply VSS (V supply). L293d will use this to drive the motor. It means if you want to operate a motor at 9V then you need to provide a Supply of 9V across VSS Motor supply.

The maximum voltage for VSS motor supply is 12V. It can supply a max current of 600mA per channel. Since it can drive motors Up to 12v hence you can drive pretty big motors with this l293d.

VCC pin 16 is the voltage for its own internal Operation. The maximum voltage ranges from 5v and up to 12v.



(1) IN1,2 & IN3,4 are controll signals from controller use for Direction control of Motor.
(2) If IN1,2 signal is logic(1,0) then Motor 1 Rotates in One Direction.
If IN1,2 signal is logic(0,1) then Motor 1 Rotates in Opposite Direction.
(3) EN1 & EN2 are Enable pins. Connect 5V DC to EN1 & EN2 pin to operates Motor its normal rated Speed .
if Speed Control needed. then give PWM on EN1 and EN2 from Microcontroller
(4) Power for Motor.if 12V DC Gear Motor is Used Then apply 12V.
(5) Make sure to make GND common for all Circuit

Figure 3.3: L293D MOTOR DRIVER

4 PROBLEM DEFINITION

It is difficult for visually impaired people to move or live without help. They usually use alternatives like a white cane stick to guide them during moving. Although it might be helpful, it doesn't guarantee saving visually impaired people from risks. These traditional ways can only be used for low-level obstacle detection.

Electronic Travel Aids (ETAs) devices have been recently introduced to be a mobility aid for the visually impaired people. ETAs are devices containing sensors that alert the visually impaired people about obstacles existence through vibration and sound. Such devices increase the visually impaired person's self-confidence and provide safety, as they give the necessary help to those people to facilitate their movement in an unfamiliar environment.

We propose a bot system which detects obstacles in the visually impaired person's path and changes its direction accordingly to save him/her from hitting obstacles. Most of the systems which serve this purpose have two major disadvantages. Firstly, such devices have a big size, high weight, and high power consumption. Secondly, a solution based on sound is confusing and difficult to understand.

So, we propose the following system in this project report:

1) Cheap bot with a total cost not exceeding □4000.
2) Light weight components integrated to the bot which make it user friendly.
3) Fast response of obstacles in close range of 5-10 cm using infrared sensors.
4) Avoidance of confusion by indicating change in direction on detection of an obstacle.

5 PROPOSED APPROACH

The bot we are proposing is basically an embedded system integrating the following components: a pair of infrared sensors, one on the front-left and one on the front-right to be able to detect obstacles in front of the visually impaired person in the range of 5-10 cm. Both infrared sensors collect real time event and use this to decipher the presence of an obstacle.

When the infrared signal is received at the infrared sensors, these begin to compare between transmitted and received signals to identify obstacles standing in the way of the visually impaired person. If the sensors find a difference in the form and amplitude of received and transmitted signals, it invokes the appropriate alert in the form of change in direction towards the opposite direction of that of the obstacle.

The whole system is powered using a 5V power supply. The DC motors are connected through the motor driver IC (L293D driver module). The program code is to be written by using Python language which has been partially written and will be completed by the end of this term.

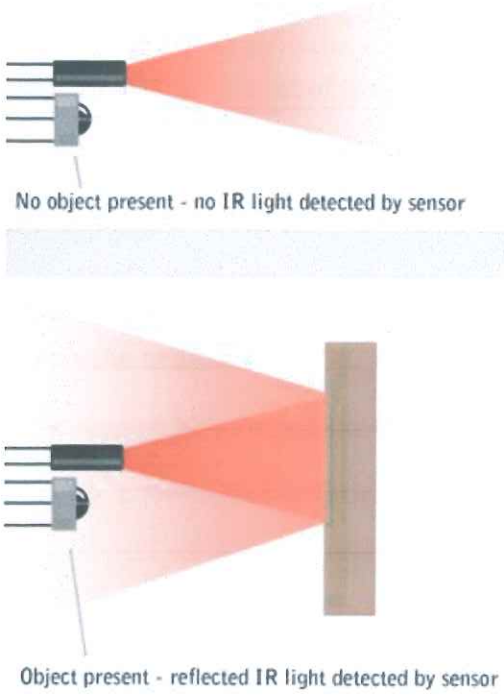


Figure 5.1: IR WORKING

6 WORKING OF MODEL

With the reliability and high level of performance of robotic vehicles nowadays, it is a great way to demonstrate the application of collision detection and obstacle avoidance in real lives. In this project, we have designed an autonomous robotic vehicle which is used to detect obstacles and avoid collision. This robot consists of two infrared sensors – one on the left of the front face and one the right of the front face.

On running the program written for functioning of the robot, the robot gets the information about the obstacles from the surrounding area through the two infrared sensors in front of the robot. Whenever the robot is travelling on the desired path (one without obstacles), the infrared waves are transmitted by the head of infrared sensors. Whenever an obstacle comes in front of it, the infrared waves are reflected back from that obstacle and that information is passed to the motor driver module.

The motor driver then controls the movement of the two DC motors mounted on the left and right of the motor based on the infrared signals. For example, if the obstacle is detected by the right infrared sensor then the movement of the vehicle in its reverse direction is initiated by the motors. The left motor turns anticlockwise and the right motor turns clockwise. Then the vehicle turns left with both the motors moving in the clockwise direction. This movement helps avoid the obstacle and travel without collision. The speed of each motor pulse in controlled by pulse width modulation (PWM).