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DC Motor Speed Control Using PWM

K. Priyanka[1], A. Mariyammal[2]
[1,2]Department of Electrical and Communication Engineering,
Vivekanandha College of Engineering for Women(Autonomous),
Tiruchengode.

Abstract:-Dc motor are mostly used in industries so we used to control the speed of the motor by using PWM. In this paper, to control the speed of DC motor using Pulse Width Modulation (PWM) method. Microcontroller AT89S52 is used to generate PWM. L293D IC is used to drive the motor which is made up of two H-Bridge. 555 IC is used with opto coupler to sense the speed of DC motor. Rectifier circuit is used for power supply to circuit and motor. This paper shows that precise and accurate control of small DC motors without using costly components.

Keywords:-PWM , Microcontroller, DC Motor.

I. INTRODUCTION

In our project we use PWM to control the speed of the DC motor and Using Atmel AT89S52 microcontroller generate the PWM wave for speed control of DC motor, we need a variable-voltage DC power source to control the speed of the DC motor. When the DC motor is on, it takes certain time to reach at full speed. Then, the power source is on, the DC motor starts gaining speed and if we switch off the power source before it reaches at rated speed, it starts to goes down. In quick Way switching on and switching off are done, the motor rotate at a lower speed between zero and rated speed. we used PWM method so it switches the motor „on" and „off" with a pulse wave. The main objective of this paper is to become easy with the implementation of hardware of Atmel AT89S52 microcontroller based speed control of DC motor, L293D IC is used to provide to motor and infrared sensor is used to count the speed which are interface with 555 IC, it give senses of occurring overload to the operator at overload condition and speed display on LCD screen. For the required speed the speed controller takes signal represent and to drive a motor at a constant speed.

II. DESCRIPTION

A. Pulse Width Modulation

pulse width modulation is a modulation technique used to encode a message into a pulsing signal. The average value of voltage fed to the load is controlled by turning the switch between supply and load on and off at a fast rate. The longer Switch is on compared to the off periods, the higher the total power supplied to the load.fig:1 represents the PWM.

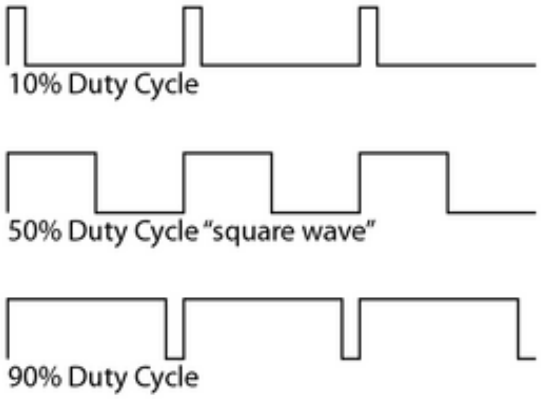

Figure 1. PWM Wave

B. Power Supply

Power supply is the major source of the electrical base and we use step down transformer from 230v AC to 12v DC and after we use full wave bridge rectifier to convert AC to DC source for the components.fig:2 represents the power supply and bridge rectifier.

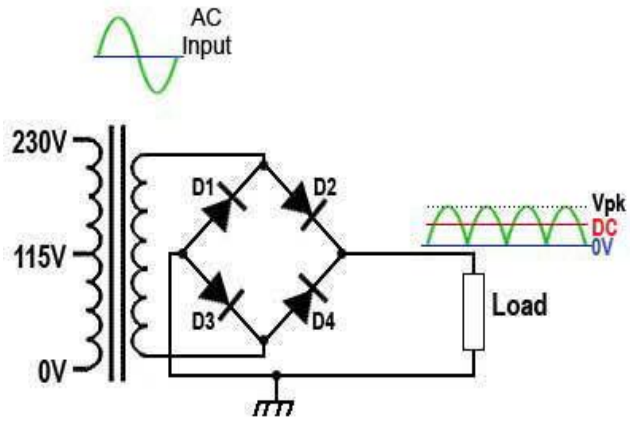

Figure 2. Power Supply With Bridge Rectifier

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C. Motor Driving IC

L293D is a typical motor driver or motor driver IC which allow DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motor in any direction. Dual H-bridge motor driver integrated circuit(IC). It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. Hence H-bridge IC are ideal for driving a DC motor.

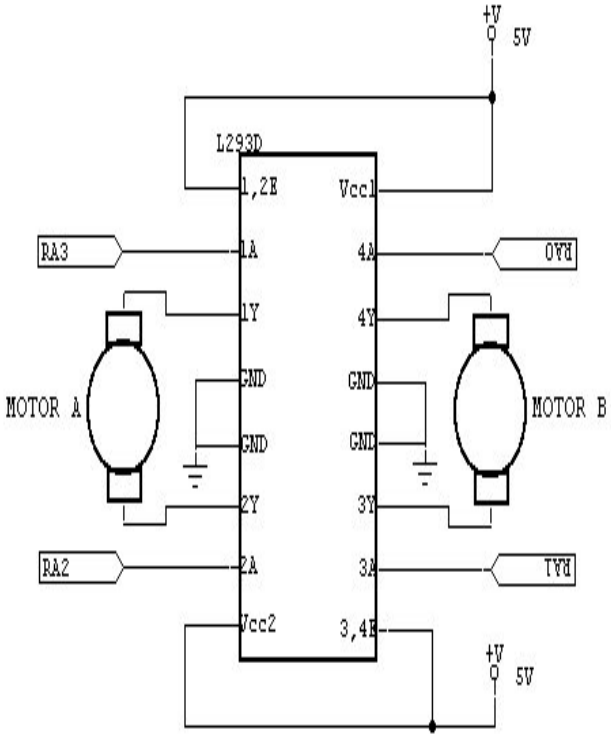

Figure 3. Motor Driving IC

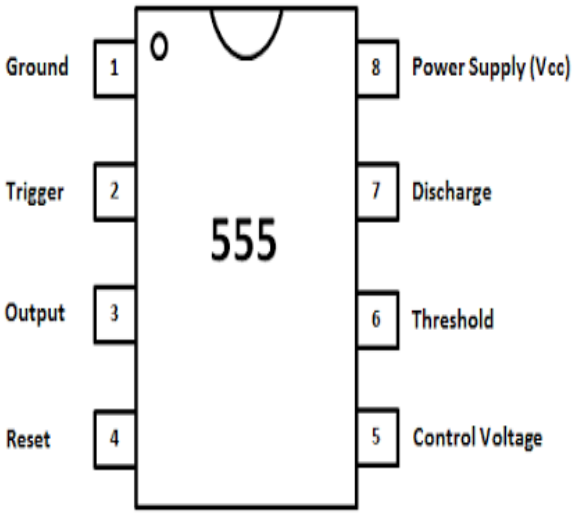

Figure 4. 555 Timer

D. IR Sensor

In this IR detector and transmitter circuit the IC 555 is working under MONOSTABLE mode. It is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

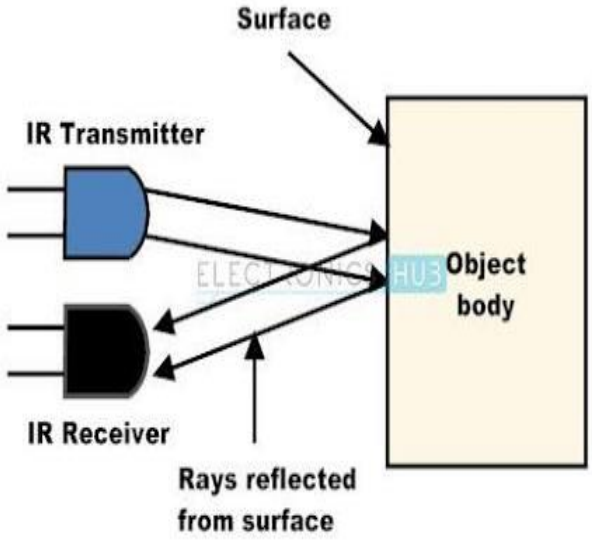

Figure 5. IR Sensor

E. LCD Display

Here we use 16*2 LCD is interface with AT89S52. LCD 16*2 is used as output by the controller to display data to user. The 16*2 LCD display have 16 number of data can be written on 2 lines. The data may be latter (A-Z) or number (0-9) or any symbols.

Figure 6. LCD Display

F. Microcontroller AT89S52

We use AT89S52 for their low cost, due to their industry standard instruction set, fast programming time. Microcontroller means a small computer on a single integrated circuit.

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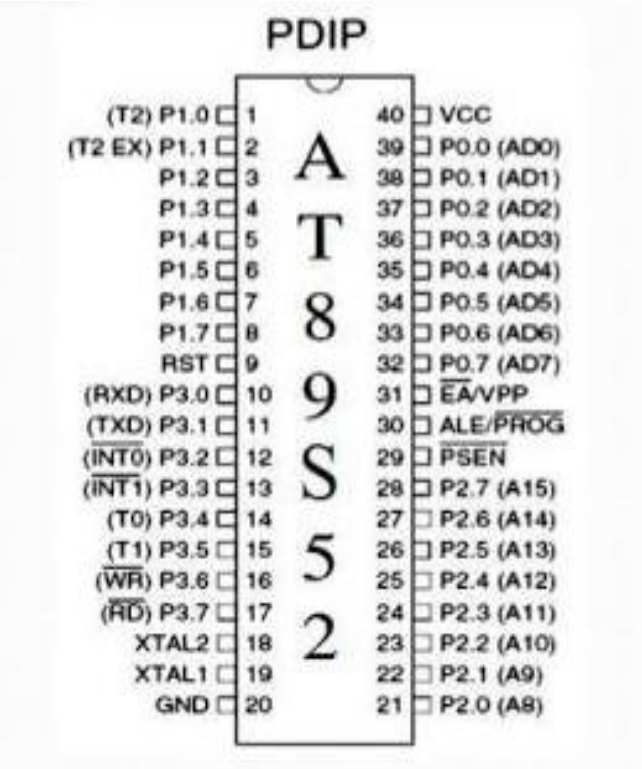

Figure 7. Microcontroller AT89S52

G. Bridge Rectifier

A bridge rectifier is a type of full wave rectifier which uses four or more diodes to efficiently convert AC to DC

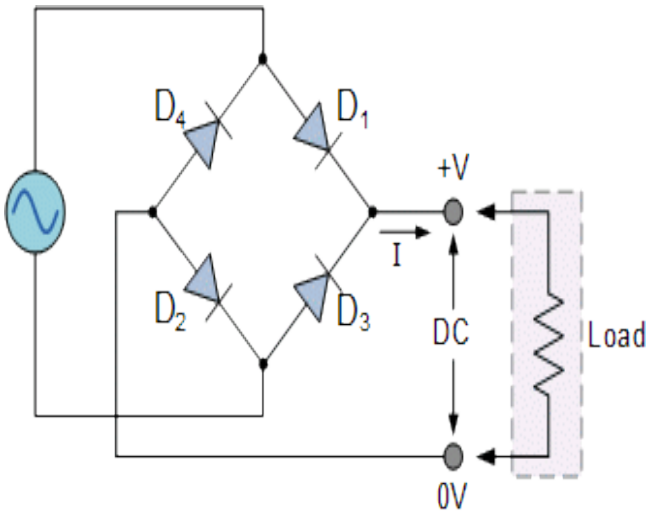

Figure 8. Bridge Rectifier

H. Regulator

A device used to control things such a speed of the motor, time, temperature in a room etc.,

Figure 9. Regulator

I. Components Required

- Capacitors 3- 104 pF
  It is a device used to store an electric charge.
- Resistors 2- 220 to 1KΩ.
  It is a passive two-terminal electrical component that implements electrical resistance as a circuit element.

III. WORKING

The working is done by first a AC source is given via the power supply and by using the step down transformer the AC source is covert into the DC source and we use full wave bridge rectifier to convert the AC to DC in low voltage so that the motor will run at low voltage and regulator is used to give the whole setup or components the regulated voltage 5V and microcontroller is used to generate the pulse width wave. When applying PWM controlling method, keep in mind that using a motor is as low pass system. PWM method is the high frequency avoided and we know that large motor is mainly inductive so avoid high frequency, hence will not perform well using high frequencies. This method work on low frequency so lower frequency is better than higher frequency. motor driving IC will drive the microcontroller for minimum amount of current and it will switch on and switch off motor at a required speed. IR sensor will count the speed of the motor , which is interference with 555 timer and it will detected by RPM. Microcontroller is used to generate the pulse width and it will show the speed of the motor and it will control the speed by indicating in the LCD display .microcontroller generate pulse width modulation signal it gives to the motor driving IC L293D and it increases the voltage of the source and motor regain their speed at desired. By using the pulse width modulation we can easily find the speed at required load and it is calculated but the speed will be at zero stage to rated speed only.

Now a day PWM technique are using in fuzzy logic control system, so PWM method is very efficient and reliable method to control the speed of motor so it future is also bright in the modern era with fuzzy logic.

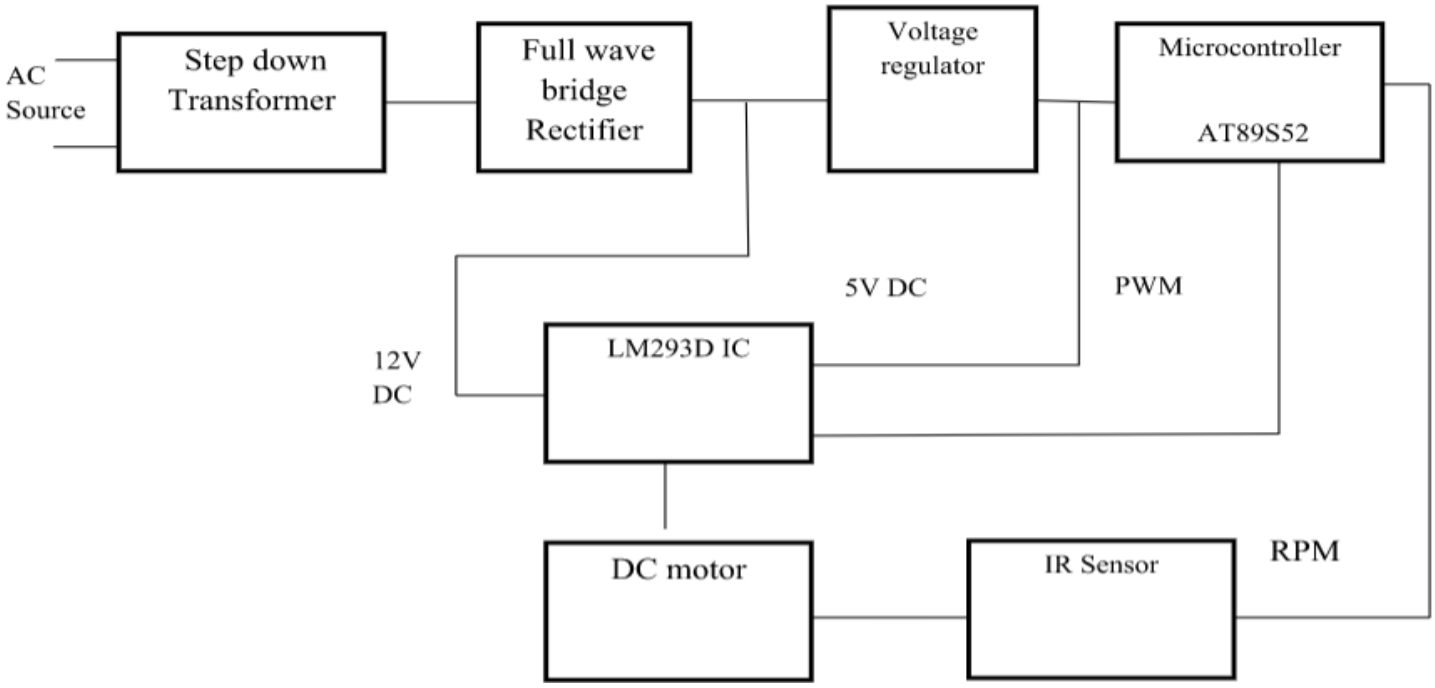

Figure 10. Block Diagram

IV. CONCLUSION

Hence , the speed control of the motor is controlled by the PWM which is generated via microcontroller and it is

- Low cost .
- It is reliable one.
- It is efficient and long lasting.
- The speed will be in constant at different loads.
- It is more comfortable to use in industries for speed control of the motors.

Our project is discussed on base of the pulse width modulation.

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