

# Monitoring and Control of Speed of DC Motor using LabVIEW Environment

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**Abstract:** The control of the DC motors is necessary in industries. The major use of controlling the speed is in industries like drilling, robot industries. The main objective of this paper is to design an efficient and easy system to control the speed and direction of the motor. The proposed methodology is to design a system to control and monitor the speed and direction and to inform the changes when any of these factors goes higher than industry standards. A mechanism using ARDUINO and LabVIEW is introduced in this proposed methodology, which will monitor and control the speed according to the need of industry. The system is implemented using LabVIEW software. The system also uses the motor driving IC L293D to change the direction of the DC motors. With the use of IC, the speed can be effectively controlled and the actions can be made accurate and effective. Thus through this project we try to prove that control of speed can be easy and the directions can also change. LabVIEW is the powerful and changeable programming language for operating and controlling the speed motor and ARDUINO is suitable for interactive environment.

**Keywords:** Arduino, LabVIEW, DC motor, IC L293D.

## I. INTRODUCTION

The monitoring and control of the DC motors through automation is necessary in industries. Automation plays a crucial role in today's world of instrumentation. Software based data acquisition and monitoring is the recent need of different industries. Software based data acquisition, monitoring, controlling and protection is the current need and trends in research in area of automation for academicians, researchers as well as industries. In many industrial application alongwith speed the direction of DC motor is also required to change.

S. Muruganandhan et. al presented in [1] open loop speed control of DC motor using NI ELVIS DAQ card with Labview and also they used chopper circuit for PWM. A mathematical model of SEDC motor and PID control of DC motor using LabVIEW and arduino have been presented by [2]. R.Ranjani et. al presented speed control of DC motor using PID control by PWM using LabVIEW and MyDAQ card [3]. Pratap Vikhe et. al presented speed control of DC motor using PWM technique using LabVIEW [4]. LabVIEW as software used for Industrial process monitoring [9], real time solar panel parameters monitoring [10] and induction motor parameter monitoring and parameter analysis[11].

In this paper, we presented speed and direction control of DC motor using PWM technique. We used LabVIEW as a system tool interface with arduino using LabVIEW interface

with arduino (LIFA). We used L293D IC which is H-bridge motor driver IC so that we can also control direction.

The main objectives of this are:

- 1) To design a virtual instrument to monitor speed and control the speed and direction of motor.
- 2) To interface the hardware with software.



Figure: 1 Schematic diagram of a project system based on LabVIEW

## II. SYSTEM & COMPONENTS

### • LabVIEW:

Labview which is virtual instrumentation software by which we can monitor different sensors using only signal computer. To run Labview software, system must have high performance processor such as laptop. We started looking for literature and research papers. Hence we came up an idea of INTERFACING LabVIEW WITH ARDUINO which was cheaper. As this project is helpful in different applications like industries, agriculture, home and many more. Labview is abbreviation of Laboratory virtual instrument engineering workbench which is created by national instruments. It is a graphical programming language which uses icons instead of text create applications. Labview codes are also known as virtual

instruments or VI'S for short. Labview is extensively used for data acquisition signal analysis and also for hardware control. Labview consist of: 1) Front panel window and 2) block diagram window. Front panel window's function is to control and show indicators of the system. Block diagram window's function is to make programs and coding of the system.

- **L293D IC:**

The L293D device is quadruple high current half-H driver. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36V. The devices is designed to drive inductive loads such as relays, solenoids, DC and bipolar stepping motors, as well as other high-current/high-voltage loads in positive supply applications. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN.

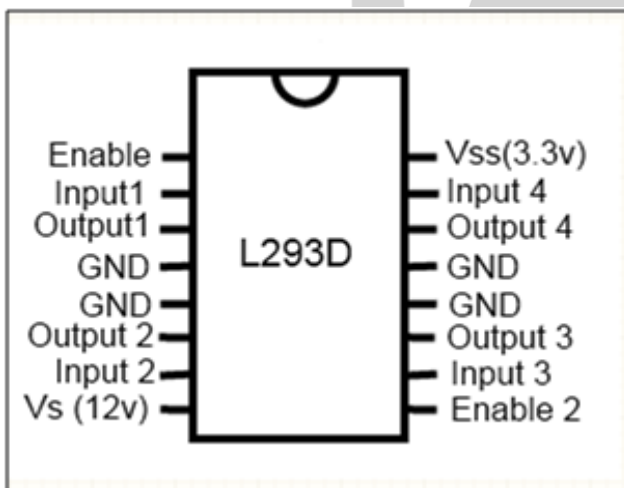


Figure 2: pin diagram of l293d IC) [5]

➤ Block Diagram:

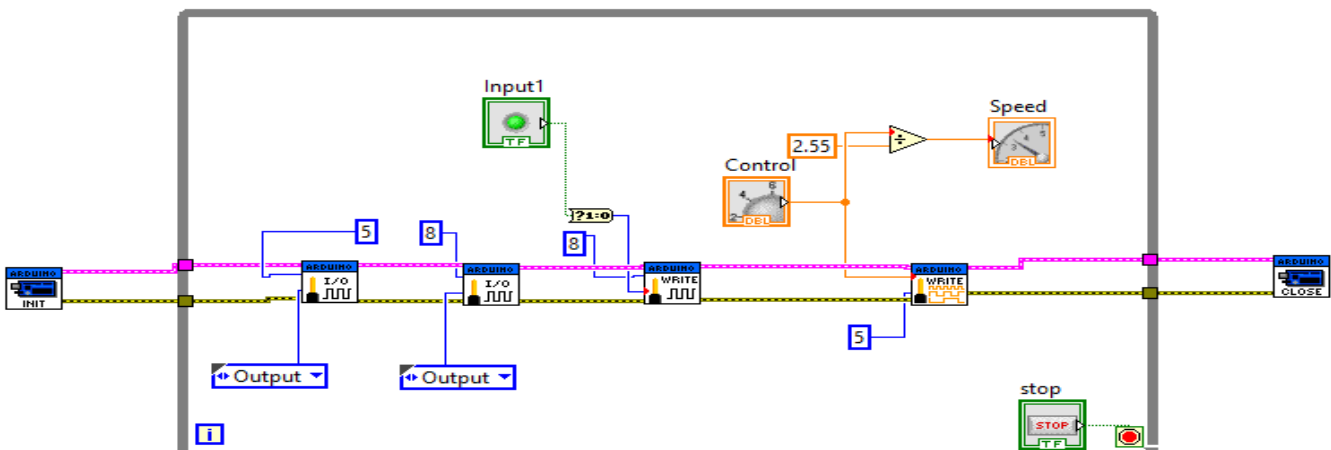


Figure 3: Block diagram of the system

- **Description: -**

- In Above figure, block diagram of Speed control of DC motor is shown.
- In this, pin 5 is set for the speed control and pin 8 is set for enable.

- **D.C. MOTOR:**

- In our project we use DC motor.
- Specification:
- Input voltage =12v
- Speed =3000 rpm

- **Arduino:**

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.

### III.SIMMULATION AND RESULT

- **Overview of the Coding:**

The coding of this paper is developed in the block diagram. It has been developed for controlling the speed of DC Motor. LabVIEW uses the dataflow programming where the flow of the data through the nodes and wires on the block diagram determines the execution order of the function and VI's. The block diagram contains the coding and graphical sources code which is also known as G code [9].

We have done this work in two stages , stage V1.0 and stage V2.0. In first stage V1.0, we have control the speed of DC motor using LabVIEW GUI programme using L293D motor driver IC. While in stage 2 we enhance our work by adding direction control in programming. So we control the direction and as well as speed in our stage 2 work.

- Stage- V1.0:

- In this version, we made VI for control speed of DC motor.

➤ **Front Panel: -**

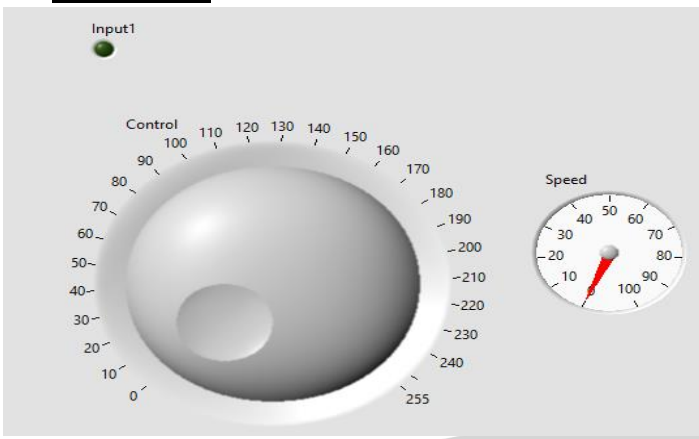


Figure 4: Front panel of system

- **Objective:** - In this VI, only speed is controlled but no direction change.
- **Remedy:** - We used one more enable push button for supply contro
- **Stage V2.0**

In this stage we modified our system for the controlling the speed with its direction.

Where pin:5 is used to the controlling of the speed, pin:8 is used to run the motor in clockwise direction and pin:9 is used to run the motor in to anti-clockwise direction.

For this , we used push buttons to enable pin:8 and pin:9 .

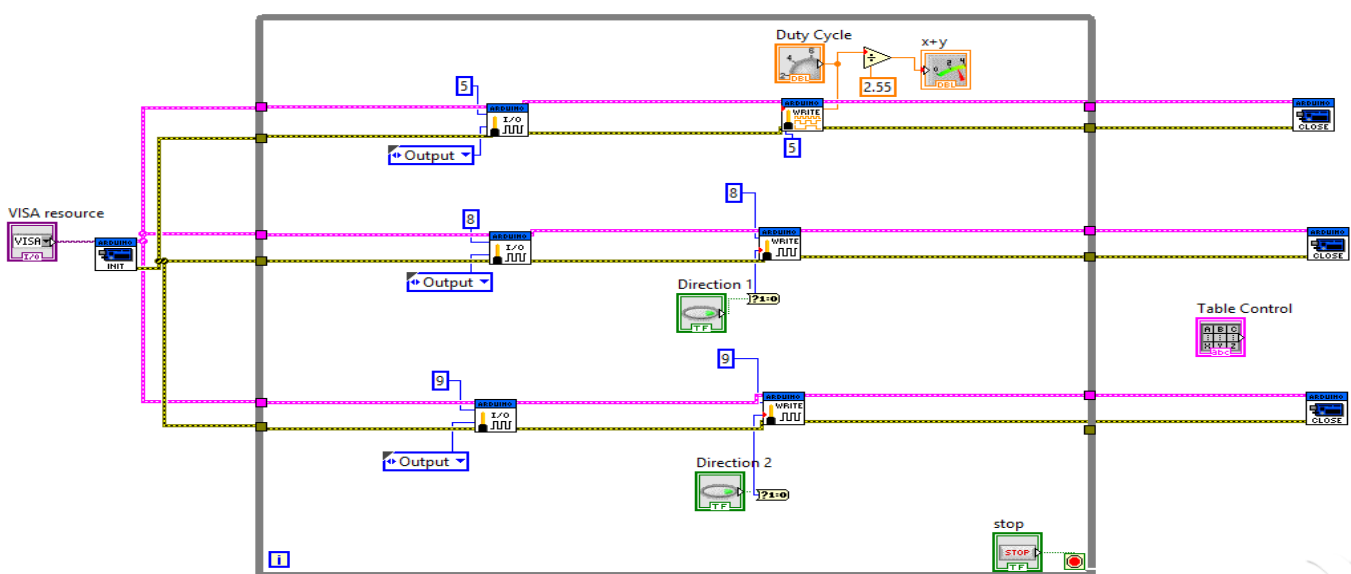


Figure 5: Block diagram of system

• **Front Panel:**

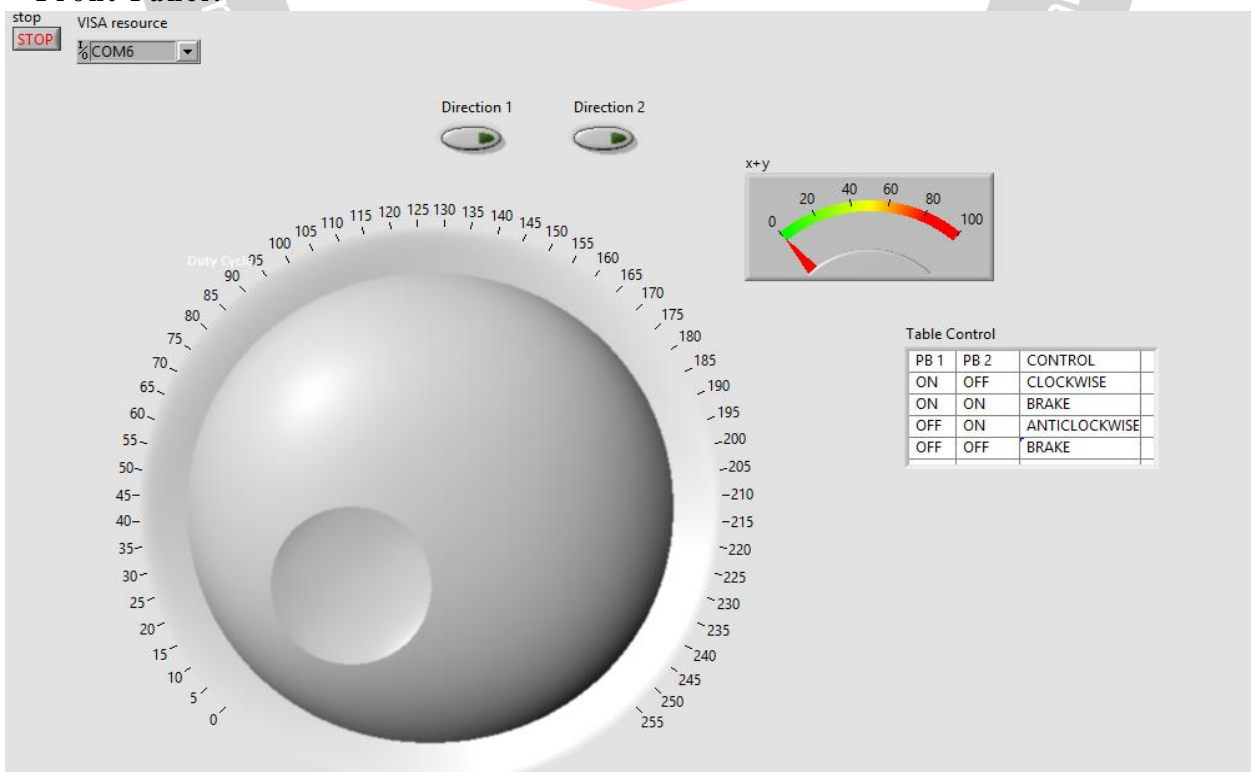


Figure 6: Front panel of system



**Circuit Diagram**

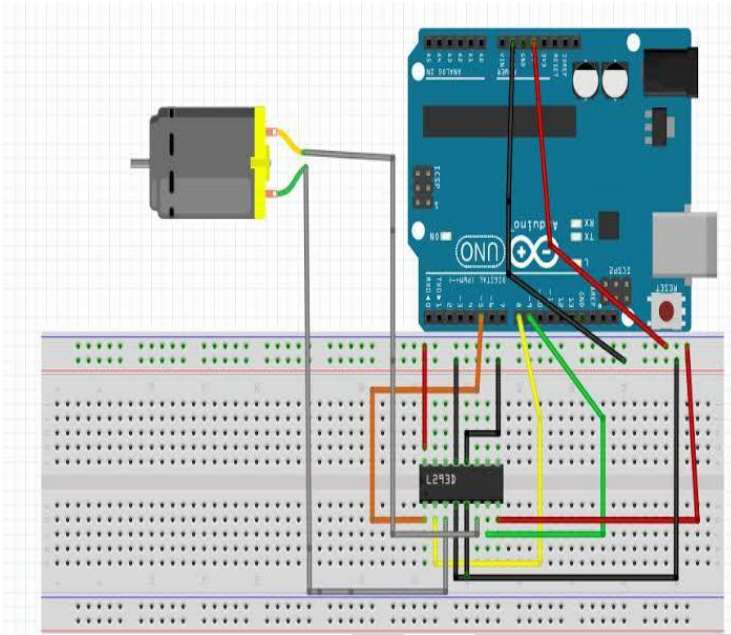


Figure: 7: Connection diagram of IC L293d with arduino and dc motor [6]

**Description**

- As shown in the block diagram, I/O blocks will set the pin in Arduino for the output.
- Pin no. 8 and Pin no. 9 are set for controlling direction of motor.
- Pin no. 5 is set for controlling the width of pulses for controlling the input voltage of D.C. MOTOR.
- Because of controlling the input voltage the speed of DC Motor will be control.
- The output signals of Arduino are given to the Motor Driver IC L293D.
- And because of this IC and given pulses, The speed and direction of DC motor can be control.

**Working: -**

Pin1	Pin2	Pin7	function
High	High	Low	Turn anti-clockwise (reverse)
High	Low	High	Turn clockwise(forward)
High	High	High	Stop
High	Low	Low	Stop
Low	X	X	Stop

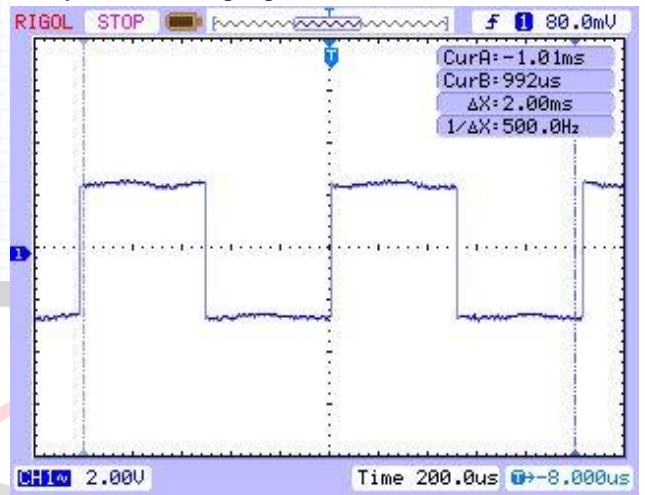
**Control table**

- As per shown in the control table, Direction will be control of DC motor.
- At pin no. 1, the pulses of input voltage are controlled.
- Pin 2 and Pin 7 are use for controlling direction by control its input as high or low.
- If pin 2 will high and pin 7 will low, it will rotate in anticlockwise direction.

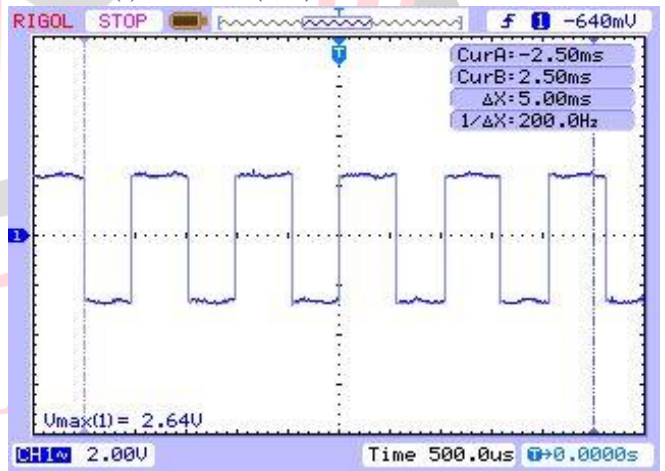
- And if pin 7 will high and pin 2 will low, it will rotate in Clockwise direction.
- But if both pins will high or low it will experience braking because of that motor will stop rotating.

**Waveform from the system:**

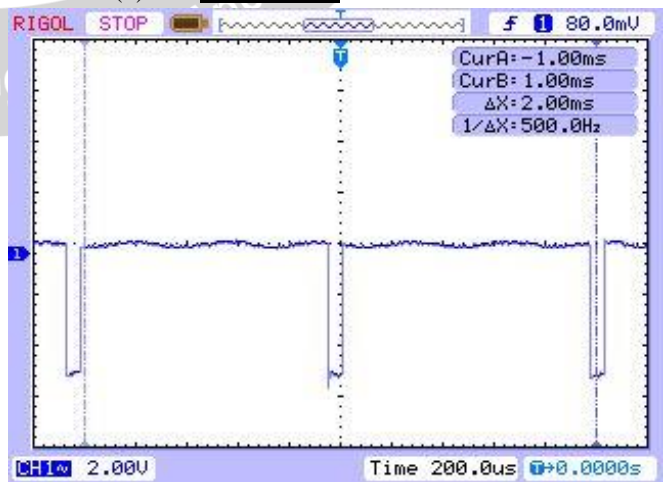
Following are the waveforms taken by the DSO for our system.fig.(a) shows the waveform for the 50% duty cycle at output pin:5 of the arduino. Similarly fig.(b,c,d) are the waveforms for the different duty cycles at the output pin:5.



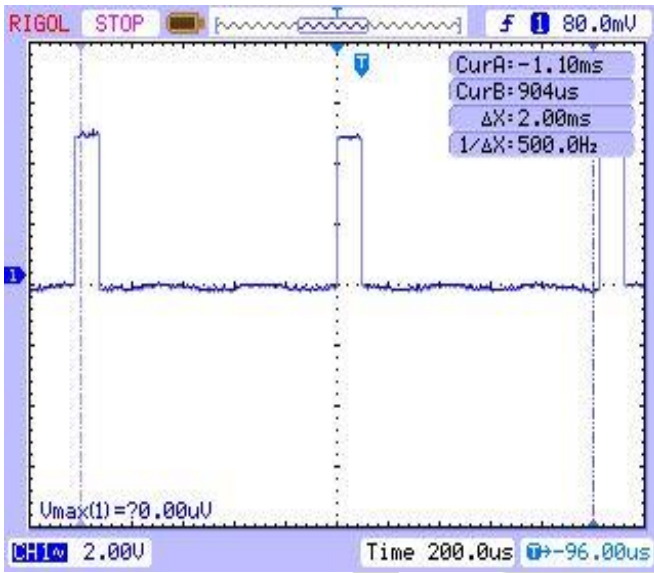
(a) PWM(50%)



(b) PWM(50%)



(c) PWM(90%)



(d) PWM(10%)

Figure 8: Waveforms (a), (b), (c) and (d) for different PWM used for different speed.

#### IV. CONCLUSION

This paper deals with the design and development of speed control and direction control system of DC motor which will more efficient and accurate than other systems. It represents software based automation for monitoring and speed control of DC motor. It will control the input voltage of DC motor using PWM signals which generated in LabVIEW. The efficiency of this system is high.

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