Dc Motor using A PID Controller in LABVIEW with Arduino
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Abstract—PID is widely common for a feedback used in a control system process. It is also used for an industries & techniques. This application is mainly used to determine the speed Control of a Dc motor. It can be lead to instability of a closed loop control system. Mainly, our paper how DC motor can be controlled by using a PID controller in LABVIEW. A Motor, will be interface with LABIEW software using an arduino Uno board kit. It will be mostly plays a role in data acquisition board. Actually, Speed of a Dc motor will be set by created a graphic user interface for PID controller in LABVIEW Software. Here, the software it will be turn pass this speed to dc motor using a PWM pins on the arduino board. Tachometer is a sensor which measure the speed of revolutions. From a tachometer the output is sent back of a PID controller using arduino Uno board kit. Suppose, the speed will not be same mean the controller will be try to minimize the error and bring a motor to set point value.

Key words: Arduino Uno board kit, LABVIEW Software, Dc motor, PWM Pulses, PID Controller

I. INTRODUCTION
DC Motor plays a role in research, laboratory experiment, industry etc. Dc Motor will be simplicity and low-cost. A motor will be controlled by three methods namely terminal voltage control, flux control method, armature rheostat control method. A terminal voltage control is employed. A System configuration will be provide a desired system response. Our aim is to control the speed of the dc motor using low cost of Data Acquisition card(DAQ) (i.e.)Arduino board interface with a PID controller of using LABVIEW Software.

In this, Section I includes mainly determine control the speed of a dc motor. Section II includes Motor will be interface with a LABVIEW software using an arduino Uno board kit. Section III includes from the tachometer the output is sent back of a PID controller using arduino Uno board kit.

II. PID CONTROLLER
The PID Controller is a device which produces an output signal. A Proportional integral derivative controller is a control loop feedback mechanism commonly used in industrial control systems. A PID Controller continuously calculates an error value as the difference between a measured process variable and a desired set point. The basic idea behind a PID Controller is to read a sensor, then compute the desired actuator output by calculating proportional, integral, and derivative responses and summing those three components to compute the output.

A high level, block diagram view of a closed loop feedback control system in the form of a PID loop.

A. Setpoint:
The set point is the signal that tells the control system what the user wants as his desired output. Also known as command inputs, reference signals and inputs.

B. Output:
Those physical characteristic of the plant which you want to control.

C. Comparator:
Simply a subtraction block. Subtracts the feedback from the set point to get the error.

D. Controller:
This processes the errors using a PID ALGORITHM to produce a corresponding control output that will ultimately cause the plant to behave in the desired way.

E. Control Output:
This instructs the actuators how much to adjust to manipulate the process to get the desired output.

F. Actuator:
Translates the control output into physical changes in the plant’s behavior. Essentially it supplies energy of some form to the plant to modify its behavior.

G. Plant:
The process or entity to be controlled.

H. Sensor:
Measures the physical characteristics of the plant and produces a corresponding signal that represents that characteristic.

I. Feedback Element:
The feedback element modifies the sensor signal in order to improve the final control of the plant.

J. Feedback:
The signal produced by the feedback element which used to construct the errors.

K. Disturbances:
External influences acting on the plant.
III. ARDUINO UNO BOARD

Arduino board based ATmega328 microcontroller. ATmega328 is a CMOS 8-bit microcontroller is a low-power RISC architecture. Arduino refers to an open source electronics platform or board and the software used to program it. Arduino is designed to make electronics more accessible, to artists, designers, and anyone interested in creating interactive objects or environments. An Arduino board can be purchased pre-assembled or, because the hardware design is open source, built by hand. Either way, users can adapt the boards to their needs, as well as update and distribute their own versions.

A. Tabulation: (Specifications for arduino Uno board)

<table>
<thead>
<tr>
<th>S.NO</th>
<th>SPECIFICATIONS</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Microcontroller</td>
<td>AT Mega328</td>
</tr>
<tr>
<td>2</td>
<td>Operating voltage</td>
<td>5v</td>
</tr>
<tr>
<td>3</td>
<td>Input voltage(recommended)</td>
<td>7-12v</td>
</tr>
<tr>
<td>4</td>
<td>Analog input pins</td>
<td>6</td>
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<tr>
<td>5</td>
<td>DC current for 5v</td>
<td>20mA</td>
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<tr>
<td>6</td>
<td>DC current for 3.3v pin</td>
<td>50mA</td>
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<tr>
<td>7</td>
<td>Flash memory</td>
<td>32kB</td>
</tr>
<tr>
<td>8</td>
<td>SRAM</td>
<td>2KB</td>
</tr>
<tr>
<td>9</td>
<td>EEPROM</td>
<td>1KB</td>
</tr>
<tr>
<td>10</td>
<td>Clock speed</td>
<td>16MHz</td>
</tr>
</tbody>
</table>

B. PIN DIAGRAM FOR Atmega328:

C. Applications:

Today the ATmega328 is a commonly used in many projects and autonomous systems where a simple, low powered, low-cost micro-controlled is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Uno models.

IV. PWM USING ARDUINO UNO BOARD

PWM is a technic for supplying an electrical power to lead a relative slow response. Digital control is used to create a square wave, a signal switched between ON and OFF. This ON-OFF pattern can simulate voltage in on and off by changing the portion of the time the signal spends on versus the time that the signal spends off. The duration of “on time” is called the pulse width. A signal will be consists of a train of voltage pulses such that the width of individual pulse control in effect of voltage level to the load. Here, both the AC and DC signals can be stimulated by using with the PWM pulses. For a DC motor, an energy storage in the motor windings effectly smooth out of energy but delivered by the input pulses. It experiences a lesser (or) greater electrical power of input depends upon the width of the pulses. If the signal as an input to a device an response time much larger than degree Celsius, Such that the device will be experienced a signal as an approximately DC input voltage.

PWM control is a very commonly used method for controlling the power across loads. This method is very easy to implement and has high efficiency. PWM signal is essentially a high frequency square wave. The duty cycle to this square wave is varied in order to vary the power supplied to the load. Duty cycle is usually stated in percentage and it can be expressed using the equation:
%DUTY CYCLE = (Ton/ (Ton + Toff)) +100.
Where Ton is the time for which the square wave is high.
Toff is the time for which the square wave is low.

When duty cycle is increased the power dropped across the load increases and when duty cycle is reduced, power across the load decreases .The block diagram typical PWM power controller scheme is shown below:

Control signal is what we give to the PWM controller as the input. It might be an analog or digital signal according to the design of the PWM controller. The control signal contains information on how much power has to be applied to the load. The PWM controller accepts the control signal and adjusts the duty cycle of the PWM signal according to the requirements. PWM waves with various duty cycle are shown in the figure below:

B. LABVIEW Interface for Arduino (LIFA):
A microcontroller acts as I/O engine it will be interface with the LABVIEW is through a serial connection. It will be helps to more information from arduino to LABVIEW without using through a serial communication.

Using open, Read/write, close convection in LABVIEW we have to access the digital, analog and pulse width modulated signals of arduino microcontroller. A controlled must be connected to the computer with a LABVIEW through a USB, Serial and (or) Bluetooth.

V. RESULTS AND DISCUSSION
A System mainly basically their types namely they are:-i.e) Open loop System ii.)Closed loop System. But, using a labview interface for arduino using only closed loop system.

A. Closed Loop System:
A Controller will compare a set value with a value are received from the Arduino. The arduino it will be receives the values from the tachometer. It will be measure the revolution of dc Motor .The speed values will not be same mean the controller will be try to minimize the error and bring a motor to set point value.

B. Block Diagram& Front Panel:
The duty cycle can be varied from 0 - 100% by the user controlled interactive graphical dial on front panel. A Set by the user will be fed into the PID Controller and passed on the arduino PWM Pins.

And, hence the PWM pulses to the motor along with a supply voltage that moves the motor shaft of the DC motor will be move and give us the speed at which the motor is moving. Tachometer is the sensor which measures the rotation will be used here. The tachometer will be given an external power supply voltage of 5V.

VI. CONCLUSIONS
Here, the application mainly determine to control the speed of a dc motor. And also, it can be lead to instability of a closed loop control System. Finally, the speed of a DC Motor will be set by creating a Graphic User Interface for PID Controller in LABVIEW Software.

REFERENCES