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Speed Control of the DC Motor through Temperature Variations using Labview and Aurdino

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***Abstract*—In the present era automation is a popular technique which is seen almost everywhere starting from industrial application to consumer application. This project describes how the DC motor speed is automatically controlled through temperature variation. The use of DC motors were mostly found in AC machines, small cooling fans, rob arms and also in simple toy cars. However in this project,it makes use of the LabVIEW platform which is made to be interfaced with the DC motor. The interfacing circuit is done on a Arduino prototype board which is supported by the LabVIEW platform. Since the speed of the motor is controlled through temperature variation, temperature measurement circuit is also interfaced through LABVIEW. The temperature sensor used in this project is LM35. Both temperature measurement and the interfacing of the DC motor is done through LABVIEW software loaded into Arduino board. All the signal communication between LABVIEW and the circuits which are interfaced on the Arduino prototype board is possible through the LabVIEW Makerhub. Initially the speed of the motor is set to a particular speed which is related to a particular temperature. The change in temperature is compared with the set temperature. With respect to the change in the variation in temperature the dc motor speed can either be increased/decreased using the LABVIEW program.**

***Index Terms*— Aurdino Uno, DC motor, Virtual Instruments(VI),LabVIEW, PWM (Pulse width modulation).**

I. INTRODUCTION

The use of most of the electronic devices available in the market, in our day to day life seems to be an automated control type for e.g. device like personal computer CPUs need to be operated in a temperature controlled environment. This means the speed of the DC motor is directly maintained through temperature. Besides this,there are some industrial applications which follow the said procedure in maintaining a constant temperature working environment for the machines. The motor speed can be controlled in many ways. But as per the requirement the speed of the motor has to vary with temperature variation. Hence the automation is made through software programming. Thus the project makes use of the user friendly instrumentation software LabVIEW, where the field of work is based on the platform like virtual instrumentation.
Conventional instrumentation usually requires large investments, resulting in expensive monitoring or control systems, which generally are not able to perform the analysis and control of several signals simultaneously. Considering such points, the new generation of acquisition systems, named virtual instruments (VI), have been considerably increased in the last few years. The method adopted here is low cost technique for the

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speed control of a DC motor. Aurdino Uno board acts as a data acquisition system. The PWM controller in LabVIEW is interfaced with the DC motor via Aurdino Uno board.

II. Principle Operation Of Dc Motor

The controlling of the speed of the dc motor can be achieved using both mechanical and electrical techniques. In past ages,the controls of the speed of the dc drives were basically mechanical and hence it required huge size hardware to be implemented. The most important objective behind this work is to become familiar with the designing and the implementation of both software as well as the hardware of the control of the speed of the DC motor and to give senses of occurring overload condition to the operator at overload condition. As the system is mostly based on the speed controlling of the DC motor is done through temperature variation, so the desired goal is to achieve a system with constant speed at any temperature.
The main purpose of the controller speed unit of the dc motor is to take a signal which represent the required speed, and to drive the motor at that required speed.PWM (Pulse width modulation) helps to reduce the total load without a huge loss, which normally do occur when a power source is limited by a resistive load. The basic principle in this whole process is that the modulation duty cycle is directly proportional to the average power which is delivered. PWM (Pulse Width Modulation) method has lot of characteristics in controlling a system. A simple method for the speed control of a DC motor is to control driving voltage, when the voltage is high the speed would be high.

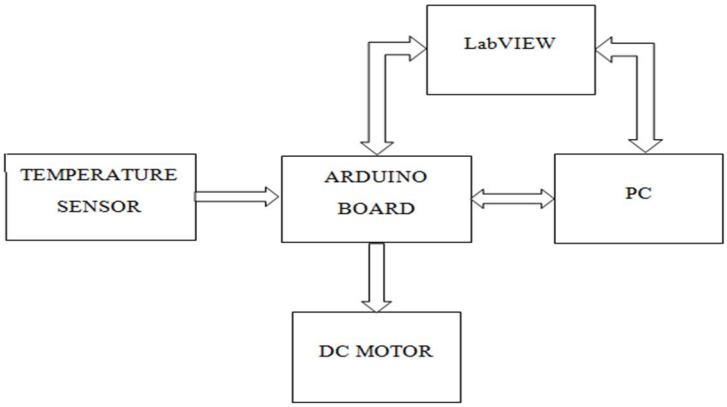

Fig 1: Block Diagram

In most of the applications normal controlling of the voltage will cause lot of power to be lost on control system, hence one goes for the PWM (Pulse Width Modulation) method is more used in controlling the speed of the DC motor application. We can easily understand by example.On and Off time is referred to as “duty cycle”.The temperature is measured through temperature sensor. With respect to the temperature,the DC motor is already set to rotate at a predefined speed. This means there is a scaling relation between the measured temperature and the input voltage which is applied to the DC motor. Now when the temperature value changes, the scaled voltage applied to motor also changes. Scaling the sub VI in such a manner that with increase in temperature the voltage should increase in order to increase the motor speed. This is with a meaning that if it is necessary to maintain the temperature at a fixed value, a cooling fan to be attached to DC motor should rotate speedily. The current motor speed is measured in the form of RPM (revolution per minute).The interfacing circuit is built on the Aurdino prototype board which hence supports to the LabVIEW platform.

III. Software And Hardware Implementation

LINX is a free open source add-on for LabVIEW and provides interfacing with common embedded platforms such as Aurdino, myRIO , chipKIT and more. LINX’s abstraction layer of the hardware provides support for hardware peripherals and also for common sensors. In addition, it also enables the same code to be interfaced with a chipKIT or Aurdino base board and run headlessly on myRIO with no modifications. LINX can make it easy to add a graphical user interface to our projects and combine the processing power of our

desktop or laptop computer with the I/O of common embedded platforms. LabVIEW makes tasks like data logging, signal processing and connecting to the web easier than ever before using graphical programming.

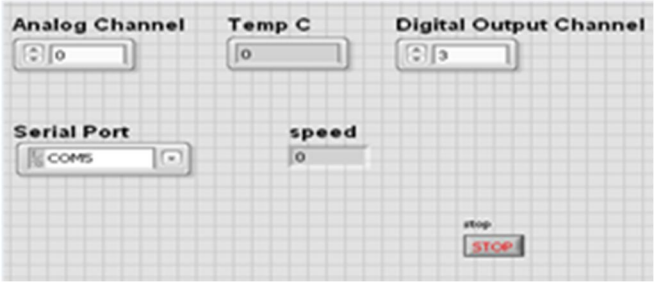

Fig. 2: Front panel of the controlling speed of the DC motor

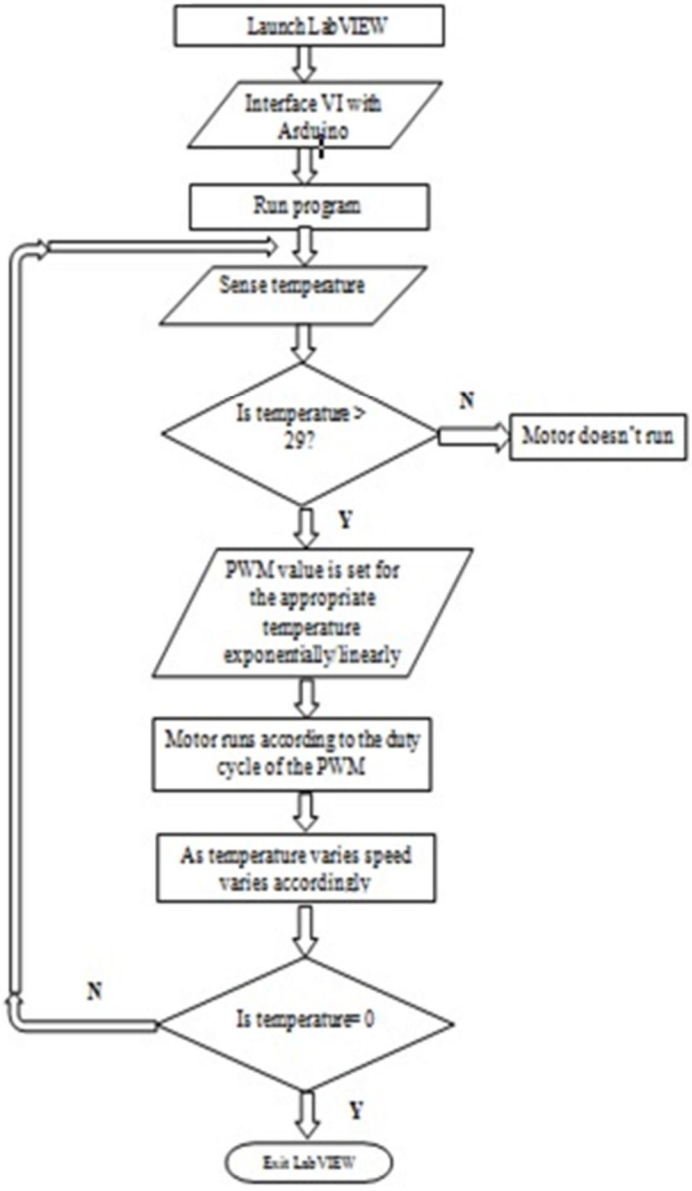

Fig2:Flowchart

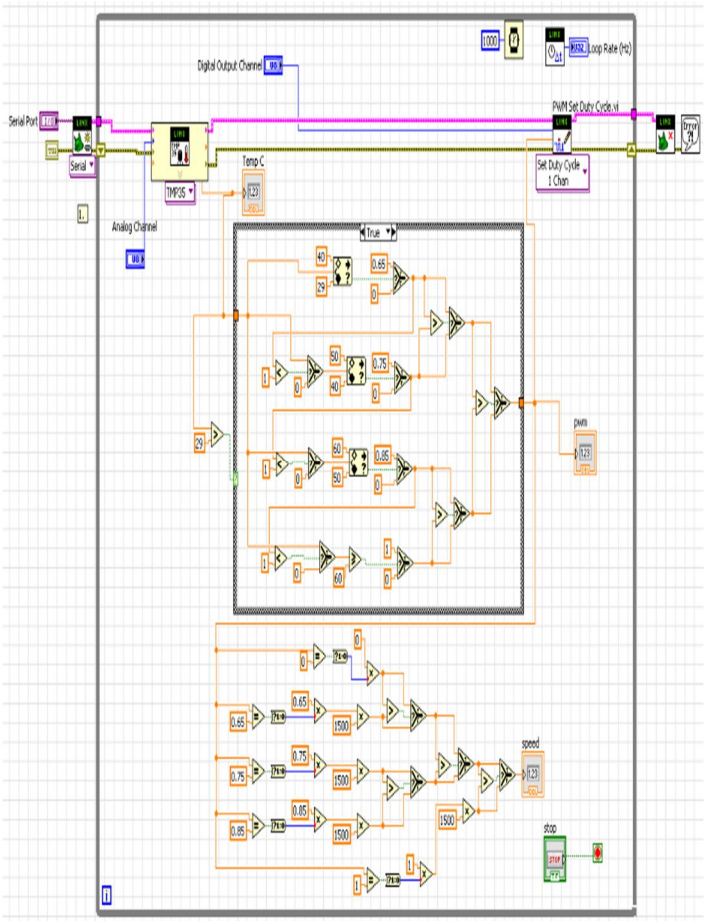

Fig 3:Block diagram of the controlling speed unit of the DC motor

IV. Advantages Of Labview

The importance of LabVIEW over other development environment is that the extensive support in order to access various instrumentation hardware. Drivers and abstraction layers for many different types of instruments and buses are included or are available for inclusion.

Even people with limited coding experience can write programs and deploy test solutions in a reduced time frame when compared to more conventional or competing systems.The compile time is reduced by the run-time engine and it provides a constant and consistant interface to many graphic systems,operating systems,hardware components.

The code of the LabVIEW can be reused numerous times across the platform hence making the LabVIEW more flexible to use.

Many libraries with a large number of functions for data acquisition, signal generation, mathematics, statistics, signal conditioning, analysis, etc., along with numerous graphical interface elements are provided in several LabVIEW package options.

The LabVIEW development system gives a unique oppurtunity to create stand-alone executables and the resulting executable can be distributed in an unlimited number of times. The run-time engine and its libraries is provided freely along with the executable.

Another advantage of the LabVIEW environment is that it is platform independent, which is portable between different LabVIEW systems for different operating systems (Windows, MacOSX and Linux).

LabVIEW helps in lowering the cost of both hardware and software hence making it very useful for a cost effective application and can also be used for a wide range of real type applications.

V. CONCLUSION

The method adopted here is low cost technique for the speed control of the DC motor. Aurdino Uno board acts as a data acquisition system. The PWM controller in LabVIEW is interfaced with the dc motor via Aurdino Uno board. Hence. the speed control of the DC motor was monitored by temperature variations using temperature sensor through Aurdino. Conventional instrumentation mostly requires huge investments, which results in expensive monitoring or controlling systems, which generally will not be able to perform the analysis and control of several signals simultaneously. Considering such points, the application of a new generation of acquisition systems, named Virtual Instruments (VI), have been considerably increased in the last few years. It can be used for several applications such as in industrial automation, irrigation system in agriculture, robotics and domestic appliances because of its low cost and less complex control structure and good range of the speed and torque and also its low power consumption.

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