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ARDUINO SPEED CONTROL OF DC MOTOR

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ABSTRACT

This work presents a simple speed control application for a DC motor in laboratory use. The purpose of this application is to maintain the desired speed on a generator operating on the same axis to the motor. Two small laboratory DC machines of 1kw and 300W nominal power have been used for testing the controller. Close loop control has been applied by using appropriate speed encoder. The controller functions as a DC chopper and PWM signal is produced by an Arduino UNO controller. The nominal input voltage was 200Volt, so igbt switching devices were used. There are over voltage and over current protections and, moreover, a mode without speed metering is available (open loop control scheme). A detailed analysis is provided on the equipment and the techniques that have been used for the control of the power electronic device. The scope of this work was to plan and test the controller, in terms of energy efficiency and economical operation. This study presents the critical results of the tests focusing on the best operational point and discusses the related conclusions. The controller's operation was efficient in both low and high speeds that were tested.

INTRODUCTION

DC motors have many applications in many fields of industrial, commercial and other activities, such as robotics, automobiles, servomechanisms etc. The electric drive systems used in many industrial applications require higher performance, reliability, variable speed due to their ease of controllability. The speed control of a DC motor is crucial in applications where precision and protection are essential. The purpose of a motor speed controller is to take a signal representing the required speed and to drive a motor at that speed. Microcontrollers can provide easy control of a DC motor. A microcontroller-based speed control system consists of an electronic component and a microcontroller. There are many applications of DC motor drives that use power electronics to control the voltage and consequently the speed or position of the motor. For large motors it is highly economical to use power electronics, in order to minimize the power loss and the size of the motor.

EXISTING SYSTEM

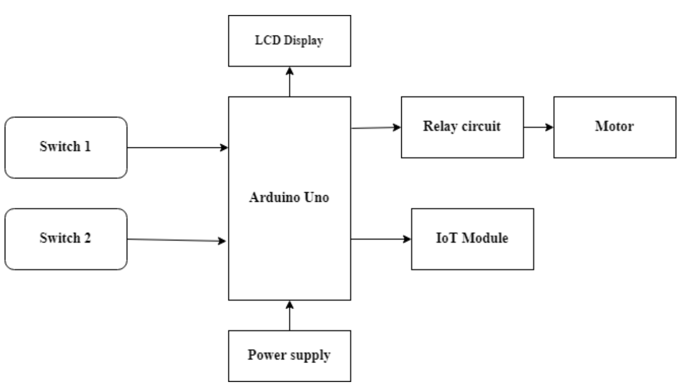
Vikhe, Punjabi, and Kadu (2014) reported how DC motor can be controlled by using a PID controller in Lab VIEW. The speed of the DC motor is set by creating a Graphic User Interface (GUI) for PID Controller in Lab VIEW. Lab VIEW in turn pass this speed to the DC motor using a PWM pins on the Arduino Uno board. DC motor move with the speed set by the user in Lab VIEW. The speed of the DC motor is sensed by using the tachometer. From tachometer, the output is sent back to the PID Controller in Lab VIEW via Arduino board. PID Controller compares the actual speed of the DC motor with the set speed. If its speed is not same, PID Controller will try to minimize the error and bring the motor to the set point value.

PROPOSED SYSTEM

Arduino can be used to Develop Stand-Alone Interaction Objective or can be connected to software on computer. The open-source IDE can downloaded for free.

The Arduino Mega is a microcontroller board based on the Atmega2560. Example: (Flash, Processing, MAXMSP). Power supply Motor speed control of DC motor is nothing new. A simplest method to control the rotation speed of a DC motor is to control its driving voltage. The higher the voltage is the higher speed the motor tries to reach.In many applications simple voltage regulation would cause lots of power lesson control circuit, so a pulse width modulation method (PWM) is used in many DC motor controlling applications. In the basic Pulse Width Modulation (PWM) method, the operating power to the motors is turned on and off to modulate the current to the motor. The ratio of "on" time to "off" time is what determines the speed of the motor. [2] discussed about E-plane and H-plane patterns which forms the basis of Microwave Engineering principles. [4] discussed about principles of Semiconductors which forms the basis of Electronic Devices and Components. [6] presented a brief outline on Electronic Devices and Circuits which forms the basis of the Clampers and Diodes.

BLOCK DIAGRAM

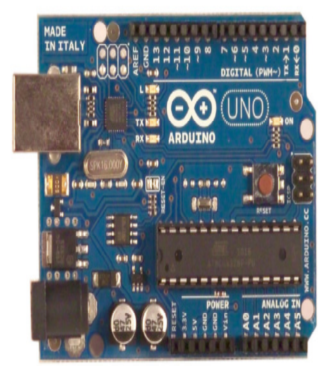


HARDWARE DESCRIPTION

- Transformer
- Arduino Board
- H-Bridge
- Regulator
- Motor
- Motor Drive

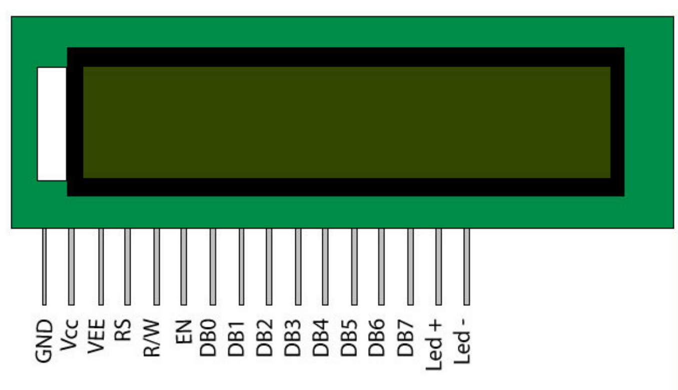
ARDUINO UNO

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources.



LCD DISPLAY (16x2)

LCD display is a LCD type of plat panel display which uses liquid crystal in its primary from of operation.



RELAY:

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used.

Relays are used where it is necessary to control a circuit by a low-power signal or, where several circuits must be controlled by one signal.

ADVANTAGE

- It requires no human supervision.
- It causes no harm to the animals or humans.
- It is a highly flexible system.
- It is also highly economical.
- It is an effective, accurate and adaptive system. IX
- It is used to protect the farm.
- It is used in orchard\fruit garden.
- It is used for vegetable garden

APPLICATION

- Weighing machines
- Traffic light count
- Parking lot counter
- Embedded Systems
- Home Automation
- Medical instrument

CONCLUSION

The research is about controlling DC Motor using arduino. The research was done by simulation and hardware implementation. In the simulation and hardware implementation result, the integral state feedback gave a good performance while reaching the set point. From the tracking control result with different set points, integral state feedback presented similar performance: the augmented system performed with fast rising time and settling time with small overshoot. Compared with the existing methods, the integral state feedback had a better system response in tracking control at some set points

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