Speed Control Of Dc Motor Using Composite Nonlinear Feedback

The main advantage of using a DC motor in today's world is its ability to control speed and position. Many controllers have been designed so far to reduce the overshoot and settling time so as to give a better performance. This thesis focuses on speed control of a DC motor using an Adaptive Neuro-Fuzzy controller. This controller is based on Adaptive Neuro-Fuzzy Inference System (ANFIS), which aims at reducing the steady state error and rise time. A Proportional-Integral-Derivative controller is designed to control speed of a DC motor from which training data is taken to design ANFIS. A model is developed and simulated using MATLAB/SIMULINK. Performances of both PID and ANFIS controllers are evaluated at different load torques. A real-time implementation of the proposed model is applied on a lab-kit DC motor using d-Space. The simulation and the implementation results are compared.

Nowadays, DC motors plays a vital role in most of the industrial areas, it can be seen in most of the electronic devices. The purpose of a motor speed controller is to take a signal representing the demanded speed, and to drive a motor at that speed. In this project, the power converter for DC motor application is developed. One of the most common methods is by using PWM wave to control the speed of the motor. Therefore, to provide the required power to the motor, SPMS is used to supply the DC motor from AC power supply. Rectifier which converted AC/DC and buck converter are combined which output can be supplied to the DC motor. The SMPS which supplies the DC motor is developed and the output is controlled by using PWM. TL494 is used to generate the PWM wave which can be varied in duty ratio. In the end of this project, the motor speed will satisfied the desired speed control as expected.

FOUR QUADRANT DC MOTOR SPEED CONTROL WITH MICROCONTROLLER

Adjustable Closed-loop DC Motor Speed Controller

DC Motor Control using Chopper

DC Motor Speed Control with PWM

Speed Control of Dc Motor Using Pwm Technique

Motor speed control is very important in rotating machinery applications. There are many applications that have been developed based on motor speed control theory, such as conveyor. The idea of motor speed control is to take a signal representing the demanded speed, and to drive a motor at that speed. The purpose of this project is to develop the Pole Placement controller to control the speed of DC motor and implement the controller into Ladder Diagram which connected to PLC. By using Pole Placement controller, the DC motor will rotating at the demanded speed which is set by the user with minimum error. Before the controller was developed, numbers of simulations were done using M-FILE (prompt) and MATLAB Simulink. The objective of the simulation is to evaluate the system response of the DC Motor in with and without controller. The used of PLC in this project will help to reduce complexity and made troubleshooting a very easy task to do. The model of PLC which is used in this project is OMRON (CQM1H-CPU51) and the program for this controller system is in ladder diagram (CX Programmer). The Pole Placement controller is implementing in the PLC program so that this system has a better response and less error. Finally, analysis of the response is made after the Pole Placement is implemented into the system.

The automatic control has played a vital role in the advance of engineering and science. Nowadays in industries, the control of direct current (DC) motor is a common practice thus the implementation of DC motor of controller speed is important. The main purpose of motor speed control is to keep the rotation of the motor at the present speed and to drive a system at the demand speed. The DC Series Wound Motor is very popular in industrial application and control systems because of the high torque density, high efficiency and small size. The main purpose of this project is to control speed of DC Series Wound Motor using four controllers which are PID, PI, P, and Fuzzy Logic Controller (FLC). Initially all the controllers are developed by using MATLAB simulink model. In this project, PID, PI, and P controller are developed and tuned in order to get faster step response and the Fuzzy Logic Controller (FLC) is design based on the membership function and the rule base. The expectation of this project is the Fuzzy Logic Controller will get the best performance compared to other controllers in terms of settling time (Ts), rise time (Tr), peak time (Tp), and percent overshoot (%OS). Finally a GUI of these controllers are developed which allow the users to select any controller and change its parameters according to the different conditions under loaded and unloaded scenarios.

DC Motor Speed Control Using a Phase-locked Loop

Digital DC Motor Speed Control System

DC Motor Speed Control with PID Control Using Visual Basic

Digital Speed Control of a D.C. Motor

Speed Control of DC Motor Using Pole Placement Controller Implementation with PLC

The speed control of DC motors is very crucial in applications where the importance of precision and protection. Purpose of a motor speed controller is to take a signal representing the required speed and to drive a motor at that speed. Micro controller can provide easy control of DC motor. This project is about speed control system of DC motor by using micro controller and it is a closed-loop control system. Pulse Width Modulation (PWM) technique is used where its signal is generated in microcontroller which is the signal will send to motor driver to vary the voltage supply to control motor speed.

The development of technologies affects the demands of industries at the present time. Thus, automatic control has played a vital role in the advance of engineering and science. In today's industries, control of DC motors is a common practice. Therefore, implementation of DC motor controller is required. There are many types of controller that can be used to implement the elegant and effective output. One of them is by using a PI controller. PI stands for Proportional and Integral Controllers which are designed to eliminate the need for continuous operator attention thus provide automatic control to the system. Cruise control in a car and a house thermostat are common examples of how controllers are used to automatically adjust some variable to hold the measurement (or process variable) at the set-point. This project is focusing on implementing PI controller to control the speed of a dc motor. The overall project is divided into two parts. The first part is concern on the simulation using MATLAB simulink where the dc motor is modeled and PI controller is tuned using Ziegler-Nichols rules and software tuning. The second part is implementing the simulation. This part is divided into another two parts, Graphical User Interface (GUI) development and hardware interfacing. GUI is built using National Instrument LabVIEW software with implementation of PI controller. An oscilloscope also had been build there. Hardware interfacing part is built with Mitsumi dc mini-motors, M31E-1 Series, speed sensor and analog to digital converter, DAC8032. As the result, PI controller is capable to control the speed of dc motor followed the result from simulation.

Speed Control of DC Motor by Using Fuzzy Logic Controller

Development of Control Shceme for DC Motor Speed Control Applications

DC Motor Speed Control Using Thyristor Converter and Single-phase Supply

Embedded Microcontroller Interfacing

Speed Control of DC Motor Using Linear Quadric Regulation (LQR) Controller

This book is all about running a brushless DC motor using a sensorless technique. The target of the work was to make a very simple operating method for a brushless motor and formulate a speed control mechanism. Initially the work was started with both considering back-EMF and without considering back-EMF. Because of more complexity in the back-EMF sensing method, and as our intention was to make a simpler and cost effective operation, so finally we assembled our project the without back-EMF sensing. Even though being a simple and inexpensive machine, the performance was quite good. However adding back-EMF sensing in this machine can give it more dependability.TABLE OF CONTENTS: DECLARATIONIAPPROVALIIACKNOWLEDGEMENTIIILIST OF FIGURESVIIABSTRACTIXCHAPTER 1INTRODUCTION101.1.Introduction101.2.Historical Background101.3.Advantage over Traditional Method111.4.Objective of this Work121.4.1.Primary objectives121.4.2.Secondary Objectives121.5.Introduction to this Thesis12CHAPTER 2BRUSHLESS DC MOTOR142.1.Introduction142.2.Comparison of Brushless motor with brushed motors152.3.Structure of a BLDC152.3.1.Stator162.3.2.Rotor172.4.Operating Principle182.4.1.Sensored Commutation192.4.2.Conventional Control Method Using Hall-effect Sensors202.4.3.Sensorless Control222.5.Applications232.6.Summary24CHAPTER 3MOTOR DRIVE SYSTEMS253.1.Introduction253.2.Components of Drive Electronics253.3.Inverter263.3.1.Three-Phase Inverter263.3.1.1.120-Degree Conduction273.3.1.2.180-Degree Conduction293.4.Speed Control Techniques303.4.1.Open Loop Speed Control313.4.2.Closed Loop Speed Control313.4.2.1.Proportional-Integral (PI) Controller323.5.PWM based Methods333.5.1.Conventional 120° PWM technique333.5.2.PWM Duty Cycle Calculation333.6.Summary34CHAPTER 4SIMULATION354.1.Introduction354.2.Simulation354.2.1.Simulating Three-Phase Inverter364.2.2.Simulating Controller Unit384.3.Simulation Results394.3.1.Speed Control404.4.Summary40CHAPTER 5HARDWARE IMPLEMENTATION415.1.Introduction415.2.Equipments and Components425.3.Power Supply Unit435.4.Microcontroller Unit445.5.Motor Drive Unit455.6.Performance of the System465.7.Summary47CHAPTER 6DISCUSSIONS AND CONCLUSIONS486.1.Discussions486.2.Suggestion for future Work496.2.1.Limitations496.2.2.Future Scope496.3.Conclusions50REFERENCES51APPENDIX A53SPEED CONTROL FLOWCHART53APPENDIX B54MICROCONTROLLER CODES54APPENDIX C55ATMEGA32 (MICROCONTROLLER)556.3.1.Pin Descriptions556.3.2.Block Diagram586.3.3.Electrical Characteristics59APPENDIX D60L298 (DUAL FULL-BRIDGE DRIVER)606.3.4.Pin Configurations606.3.5.Maximum Ratings61

Direct current (DC) motors have variable characteristics and are used extensively in variable-speed drives. DC motor can provide a high starting torque and it is also possible to obtain speed control over wide range. Why do we need a seed motor controller? For example, if we have a DC motor in a robot, if we just apply a constant power to each motor on a robot, then the poor robot will never be able to maintain a steady speed. It will go slower over carpet, faster over smooth flooring, slower up hill, faster down hill, etc. So, it is important to make a controller to control the speed of DC motor in desired speed. DC motor plays a significant role in modern industrial. These are several types of applications where the load on the DC motor varies over a speed range. These applications may demand high-speed control accuracy and good dynamic responses. In home applications, washers, dryers and compressors are good example. In automotive, fuel pump control, electronic steering control, engine control and electric vehicle control are good examples of these. In aerospace, there are a number of applications, like centrifuges, pumps, robotic arm controls, gyroscope controls and so on.

Electrical Machines

An Accurate DC Motor Speed Control System

Intelligent Speed Control of DC Motor Using ANFIS.

Digital Speed Control for D.C. Motor

DC Motors, Speed Controls, Servo SystemsAn Engineering HandbookElsevier

Mixed-Signal Embedded Microcontrollers are commonly used in integrating analog components needed to control non-digital electronic systems. They are used in automatically controlled devices and products, such as automobile engine control systems, wireless remote controllers, office machines, home appliances, power tools, and toys. Microcontrollers make it economical to digitally control even more devices and processes by reducing the size and cost, compared to a design that uses a separate microprocessor, memory, and input/output devices. In many undergraduate and post-graduate courses, teaching of mixed-signal microcontrollers and their use for project work has become compulsory. Students face a lot of difficulties when they have to interface a microcontroller with the electronics they deal with. This book addresses some issues of interfacing the microcontrollers and describes some project implementations with the Silicon Lab C8051F020 mixed–signal microcontroller. The intended readers are college and university students specializing in electronics, computer systems engineering, electrical and electronics engineering; researchers involved with electronics based system, practitioners, technicians and in general anybody interested in microcontrollers based projects.

DC Motor Speed Control Using SCR Chopper

DC Motors, Speed Controls, Servo Systems

Brushless DC Motor Controller, AC Gear Motor, Permanent Magnet DC Motor, Large DC Motors, Brushless Electric Motor, Brushless DC Motor, DC Motors, Servo Motor

An Engineering Handbook

Designing Integrated Projects

DC Motors - Speed Controls - Servo Systems: An Engineering Handbook is a seven-chapter text that covers the basic concept, principles, and applications of DC and speed motors and servo systems. After providing the terminology, symbols, and systems of units, this book goes on dealing with the basic theory, motor comparison, and basic speed control methods of motors. The subsequent chapters describe the phase-locked servo systems and their optimization and applications. These topics are followed by a discussion of the developments made by Electro-Craft in the field of DC Brushless Motors. The final chapter provides revised data sheets on Electro-Craft products and describes the models in the motomatic range of speed controls, servomotor controls, and digital positioning systems. This handbook is of great value to professional engineers and engineering students.

The speed of separately excited DC motor can be controlled from below and up to rated speed using chopper as a converter. The chopper firing circuit receives signal from controller and then chopper gives variable voltage to the armature of the motor for achieving desired speed. There are two control loops, one for controlling current and another for speed. The controller used is Proportional-Integral type which removes the delay and provides fast control. Modeling of separately excited DC motor is done. The complete layout of DC drive mechanism is obtained. The designing of current and speed controller is carried out. The optimization of speed controller is done using modulus hugging approach, in order to get stable and fast control of DC motor. After obtaining the complete model of DC drive system, the model is simulated using MATLAB(SIMULINK). The simulation of DC motor drive is done and analyzed under varying speed and varying load torque conditions like rated speed and load torque, half the rated load torque and speed, step speed and load torque and stair case load. torque and speed.

Speed Control of DC Motor Using Controller Area Network

Solid State DC Motor Speed Control with Adjustment Acceleration

Analysis of a Feedback Speed Control for a D-C Motor Drive System

SCR Speed Control of a DC Motor

An Engineering Report

Academic Paper from the year 2020 in the subject Computer Science - Miscellaneous, , language: English, abstract: In this paper we describe a technical system for DC motor speed control. The speed of DC motor is controlled using Neural Network Based Model Reference and Predictive controllers with the use of Matlab/Simulink. The analysis of the DC motor is done with and without input side Torque disturbance input and the simulation results obtained by comparing the desired and actual speed of the DC motor using random reference and sinusoidal speed inputs for the DC motor with Model Reference and Predictive controllers. The DC motor with Model Reference controller shows almost the actual speed is the same as the desired speed with a good performance than the DC motor with Predictive controller for the system with and without input side disturbance. Finally the comparative simulation result prove the effectiveness of the DC motor with Model Reference controller.

In this book the four quadrant speed control system for DC motor has been studied and constructed. To achieve speed control, an electronic technique called pulse width modulation is used which generates high and low pulses. These pulses vary in the speed of the engine. For the generation of these pulses, a microcontroller is used. It is a periodic change in the program. Different speed grades and the direction are depended on different buttons. The experiment has proved that this system is higher performance. Speed control of a machine is the most vital and important part of any industrial organization. This paper is designed to develop a four-quad speed control system for a DC motor using microcontroller. The engine is operated in four quadrants ie clockwise, counterclockwise, forward brake and reverse brake. It also has a feature of speed control. The four-quadrant operation of the dc engine is best suited for industries where engines are used and as a requirement they can rotate in clockwise, counter-clockwise and thus apply brakes immediately in both the directions. In the case of a specific operation in an industrial environment, the engine needs to be stopped immediately. In this scenario, this system is very integral. The PWM pulses generated by the microcontroller are instantaneous in both directions and as a result of applying the PWM pulses. The microcontroller used in this project is from 8051 family. Push buttons are provided for the operation of the motor which are interfaced to the microcontroller that provides an input signal to it and controls the speed of the engine through a motor driver IC. The speed and direction of DC motor has been observed on digital CRO

Speed Control of Sensorless Brushless DC Motor

Speed Control of DC Motor Using PI Controller

DC Motor Speed Control with the Precence of Input Disturbance using Neural Network Based Model Reference and Predictive Controllers

Simulation of Dc Motor Speed Control Using Matlab/simulink

D.C. Motor Adaptive Speed Control

The automatic control has played a vital role in the advance of engineering and science. Nowadays in industries, the control of direct current (DC) motor is a common practice thus the implementation of DC motor of controller speed is important. The main purpose of control is to keep the rotation of the motor at the preset speed and to drive a system at the demanded speed. When used in speed application, speed feedback control the DC motor's speed or confirms that the motor is rotating at the desired speed. To maintain the s speed feedback at all times. The speed of a DC motor usually is directly proportional to the supply voltage. For instance, if we reduce the supply voltage from 12 Volts to 6 Volts the motor will run at half or lower the speed. The advantages used DC motor is provide e control for acceleration and deceleration with effective and simple torque control. The fact that the power supply of a DC motor connects directly to the field of the motor allows for precise voltage control, which is necessary with speed and torque control applications. methods are used to control speed DC motor is Proportional Integral Derivative (PID) and PC based to control it. In this project, the method use as controller is Programmable Interface Controller (PIC) microcontroller for the electric current control to drive a motor. Th expectation of this project is to get the precise the demanded speed and to drive a motor at that speed.

The GE Thy-mo-trol Versus the Ward Leonard Speed Control

D.C. Motor Speed Control for Heavy Material Rolling Mills by Control of Motor Field Excitation

Neural Speed Control of a DC Motor

Fuzzy Control Design for DC Motor Speed Control Through Terminal Voltage

D.C. Motor Speed-control Systems Using Thyristors