DESIGN OF PI CONTROLLER FOR DC MOTOR CLOSED LOOP SPEED CONTROL

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Abstract :

In today's industries, control of DC motors is a common practice. Therefore, implementation of DC motor controller is required. 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 speed of a dc motor

I.   INRODUCTION

Todays industries are increasingly demanding process automation in all sectors. We are using speed controller of DC motor using PI control the speed easily control the increase the production and reduce the cost. Normally close loop operation of PI controller inner current loop and outer speed loop is employ for the speed control. The DC motor can provide the high starting torque control over a wide speed range, both below and above the rated speed can be very easily achieved. The method of speed control is simpler and less expensive
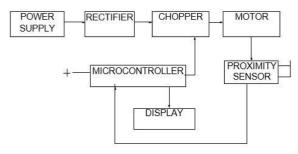
II.   BLOCK DIAGRAM

Fig.3.4 Block diagram of system

III.   WORKING PRINCIPLE

1. At given to the ac supply to the transformer the voltage is been step down to the desired voltage.

2. Regulator will give a pure DC supply, to the Arduino and then the supply is given to the motor and it will start at its desired speed.

3. This speed has been sensed by the proximity sensor and actual speed is given to the Arduino and that actual speed is displayed on the LCD and the reference speed is given to the arduino and PI will generate the error and it will change the duty cycle by using the potentiometer. We will the input of the DC drive is changed.

4. By changing the input voltage of the DC drive and then changed voltage supply with the help of the potentiometer will change the speed of the motor & proximity sensor will sense the changed speed and that will be given to the microcontroller then it is been displayed on the LCD.

ARDUINO

Arduino is an open source electronics platform

based on easy to used hardware and software. Arduino boards are able to read inputs-light on a sensor, a finger on a button or turn into an output activating a motor turning on an LED.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, an reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

OBJECTIVES

The objectives of the speed control technique project are:

- Achieve the proper value of gain Kp and Ki.

- Controlling the speed as per variation of load.

- Measurement of RPM of DC motor with accuracy.

- Designing a system such that the RPM of motor becomes equal to set RPM.

- To study the operation of proportional and integral control action.

- To program the Arduino UNO.

- To develop on economical and easy operating device for speed controlling of dc motor.

ADVANTAGES

- PI control stops the system from fluctuating, & also able to return the system to its set point.
- The response time for PI control is faster than I-only control.
- PI control is still up to 50% slower than P-only control.

APPLICATIONS

- DC gear motor
- IR sensor is known as infrared sensor
- A Liquid Crystal Display(LCD)
- DC motor drive

CONCLUSION

The closed loop control of Dc motor using microcontroller is designed. We used Arduino microcontroller to implement PI control & estimate the duty cycle & supply the motor through motor driver. Reference speed input given through potentiometer & it was observed that the motor desired speed is traced rapidly. Hence speed of DC motor can be changed to desired value by implementing low cost control using Arduino. The project can extended to restrict the motor currents within limits.

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