NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY
[IJIERT] ISSN: 2394-3696 Website: ijiert.org
VOLUME 9, ISSUE 4, Apr. -2022

DC MOTOR SPEED CONTROL USING P.I CONTROLLER

Shadab.N. Sayyad
Department of Electrical Engineering, Government College of Engineering,
Aurangabad (M.S.), India
Sayyadshadab7276@gmail.com

Mr. W. Gavhane
Professor, Department of Electrical Engineering, Government College of Engineering,
Aurangabad (M.S.), India

ABSTRACT
DC motors are used in numerous industrial applications like servo systems and speed control applications. The main objective of this paper is to minimize transient response specifications chosen as rise time, settling time and overshoot, for better speed response of DC motor drive. In this paper the speed control of DC motor is done using PI controller.it describes the methodology of speed control of DC motor with additional voltage control methods. The results are obtained by MATLAB simulation by practical connection. Using MATLAB simulation and practical connection the speed of DC motor is controlled

Keywords: DC motor, PI controller, MATLAB etc.

INTRODUCTION
The DC motor is the motor which converts the direct current into the mechanical work. It works on the principle of Lorentz Law, which states that the current carrying conductor placed in a magnetic and electric field experience a force. The DC motor is the motor which converts the direct current into the mechanical work. It works on the principle of Lorentz Law, which states that "the current carrying conductor placed in a magnetic and electric field experience a force". And that force is the Lorentz force. There are 4 major types of DC motor

- Series DC Motor
- Permanent Magnet DC Motor
- Shunt/Parallel DC Motor
- Compound DC Motor

Figure : DC motor

There are different types of controllers like lead, lag, LQR , PI, and sliding-mode control that are used in control applications. Among the few mentioned types of controllers, PI controller is one of the earliest and best understood controllers which is incorporated in almost every industrial control application due to its

efficiency and ease of implementation. The PI controller is a common method using to control the speed of DC motor. It is used in various control systems to correct the error between the command setpoints and the actual value based on some type of feedback.

SYSTEM DEVELOPE

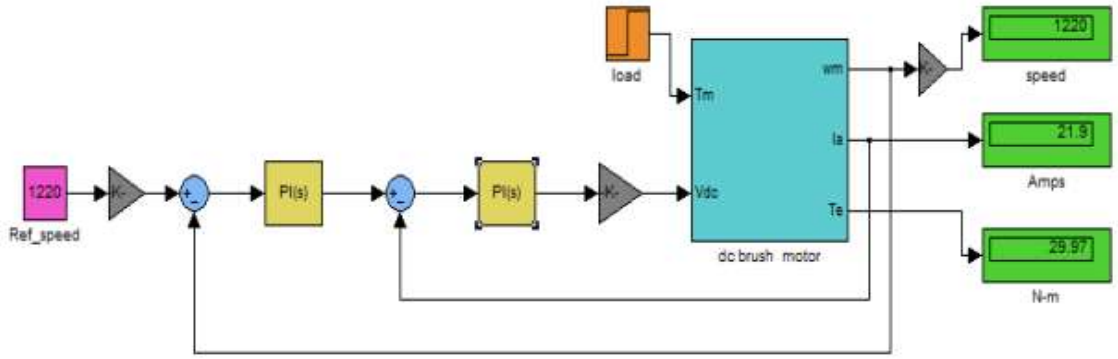

Figure 1: simulation block Diagram

WORKING

In this paper we have design and implemented a speed controller for a simple DC motor using PI controller. In particular, we have choosen and tuned the gains of a PI controller based on the effect of the gains on the system's closed-loop poles while accounting for the inherent uncertainty in our model. We have design the controller to achieve a desired level of transient response and will examine in detail the steady-state error produced by the resulting closed-loop system, including in the presence of a constant disturbance.

The purpose of this model is to build intuition regarding the design and implementation of a PI controller for the speed control of a DC motor in the presence of an array of real-world complications. Specifically, we will consider how to design the controller when we have an uncertain plant model and are limited in the amount of control effort we can supply. Furthermore, we will analyze our system's performance in the presence of unwanted exogenous inputs, which in this case will be a constant disturbance.

PI CONTROLLER

Proportional Integral controller sometimes also known as proportional plus integral (PI) controllers. It is a type of controller formed by combining proportional and integral control action. Thus it is named as PI controller.

In the proportional-integral controller, the control action of both proportional, as well as the integral controller, is utilized. This combination of two different controllers produces a more efficient controller which eliminates the disadvantages associated with each one of them

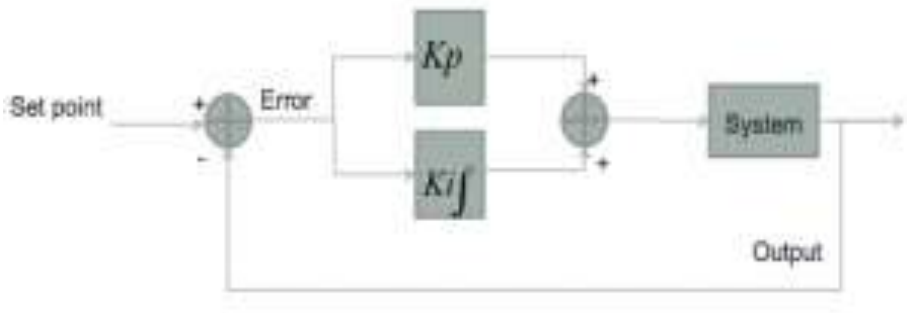

Figure: PI control loop

A P.I Controller is a feedback control loop that calculates an error signal by taking the difference between the output of a system, which in this case is the power being drawn from the battery, and the set point. The set point is the level at which we'd like to have our system running, ideally we'd like our system to be running near max power (990W) without causing the limiter to engage.

It is important to point out that due the the complexity of the electronic components within the circuit path (i.e ESC, power limiter, and motor) I was not able to accurately create model (transfer function) for the system. Having a transfer function would have allowed me to simulate the system in a software package such as MATLAB/Simulink and assist me in finding the right proportional and integral constant parameters for the controller. Unfortunately, due to the lack of a model, the parameters were obtained via a trial and error format.

CONCLUSION

The PI controller is the simple way to achieve the desired result as compared to other methods The review of many research papers as well as tremendous software (MATLAB, SIMULINK) and hardware analysis has been carried out in the area of speed control of dc motor to investigate and find out current challenges and scope of work in the area. After the review, the main issue was found that the speed control of dc motor is a typical task. MATLAB used for simulation of entire project is sophisticated and user friendly software. It must be mentioned that the efficiency of the speed algorithm can be improved by using more efficient learning techniques and dynamic weight selection algorithm.

REFERENCE

1) Orges Gjini, Takaynki Kaneko and Hirosh Ohsawa. "A new controller for PMSM servo drive based on the sliding mode approach with parameter adaptation". IEE Trans. On IA, V 123, No. 6, 2003, pp. 675-680
2) R. Nagarajan, et al., "Implementation of chopper fed speed control of separately excited DC motor using PI controller," International Journal of Engineering and Computer Science, vol. 6, no. 3, pp. 20631-20633, 2017
3) Abidaoun H. shallal1, Rawaa A. Karim2, Osama Y. Al-Rawi 3 "A novel method for tuning PID controller," Diyala Journal of Engineering Sciences, vol. 06, no. 01, pp. 62-74, Mar 2013 [4] Electrical machine by Dr.P S Bimbhra by Khanna publishers New Edition
4) Automatic control systm by S Hasan saeed, published by S K Kataria vol v 05
5) Aziz Ahmed, et al., "Comparative study of speed control of DC. motor using PI, IP, and fuzzy controller," International Journal of Advanced Research in Computer and Communication Engineering, vol. 2, no. 7, Jul 2013
6) Guoqiang Chen and Xianguang Shang, "Simulation used in education for a separately excited DC motor," World Transact ions on Engineering and Technology Education, vol. 12, no.1, 2014.