A BRUSHLESS DC MOTOR SPEED CONTROL SYSTEM USING ADAPTIVE FUZZY LOGIC CONTROLLER

SEMINAR REPORT
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ABSTRACT

It has been a practice in control system design to provide certain means of control in any control system by using different techniques such as adding compensators like PI, PD, and PID. This kind of model-based compensation has limitations in the case of poor process model and parameters of a system that vary during the process. However, fuzzy logic control has been found particularly useful for controller design when the plant model is unknown or parameter variation during the process. It does not need an exact process model and has been robust with respect to disturbances, large uncertainty and variations in the process behavior. With the incorporation of machine intelligence techniques such as fuzzy logic, artificial neural networks, and evolutionary computation with the conventional controller brings better response then fuzzy logic control approach.

This seminar presents a design method in the development of compensators for control systems using the hybrid of the conventional proportional-integral (PI) method and fuzzy logic (“adaptive fuzzy logic control”) approach to design a robust brushless dc motor controller for variable speeds. Such robust controller consists of a PI controller tuned by fuzzy logic. The fuzzy logic tuner is used to adjust the two gains of the PI controller when the parameter of the system varies, that provide an optimal response.
CHAPTER-1

INTRODUCTION

System control is a very challenging area in the field of control systems engineering, which widens the research and development of different control techniques in linear and non-linear, single and multivariable systems. Different control techniques have been formulated such as conventional PI, PD, and PID control, machine intelligence (e.g. fuzzy logic, neural networks, evolutionary computation), and the mixture of both with the hybridization of the conventional PI control method and fuzzy logic, as an example. The brushless dc motor is a permanent-magnet synchronous machine supplied from a six-transistor inverter with the switching on/off of the inverter determined by the rotor position. This system is becoming increasingly attractive in servo and variable-speed applications since it can produce a torque-speed characteristic similar to that of a permanent-magnet dc motor while avoiding the problems of the failure of brushes and mechanical commutation. Due to the presence of parameter variations in a brushless dc motor, adaptive control becomes necessary in order to obtain a reasonable behavior of a closed-loop system. As it is difficult to know the exact parameters of a brushless dc motor with different mechanical loads, we try to introduce the fuzzy algorithm to an adaptive tuner of a PI Controller.