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Robot Axis Control Using Brushless DC Motor Drive via Conventional and PD Fuzzy Controllers

A project Submitted in partial Fulfillment of the Requirements for the Degree of Bachelor of Science (BSc) in Electrical and Telecommunictions Engineering

Student: Mohammed Saed Alawamy (6181196)

Hamed Belgasem (6180068)

Supervisor: Prof. Tawfiq H. Elmenfy

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ABSTRACT

Conventional PID controller has only three parameters to adjust. Controlled system shows good results in terms of overshoot, settling time, rise time, peak time and steady state error when these parameters are well adjusted. Conventional PID controller is widely used in process control due to their simplicity and free controller. Conventional PID are linear and the most of the plants are nonlinear. Therefore, the Conventional PID has some drawbacks to control nonlinear systems.

Fuzzy controllers are nonlinear controller and have the advantage that can deal with nonlinear systems and use the human operator knowledge.

In this project, various of controllers are studied and tested to control the position of one axis of the main joint model, which using brushless DC motor drives that are connected to the rest of the manipulator through speed reducers. The control system, which consists essentially of two position control loops is built with SIMULIKN blocks, the controllers are as following:

1. Proportional of angle deviation and the Derivative of speed controller (P+D),

2. Proportional and Derivative of angle deviation plus Derivative of speed controller (PD+D),

3. Proportional and Derivative of angle deviation Fuzzy Logic Control (PD FLC).

The simulation results show the superiority of PD fuzzy control over conventional controllers especially in term of steady state error.