ADAPTIVE MOTOR CONTROL USING

FUZZY LOGIC

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ABSTRACT

The architecture and learning procedure underlying Adaptive Motor Control using Fuzzy Logic is presented. The testing of the controller and DC servo motor were conducted and examined using Simulink in Matlab software where a closed-loop system is designed. There were two input variables (error of speed and change of error) and one output variable (change of voltage) that been implemented using membership function for the Fuzzy controller. ANFIS (Adaptive-Network-Based Fuzzy Inference System) is applied in order to optimize the Fuzzy controller design. Using a given input or output data set, the toolbox functions ANFIS constructs a fuzzy inference system (FIS) whose membership function parameters are tuned (adjusted). This allows the fuzzy systems to learn from the data its modeling. The additional controller such as PID controller is taken into consideration to analyze the response system in order to develop accuracy in terms of tuning. This closed-loop control system was accomplished using motor with no-load and load as to ensure that the system can adapt load disturbances. A step function block is used as a load. This step load will act at a certain time after the motor has reached steady-state speed. The load will reduce the speed of the motor and the controller will try to achieve the step speed. This process will continue until the desired speed reach. The reaction of the controller to react at this load disturbance is characterized as a good controller. Therefore, Adaptive Motor Control using Fuzzy Logic is executed to control the DC servo motor speed. The process of designing the Fuzzy Logic Controller is easy to be understood because it is based on the natural language. Fuzzy logic control requires less time to design and the performance was better compared to PID controller in terms of overshoot and the correction mechanism.