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Ministry of Higher Education
And Scientific Research
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Speed Control of Separately Excited DC Motor Using Fuzzy Logic Controller

A thesis

submitted to the Department of Electromechanical Engineering , of University
of Technology in a partial fulfillment of the requirements for the degree of
Master of Science in Engineering Educational Technology/Electrical
Engineering

BY

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Supervisors' Certificate

We certify that this thesis entitled " Speed Control of Separately Excited DC Motor Using Fuzzy Logic Controller " was prepared by (Ahmed Rissan Hussein) under our supervision at the Department of Technical Education/ University of Technology/ Baghdad, in partial fulfillment of requirements for the degree of Master of Science in Electromechanical Engineering / Electrical Engineering.

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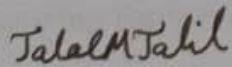
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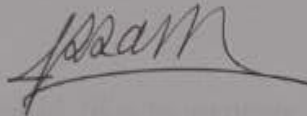


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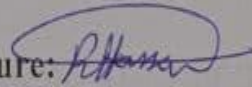


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Abstract

Motor speed control has been the focus for many researchers . The work presented in thesis is concerned with design of the [PID, FLC] controller was achieved through the use of Matlab V 7.0 and simulink .

The design simulation of all the controllers such as conventional [i.e proportional , integral , derivative ,(PID)] and intelligent control [namely Fuzzy logic control (FLC)] are compared for different DC motor speed control .

Different simulations are performed using the PID and FLC controller for different conditions namely various motor plants having readily changed parameter in order test the robustness of the system , Also three types of input ,i.e step,ramp,and train of pulses are employed result ,obtained .medicated that the prospered FLC controller are better compared with controllers such as PID,[e.g. for PID, $t_r= 0.3$ sec , $M_P=0.1$ $t_s=1.8$,while for FLC , $t_r= 0.008$ sec , $M_P= 0$ $t_s=0.016$ sec .

Educational computer program based on techniques for separately excited DC motor speed control is designed using directive methods as well as ADDIE model (analysis ,design ,development , implementation ,and evaluation) .

The instructional design program uses tutorial method make users to understand the subject from slides of PowerPoint program to view the program .

The design is tested using different human samples [B.Sc and M.Sc graduates] .

Conclusions

The DC motor speed control needs the accuracy ,because the overshooting state and steady-state error affect motor operation and response , so that the researcher has depended on three cases in work . The first DC motor runs without controller . the second , DC motor run with PID controller in this case the output response is improved . The third case uses fuzzy logic controller. In this case the output response is very good and output result is very accuracies see table (3-1) therefore ,this thesis has the following facilities :

- 1-The use of MATLAB program and SIMULINK enables the user to have flexibility in choosing different elements and diagrams. They also provide good and easy means of obtaining and inspecting output at various points of the diagrams concerned .
- 2- The use of fuzzy logic simplifies the design of controllers , because it relies on fixed fuzzy rules , the rule base is built based on input information .
- 3- MATLAB V 7.0 and Simulink are used to design fuzzy logic controller for speed control of DC Motor .
- 4- Motor speed closed-loop system is tested without the use of any controller ,giving an output response with unacceptable transient parameters .
- 5- Motor speed closed-loop control using PID controller is tested and is found to give reasonably good transient parameters .
- 6- Simulation results of the fuzzy controlled motor speed are found to give fairly accurate results .
- 7- comparison of the results obtained from using fuzzy logic controller with those based on PID controller indicate .The fuzzy logic control gives better results .
- 8- Instructional program is written to enable students to learn the subject of dc motor control in detail .

5-2 Recommendations for future work.

1- The use of genetic algorithm based controller should be tried .

2-The fuzzy logic controller should be implemented for AC motor control .

3- The fuzzy logic controller should be transformed into hardware using FPGA and tested practically .

4-improved the research by using neuro fuzzy controller and tried of position DC Motor or AC Motor .

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