Neural Networks Based Approach for Identification And Control of DC Motor

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in the Department of Computer Engineering, Yarmouk University, Irbid, Jordan

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May, 2006
ABSTRACT

Al-Ma'a'ita, Eyad Khalil. Neural Network Based Approach for Identification And Control of DC Motor. Master of Science Thesis, Department of Computer Engineering, Yarmouk University, 2006 (Supervisor: Dr. Eyad Abu Al-Feilat and Co-supervisor Dr. Muwaffaq Alomoush).

This thesis compares the performance of a radial basis function neural network (RBFNN) and a Backpropagation neural network (BPNN), for off-line identification and control of separately excited DC motor (SEDM). The choices of process excitation signal, data sampling time, and neural network model structure are investigated by time-domain simulation. Validity of neural networks models are carried out by cross-validation test. The simulation results show that, compared to the BPNN, the RBFNN is simpler to implement, needs less training time, and has some better approximation properties.

Two control schemes are used; direct inverse control and internal model control. The performance of RBFNN and BPNN controller are investigated based on step response, sharp changes in speed trajectory, sudden loads, and changes in motor parameters. The simulation results shows that both controllers have excellent step response, adapt well to sharp instantaneous changes in speed trajectory and load connected to the motor, and adapt to the changes of motor parameters. The simulation results show that both internal model controller and direct inverse controller exhibit identical performance. Therefore, it is believed that internal model controller is not recommended due it's complexity as long as the inverse model of the plant is identified accurately.

Key Words: Neural network, Radial basis, Backpropagation, Identification, Control, DC motor