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SPEED CONTROL OF PERMANENT MAGNET SYNCHRONOUS MOTOR USING NEURAL NETWORK

N.M.Zin, W.M.Utomo, Z.A.Haron, A.A.Bohari, S.Y.Sim, R.M.Ariff,
Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Batu Pahat, Johor
adzianie@gmail.com

Abstract

This paper presents the implementation of a model for a Permanent Magnet Synchronous (PMSM) speed control by using neural network. The mathematical model of PMSM and artificial neural network algorithm is derived. The controller is designed to tracks variations of speed references and stabilizes the output speed during load variations. The PMSM has been widely used in motion control applications; especially because of their low rotor inertia, high efficiency and reduced rotor size. However, due to the nonlinearity of the PMSM drive characteristics, it is difficult to control by using conventional proportional-integral-differential (PID) controller. In order to overcome this main problem, a neural network controller with online learning technique based on back propagation algorithm is developed. Hysterisis current controller is used for inner loop current control. The effectiveness of the proposed method is verified by develop simulation model in MATLAB-simulink program. The simulation results show that the proposed neural network controller (NNC) produce significant improvement control performance compare to the PID controller for both condition controlling speed reference variations and load disturbance variations. It can conclude that by using proposed controller, the overshoot, steady state error and rise time can be reducing significantly.