ABSTRACT

Oktavianus Kati, *A Sliding Mode Controller (SMC) of a Three Phase Induction Motor with a Direct Torque Control (DTC) System using the Genetic Algorithm* (supervised by **Rhiza S. Sadjad** and **Nadjamuddin Harun**)**.**

In this research the Genetic Algorithm has been implemented to find the optimum parameters of a Sliding Mode Controller (SMC) built for a three phase induction motor with a Direct Torque Control (DTC). A d-q model of a 7.5 kW, 10 HP, 415 Volt, 1450 RPM motor driven by an inverter and a Space Vector Pulse Width Modulation (SVPWM) control has been used as the control system's plant. A DTC estimator is the subsystem for computing the estimation of the torque error, the flux angle and the d-q axis flux angle. The SMC subsystem calculates the reference torque from the angular speed error.

From the experiment using the d-q model of the motor without any control, it has been shown that an additional torque as much as 20 Nm reduces the motor speed up to 26.06%, while a 10 Nm torque reduction increases the motor speed up to 11.74%. The DTC eliminates the speed variations due to the torque disturbance, with the maximum overshoot of 6 to 12 %, and the settling time of 0,8 to 1,6 seconds. Using the SMC with parameters optimized by the Genetic Algorithm, the maximum overshoot is reduced up to only 1.9 to 2.9 %, and the settling time is reduced up to only 0,08 to 0,09 seconds.

For a variable speed operation, the control system has made it possible to limit the error up to only 0,03 % for the nominal speed operation at 1450 RPM, but the error increases almost proportionally as the speed decreases when the motor is operated at the lower than nominal speed operation, i.e. 0,08 % at 725 RPM and 0,27 % at 362,5 RPM.