A Comparative Study between the Two Applications of the Neural Network and Space Vector PWM for Direct Torque Control of a DSIM Fed by Multi-Level Inverters

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Abstract. Nowadays, thanks to the development of control and power electronics, the dual stator induction machine DSIM has become among the most important multi-phase machines included in the industrial application of welding process, this is due to its positive features among them is its high reliability and reduce both losses and rotor torque ripple.

This paper aims to apply both techniques of artificial intelligence represented by the neural network algorithm NNA and the Space Vector PWM SVM for direct torque control DTC of the DSIM to improve the machine performance to control speed wire of Gas Metal Arc Welding (GMAW), and control algorithms DTNC and DTC-SVM.

Generalization capacity, the parallelism of operation, computational speed, and learning capacity all these features made it possible to exploit the neural network algorithm to control the machine. Fixed switching frequency obtained, dispensed with the vector selection table and the hysteresis controller, the three pros allowed the inclusion of SVM technique in DTC strategy.

The converters are included to feed the DSIM and the GMAW process. A several of the results obtained prove the two applied techniques (NNA, SVPWM) in improving the quality of both electromagnetic torque and flux and the dynamic responses of the DSIM.

Keywords: GMAW, DSIM, Neural Network Algorithm NNA, Space Vector PWM SVM, DTNC, DTCSVM, Three-level NPC inverter.