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Speed Sensorless Direct Torque Control Strategy of a Doubly Fed Induction Motor Using an ANN and an EKF

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Abstract: This study is devoted to the Direct Torque Control (DTC) strategy of a Doubly Fed Induction Motor (DFIM), with the use of an Artificial Neural Network (ANN) in the switching table, that gives the control sequence of the voltage inverter.This strategy is performed in two methods, the first one is with a mechanical sensor for the motor speed and, consequently, the position of its rotor, and the second one is without a mechanical sensor, using the Extended Kalman Filter (EKF) as a fast observer for the nonlinear closed loop with the obtained variable matrix. The EKF gives the new values of the state variables of the DFIM by minimizing the noise impact. This helps to avoid problems caused by the motor speed sensor and to make better the control robustness and its performances in the situation of any sensor fault. The selected configuration uses two voltage inverters linked to the stator and the rotor windings, which permits adopting the energy distribution between the stator and the rotor, and which is a suitable drive for the changeable speed application.

Keywords: *doubly fed induction motor (DFIM); direct torque control (DTC); artificial neural network (ANN); extented Kalman filter(EKF).*

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