



A DTC Neurofuzzy Speed Regulation Concept for a Permanent Magnet Synchronous Machine

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Abstract: Based on Sugeno fuzzy logic system, this paper develops a Neuro-Fuzzy Direct Torque Control (NFDTC) for a Permanent Magnet Synchronous motor (PMSM). The main idea of DTC control is motivated by direct choosing the stators voltage vectors according to the differences between the references of the electromagnetic torque and the stators flux and their reels values calculated and related only on the actual-sizes of the stators. The neurofuzzy regulator is synthesized by using the Sugeno reasoning methods, where the consequences rules are a single order polynomial of inputs defined by three Gaussians fuzzy sets. The parameters of the premises and the conclusions of the fuzzy rules of Sugeno are determined on the base of the input-output data provided by a fuzzy regulator of the Mamdani type, where the linguistic variables of inputs-outputs of the torque, flux and position of the stator flux vectors are of triangular membership functions. The training is based on the extended Kalman filter concept, which allows the determining of the parameters vector of the fuzzy rules so that the output of the Sugeno regulator approaches will be the best possible output of the Mamdani regulator. The simulation results make it possible an effective evaluation of the Kalman extended based filters training algorithms.

Keywords: *DTC; PMSM; Inverter voltage; fuzzy sets; Sugeno methods; extended Mamdani and Kalman filter.*

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