

This paper proposes a combined modeling method for switched reluctance machine (SRM) with few samples of flux linkage characteristics measured without rotor clamping devices and position sensors. The proposed method mainly consists of two steps, namely data reconstruction and characteristic description. In data reconstruction, the entire flux linkage characteristics are obtained by training support vector machine (SVM) with the measured few samples. The characteristics from the trained SVM are consistent well with those from the rotor-clamping measurement. In characteristic description, back-propagation neural network (BPNN) is adopted to describe the reconstructed flux linkage characteristics and calculated static torque characteristics. On this basis, the simulation model of the SRM prototype is built in MATLAB. The results from simulation under both motoring and generating mode are compared with those from experiments, and good agreements can be found, which prove the effectiveness of the proposed modeling method. To further demonstrate the accuracy and application of the entire flux linkage characteristics obtained from data reconstruction, BPNN is used again to build the mapping from flux linkage and phase current to rotor position for rotor position estimation, and some results are presented. The applicability of the proposed method to different SRM topologies is discussed as well.