Abstract:
This study presents a new strategy for estimating the states (rotor flux and speed) and the load torque to implement a multivariable controller for a sensorless three-phase squirrel-cage induction machine in wind energy conversion systems. The multivariable control is carried out using input-output feedback law and its objective is to track profiles of the rotational speed and the rotor flux amplitude. The state estimation considerably improves the performance of rotor flux based model reference adaptive system in the variable speed region of operation. The technique uses Kalman filter as a rotor flux observer and an artificial neural network adaption mechanism to estimate the rotor speed. The state estimation requires only the measurements of the stator voltages and currents. The estimation method, for both states and torque, is not invasive as no mechanical sensors are needed. The wind energy conversion system and the proposed control-estimation techniques are simulated in Matlab/Simulink software platform and tested using the OPAL-RT real-time simulator (OP5600) to verify the accuracy of the proposed control-estimation method.