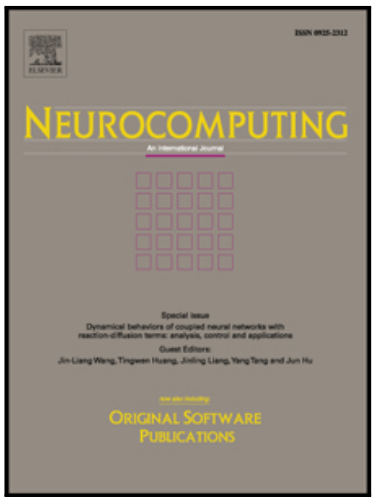

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Abstract

The variable and unpredictable nature of wind is the major problem in harnessing wind energy. So, it is very important to optimize the operation of wind turbine for its safety and better efficiency of wind energy conversion system. Several methods have been used to improve the quality and efficiency of wind power system. In this study, a novel control algorithm based on adaptive neuro-fuzzy inference system (ANFIS) is proposed to estimate the wind turbine power coefficient as a function of tip-speed ratio and pitch angle. Neural network trains the fuzzy membership functions (MFs) to adapt the system behavior. The least square algorithm is used to train the system in forward pass and back propagation gradient decent algorithm in backward pass. The simulation is done for national renewable energy laboratory (NREL) offshore 5 MW baseline wind turbine. The controller is implemented in MATLAB to investigate its performance. The root mean square error (RMSE) is calculated, simulation results show the effectiveness of the proposed model. The proposed method is computationally intelligent, more reliable and easy to implement for fast estimation of power efficient.

Keywords Wind turbine, Tip-speed ratio, Pitch angle, Power coefficient, ANFIS