Application of adaptive neuro-fuzzy methodology for performance investigation of a power-augmented vertical axis wind turbine

Abstract

Wind power is generating a lot of interest in many countries as a way to produce sustainable and low-cost electrical power. Since the power in the wind is known to be proportional to the cubic power of the wind velocity approaching the wind turbine, this means that any slight increase in wind speed can lead to a substantial increment in the energy output. Power augmentation device is an interesting option in this respect. The aim of this study is to determine the accuracy of a soft computing technique on the rotational speed estimation of a Sistan rotor vertical axis wind turbine with PAGV (power-augmentation-guide-vane) based upon a series of measurements. An ANFIS (adaptive neuro-fuzzy inference system) was used to predict the wind turbine rotational speed. The ANFIS network was developed with three neurons in the input layer, and one neuron in the output layer. The inputs for the network were time (t), wind velocity (v) and presence of the PAGV (0 with PAGV and 1 without PAGV). The precision of ANFIS technique was assessed against the experimental results using RMSE (root-mean-square error) and coefficient of determination (R^2).