Reactive power tracing in pool-based power system utilising the hybrid genetic algorithm and least squares support vector machine

Abstract

This study presents a new method for reactive power tracing in a pool-based power system by introducing the hybrid genetic algorithm and least squares support vectormachine (GA-LSSVM). The idea is to use GA to obtain the optimal values of regularisation parameter, γ, and kernel radial basis function (RBF) parameter, σ2, and adopt a supervised learning approach to train the LSSVM model. The technique that uses proportional sharing method (PSM) is used as a teacher. To obtain a lossless system, the concept of virtual load is proposed. Prior to that, the equivalent transmission line model is introduced. It integrates the nodal reactive power with the power produced by shunt admittances. Based on power-flow solution and reactive power tracing procedure by PSM, the description of inputs and outputs for training and testing data is created. The generators' shares to reactive loads in the test system are expected can be determined accurately by proposed GA-LSSVM model. In this study, five-bus system is used to illustrate the concept of virtual load and equivalent transmission line model whereas the 25-bus equivalent system of southern Malaysia is used to illustrate the effectiveness of the proposed GA-LSSVM model compared to PSM and artificial neural network.