ABSTRACT

Along with load on modern power system were grown up quickly and rapidly, on the other hand, the installment of new transmission system and new power plant are limited for economical or environmental reasons and power system must be operated and continuously provided power in stable operation, this situation could make power system operated in critical stability region. If these issues couldn’t be addressed properly and quickly, it would cause the system were oscillation and unstable. Therefore, power system requires the optimal control strategy in order to continuing operation and guaranteeing power quality.

This Thesis proposes a novel method used as wide-area control system (WACS) based least squares support vector machine (LS-SVM). The LS-SVM method which developed as WACS in this thesis is multi output LS-SVM (MLS-SVM). The main function of WACS application is to damp the oscillation on power system. WACS consists of wide area monitor (WAM) and wide area control (WAC). WAM is used to monitor the dynamic behavior of the power system, while the WAC is utilized as the additional controller to damp the oscillation due to the disturbance that occurs on power system. The improved quantum-inspired evolutionary algorithm (IQIEA) methods is used to optimize the WACS parameter based MLS-SVM since the selection of WACS parameter is greatly affects the accuracy of the WACS. Power system model used in this thesis is two-area-four generators power system to test the effectiveness of the proposed method in improving the performance of the system keep on stable. The proposed method in this thesis which called WACS based MLS-SVM- IQIEA are compared to WACS based MLS-SVM-QIEA, WACS based MLS-SVM, WACS-based M-SVM and conventional power system stabilizer (CPSS). From the simulation results show that the proposed method could improve the damping ratio for inter area and local oscillation mode compared to other methods. The proposed method could improve the damping ratio of inter area oscillation mode for 3.29e-001 better than MLS-SVM based WACS-QIEA for 3.21e-001.
The damping ratio of local oscillation mode also improved using the proposed method as 5.82e-001 better than MLS-SVM based WACS-QIEA for 3.21e-001.

**Keywords**: Wide area control systems, automatic voltage regulators, power system stabilizers, least squares support vector machine, improved quantum-inspired evolutionary algorithm (IQIEA)