別紙様式８

研 究 主 論 文 抄 録

論文題目　APPLICATION OF INTELLIGENT TECHNIQUES FOR VOLTAGE MANAGEMENT OF POWER TRANSMISSION SYSTEMS
（知識工学を適用した電圧管理手法の送電系統への適用）

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主論文要旨

《本文》

This thesis presents a group of algorithms for the voltage and reactive power control (Volt/Var control) in transmission systems. The first algorithm is a rule-based technique. Transformers with a tap changer installed in the system are selected by the proposed technique as control devices. For each bus under voltage violation, the most effective control device is selected by using the minimum electric distance criteria. In order to demonstrate the efficiency of the method, several simulations were performed using an IEEE 30-bus network as a model system. The distance measure technique is compared with classic voltage regulation approach and a genetic algorithm based.

The second algorithm is a hybrid algorithm. The objective is to minimize the number of manipulations of control devices within a 24 hours period, while the voltages at all buses are kept within the limits of a normal operation. A genetic algorithm is combined with two rule-based statements. Load behavior is analyzed by a first rule: The more acutely load varies the more required manipulations in control devices will become. And, a second rule is implemented in order to estimate the ability of the controllable devices to decrease voltage violations.

A study of different genetic algorithms (GA) applied to Voltage/Var optimization was made. Notable works are compared and critiqued in terms of common features of GA, such as encoding format, local convergences, genetic operators, evaluation functions, and processing speed. Some thoughts and suggestions for future research are given.

Finally, a multi-objective genetic algorithm, based on NSGA-II, is implemented to find an optimal condition of minimum voltage deviations, minimum power losses and minimum number of control actions of a transmission network system. Generators and transformers with off-nominal tap ratio are the devices to be controlled. Different probabilities of mutation factors are compared and it is proved that a more important mutation factor can improve the velocity of convergence without getting into a random search.