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Title :
Performance Improvement Through Optimal Location And Sizing Of Distributed Generation

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This thesis presents a new technique to determine the optimal locations and sizing of multiple DG units in a distribution system based on the concepts and principles of quantum mechanics in the Evolutionary Programming (EP) namely Quantum-Inspired Evolutionary Programming (QIEP). The concept of Quantum-Inspired is implemented according to three levels namely quantum individuals, quantum groups and quantum global in order to accelerate the convergence time of the EP. To enhance the robustness of the algorithm, the QIEP technique is constructed based on multiobjective model in which the multiobjective functions consist of reducing power losses, increasing maximum loadability and cost minimisation. All simulations in this study were carried out using IEEE 69-bus distribution test system and 141-bus distribution test system. The performances of the multiobjective QIEP optimisation technique were compared with those obtained from EP optimisation technique in terms of fitness values, consistency and computation time. In addition, the comparison also has been made between single objective and multiobjective optimisation. On top of that, the multiobjective QIEP is also applied to determine the optimal undervoltage load shedding (UVLS) in various loading conditions according to load profile with and without DG. From the analysis, it was found that the multiobjective QIEP had yielded better optimal solutions and more consistent with faster convergence time as compared to other techniques. In order to ensure that the proposed technique is suitable for on-line application, a novel intelligent based technique is presented to predict the optimal output of DG and optimal undervoltage load shedding at various loading conditions. At this stage, a classical Artificial Neural Network (ANN) is developed using systematic training and testing procedures. Next, a novel hybrid Artificial Neural Network - Quantum-Inspired Evolutionary Programming (QIEP-ANN) is developed for comparison. Later, a Least-Squares Support Vector Machine (LS-SVM) model was developed using cross-validation technique. Finally, a novel hybrid Quantum-Inspired Evolutionary Programming - Least-Squares Support Vector Machine (QIEP-SVM) was presented. The results showed that the QIEP-SVM model had shown better prediction performance as compared to classical ANN, LS-SVM and QIEP-ANN.