Innovative Approaches for Power System Security Assessment: Artificial Neural Networks, Gene Expression Programming and Simulated Annealing

Hussein M. Khattab, Almoataz Y. Abdelaziz, Said F. Mekhamer

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Power systems security assessment and enhancement is of utmost importance as a result of power systems expansions and operation near their security limits. In this book, the assessment of power system static and transient securities is presented. Different IEEE test systems are subjected to static and transient security classification when prone to different contingencies using novel artificial intelligence techniques based on artificial neural networks and gene expression programming. Results show the superiority of the gene expression programming based algorithm as well as the probabilistic neural network based classifier algorithm in comparison with back-propagation and radial basis function neural network based classifiers. The system static security is enhanced using thyristor controlled series capacitors (TCSC's) installed in series with the lines. A developed approach for placement and sizing of TCSC's is presented based on ranking method together with the simulated annealing optimization technique. The book provides extensive survey of security assessment and enhancement techniques as well as a step by step application guide to assessing and enhancing system security.

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