

Abstract

It has become increasingly important for a planning and operational engineer to perform effectively the comprehensive voltage stability analysis. In recent years several research works has been done and many techniques have been suggested for voltage stability analysis considering both static and dynamic aspects and involving conventional as well as Artificial Intelligence techniques.

*This thesis presents the analysis of the various techniques/parameters in developing a suitable Neural network for performing Static Voltage stability analysis and the application of the same. Numerous neural network functions and the training methods listed in “**Matlab 5.2 Neural Network Toolbox**” are used for the study. Specific emphasis has been given for the back propagation techniques and the training functions, which are based on well-known algorithms such as Newtons, Quasi-Newton and Lavenberg Marquardt methods [Inc 98]. Further an algorithm is developed with the most suitable Neural network and tested on different standard power systems as Ward Hale and IEEE30 bus systems. The efficiency in learning the variations of system parameters such as load and the ability of identification of the new load changes by the network is assessed. It is found that certain algorithms could assess the phenomena of Voltage Stability fast once the ANN is trained significantly.*

The disturbances in the power systems network intensify the requirement of the security assessment in modern power network. This thesis also tests the trained Neural network for the common disturbances such as generator outages and line outages. The apparent comparison in the ability of learning the normal and also the contingency by a single network and with separate networks was one of the study measures. A single ANN is capable of learning both conditions even though for larger systems the accuracy is less when compared with training on independent ANN's.

Once the assessment of the voltage stability is done the improvement measures needs to be identified and discussed. The various measures for the voltage stability improvement and the approach of fuzzy techniques developed [NU 98] for the reactive support is presented in this thesis. Further the data from a practical Indian System is collected and the same is tested for the assessment of Voltage Stability using ANN both during normal and contingency situations and the improvement measures are discussed.