NEURAL NETWORK BASED FOR VOLTAGE STABILITY PREDICTION IN POWER SYSTEM

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ABSTRACT

This thesis presents the application of artificial Neural Network (ANN) to predict the voltage stability in power system network. The ANN type of Levenberg-Marquardt training back propagation is used in the voltage stability assessment. This requires a set of data to train the ANN in predicting the voltage stability accurately. A set of training data is generated based on the voltage stability index. After training the ANN then the other set of data is tested to ensure that the robustness of network is capable to predict the voltage stability accurately. The ANN output is coded into two categories that represents as the secure and not secure. The secure codes signify that the voltage condition of the system is stable with respect to the increased amount of reactive power at a particular load bus. On the other hand, the not secure codes signify that the voltage condition of the system is unstable with respect to the increased amount of reactive power at a particular load bus. Therefore, the output of ANN reflects the reactive power variations at a particular load bus. The effectiveness of ANN in predicting the voltage stability is analyzed with a case study of IEEE 9-bus reliability test system.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Voltage stability is an important factor to be considered in power system operation and planning. The effect of voltage instability will endure the voltage collapse in a power system. Voltage instability has been responsible for many system disturbances as major blackouts.

Voltage stability is concerned with the ability of a power system to maintain acceptable voltages at all buses in the system under normal condition and after being subjected to a disturbance [1].

The ability to transfer reactive power from production sources to consumption sinks during steady operating conditions is a major aspect of voltage stability [2]. Voltage instability occurs when there is a disturbance, therefore increase in load demand or a change in system condition causes an uncontrolled voltage drop. The incidents of voltage instability are believed to be related to heavily-stressed system where large amount of real and reactive power are transported over extra high voltage transmission lines while appropriate reactive power sources are not available to maintain the normal voltage profile at receiving end buses [3].

The load flow technique can be used for determine the voltage stability limit in power system. Load flow (or power flow) is the solution for the normal balanced three-phase steady-state operating condition of an electric power system. The data obtained from the load flow analysis is used for the studies of normal operating mode, contingency analysis and stability. Many load flow technique have been developed and one important new technique is the Second Order Newton-Raphson method (SONR) [4], which has gained widespread application in many facets of power system.