VOLTAGE STABILITY ANALYSIS USING ARTIFICIAL NEURAL NETWORK

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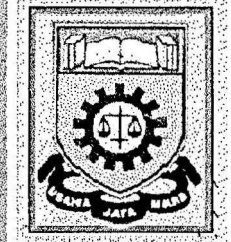

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ABSTRACT

Voltage stability problems have been one of the major concern for electric utilities as a result of heavy loading. This thesis presents the applications of artificial neural network in voltage stability analysis. A multi layer feed forward artificial neural network with error back propagation and memory-based feed forwards networks based on the estimation probability density functions, general regression neural network are proposed for calculation of voltage stability.

Back propagation using three layers and four layers i.e input layer, one hidden layer and output layer while four layer i.e input layer, two hidden layer and output layer are use. General regression using four layers i.e. input layer, hidden layer, division & summation layer and output layer are being applied in predicting voltage stability.

Both methods used same sets of data in training process and same other sets of data for testing process. All those sets of data are generated by Fast-Decoupled Load Flow Simulation using fifteen bus system. Real and reactive power at all buses and real and reactive power outputs of generator were applied as inputs to artificial neural network.

Test are carried out and the results for this two method are compared. From thr result, it shows that artificial neural network can be used to predict voltage stability of power system. The result also shows that General Regression are more accurate compare to Back propagation method. Back propagation using one hidden layer show good value compare to back propagation using two hidden layer.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Introduction

The increasing complexity of electrical power system and the demands imposed by economic have emphasised the need for improving power system. The stability of an electrical power system is a crucial factor to be taken into account when operating power system or planning new facilities.

Most large power system black-out which have occured world wide over the last twenty years have been caused by the phenomena of voltage instability[1]. Several major network collapse caused by voltage instability problem were reported in France, Belgium, Sweden, Japan and the United States[2]. Therefore voltage stability analysis are performed to provide information on the system's ability to maintain steady acceptable voltage under normal operating condition and after disturbance.

The ability to transfer reactive power from production sources to consumption sinks during steady operating conditions is a major aspect of voltage stability[3]. Voltage instability normally occur in heavily stressed system. Voltage instability occur when there is a disturbance, therefore increase in load demand, or change in system condition causes uncontrollable in voltage drop. The incident 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 normal voltage profile at receiving end buses[2]. Voltage collapse is the process by which the sequences of event accompanying voltage instability leads to a low unacceptable voltage profile in a significant part of the power system and therefore voltage collapse occur.