CONTINUATION POWER FLOW FOR VOLTAGE STABILITY ASSESSMENT

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ABSTRACT

This thesis presents a potential algorithm for continuation power flow in order to find a power flow solution at its bifurcation point. The conventional Newton's method was found to be inadequate to obtain the maximum loading point (MLP) or critical point of the power system due to the Jacobian matrix singularity. This problem can be solved by using continuation power flow, which remains well condition at the saddle node bifurcation point due to the divergence at this point is eliminated. The continuation power flow program is developed using MATLAB programming language base on algorithm of continuation power flow (CPF) technique, which can compute efficiently the parameter at saddle node bifurcation point. The existing continuation power flow (CPF) technique base on predictor-corrector method is the most accurate method but very time consuming. Thus a new technique is implemented in this paper in order to reduce the time consuming faced by the existing method. A small test system is used for the implementation of this technique and another medium test system is also used for verification of the program used.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

In recent year, an instability usually termed voltage instability has been observed to be responsible for several major networks collapses in many countries [1-2]. Voltage stability has become critical issue because the continuous load varies along with economical and environmental constrains which has led the power systems to operate close to their limits, along with stability margin reduction [1]. At this point any unexpected rise in the load level can cause voltage collapse phenomena; thus the voltage stability condition is a crucial aspect in the power systems operation and planning.

The solution curve is an important element in voltage stability assessment, which can be computed by continuation power flow method. The continuation power flow methods are powerful and useful tools for obtaining solution curves for general non-linear algebraic equation by automatically changing the value of a parameter [1]. This solution curve will show the critical point of voltage stability limit, which is at the nose of the curve. The voltage stability limits is the maximum loading point (MLP) which can be compute by many tools or continuation method that was developed by many authors, for example continuation power flow (CPF), CPFLOW (the revision of continuation power flow), and Homotopy method.

The homotopy method constructs a homotopy from an augmented load flow equation and a polynomial with known solutions and the load flow solutions are obtained by tracing the homotopy curves starting from the known solutions of the polynomial [3]. The homotopy type of continuation is considered not efficient method since it required large scale of computational and the singularity of the Jacobian matrix is still remain in this approach as stated by Ajjarapu [3].