

UNIVERSITI TEKNOLOGI MARA

**ANALYSIS OF POWER SYSTEM STABILITY
USING PRONY ANALYSIS**

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ABSTRACT

A good power system analysis is measured through the ability to detect response after experiencing disturbance within a specified requirement in a fastest way. In this manner, more condition can be implemented and analyzed to detect the possibility of instability that could lead to system collapse. Difficulty to detect the stability of a large power system network is due to simulation test produces up to thousands of output signal. Since the power system network grows each year, the simulation test of system stability should be performed each time the network changes in order to ensure the system adequacy and security are fulfilled. Furthermore, system stability test involves a lot of elements, where each of them need to be thoroughly examined, thus it is time consuming. This paper examines signal stability through its damping ratio, computes by a digital signal processing method named Prony analysis. Prony analysis will produces an output of amplitude, damping coefficient and frequency from an output signal as the components to calculate damping ratio. The calculation of damping ratio used as an indicator in achieving compliance with the limit specified by the Malaysian planning standards. Multiple software was used base on simulation and analysis among them are spreadsheet (Microsoft Excel), simulation (Power System Simulator for Engineer - PSSE) and analysis (MATLAB) are integrated together to dynamically screen several PSSE simulated output signal files consist of various elements at one instance to speed up analysis.

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CHAPTER 1

INTRODUCTION

1.1. INTRODUCTION

Electricity is very crucial at present day life. No one can afford to lose electricity supply for a few moment. Start from heavy industries, electrified transportations, commercial and services, and household cannot lose electricity even for short while. Sustain supply of electric is critical where it relies on the continuous operation of the generators to generate and the network to deliver electricity with state and condition continuously varies all the time. These generators and network, named electrical power grid, have to meet the requirement at all states and conditions, and at the same time expose to disturbance.

Power system stability has been recognized as an important problem for secure system operation since 1920s [1],[2],[3]. Many major blackouts caused by power system instability have illustrated the importance of this phenomenon [3]. Prony analysis method is being adopted in this thesis as a digital signal processing technique to determine the stability of a signal based on its damping ratio.