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FAULT LOCALIZATION USING WAVELET TRANSFORMS IN ELECTRIC POWER NETWORKS

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in partial fulfillment of the requirements for the
degree of Master of Science

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DECLARATION

The work submitted in this dissertation is the result of my own investigation, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

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Abstract

Determination of fault location in electric power systems is very vital for economic operation of power systems. Conventional distance protection schemes provide sufficient information for fault isolation and those are not satisfactory for accurate fault location and identification. This study focuses on developing an observer model for the distance relay through fault transient analysis which provides more useful information related to fault localization.

Using the theory of wavelet singularity detection as a powerful signal processing tool, travelling wave behavior of faulted signals is investigated to build up the fault location algorithm. Fault transients are discriminated from other types of power system transients using Daubechies-4 mother wavelet. The principle of proposed scheme is based on the identification of successive high frequency voltage waves arriving at the substation end in modal domain. Clarke transformation matrix is used to obtain modal quantities which eliminate significant electromagnetic coupling between three phase quantities.

The resulted fault transient voltage graph provides basic information for fault distance calculation with the help of power network's physical characteristics. Surges originated from different discontinuity points of the network including the fault point are analyzed by their magnitude, polarity and timing to incorporate them into the proposed fault location technique. New scheme is capable of locating faults irrespective of fault types, once the appropriate mode is selected from the modal domain. Fault characterization by modal analysis is based on the trial and error approach at the time of fault simulation.

Extensive simulation studies carried out using MATLAB/SIMULINK Simpower control block set show that the proposed algorithm provides an accepted degree of accuracy in fault location under different conditions and validity of proposed technique to a branched network is also investigated during the study.

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