The Center of Excellence for Communication Systems Technology Research

CECSTR CURRENT RESEARCH PROJECT ACTVITIES

Research Topic: Detection of Short Circuit Faults in Three Phase Power Systems Using Wavelet Transform Systems.

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Synopsis of the Research Project

The electrical power system network has become more complex to meet the growth in demand of electrical power energy in this 21st century. Transmission lines that expanded over several miles are the backbone of the electrical power system, which acts as interconnection between power stations and consumers. Environmental effects on the transmission lines could cause fault occurrences in the power system. Power transmission line fault identification and classification requires fast and accurate analysis to detect the fault. The ability to detect and diagnose the faults can help greatly in the protection of transmission line and prevent damages in the power system. This research project provides a solution to fault detection and diagnosis of transmission lines by using Discrete Wavelet Transform (DWT) to detect various phase/phases faults and phase/phases to ground faults in three phase power systems. The decomposed signal possess a powerful time-frequency localization property, which is one of the benefits provided by the wavelet transform, and the resulting signal can be analyzed in both time and frequency domains. Wavelet transforms have some unique features that make it suitable for this application. Unlike the Fourier Transform, the wavelet is not only localized in frequency but also in time, which allows detecting the time of fault. The phase (line) current has a transient of non-periodic nature when there is fault on the line, which a feature can be utilized for the wavelet analysis.

Faults are generated using a power distribution system simulator by Simulink MATLAB toolbox. The three phase currents are analyzed using discrete wavelet transform (DWT), decomposing the three phase and ground currents to obtain the detail coefficients at level one of phase A, phase B, phase C, and ground current. Then the maximum value of the coefficients is obtained to distinguish between different types of faults. The concept is that when the fault is there in any phase, then those coefficients in that phase will have a very high magnitude while the coefficients in other phases will have zero or very small magnitude. If there is no fault in the

power system, then coefficients in all phases and ground will be zero or may have very small value. By this way, we can distinguish between different types of faults.

Research Expectations

We intend to solve this research problem by doing the following:

1. Using wavelet transform with MATLAB to establish the system model to output fault.
2. Optimizing the solutions by exploring different types of wavelets and determine which one is better.
3. Comparing the wavelet-based technique with other techniques such as Fourier Transform and Neural Network Techniques.