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COMBINATION OF DISCRETE WAVELET TRANSFORM AND PROBABILISTIC NEURAL NETWORK ALGORITHM FOR DETECTING FAULT LOCATION ON TRANSMISSION SYSTEM

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Abstract. *This paper proposes a new algorithm for detecting faults in an electrical power transmission system, using discrete wavelet transform (DWT) and probabilistic neural network (PNN). Fault conditions are simulated using ATP/EMTP to obtain current signals. The algorithm used to analyze fault locations is developed on MATLAB. Fault detection is processed using the positive sequence current signals. The comparison among the maximum coefficients in first scale of each bus, which can detect fault, is performed in order to detect the faulty bus. The first peak time obtained from the faulty bus is used as an input for training pattern. Various cases based on Thailand electricity transmission systems are studied to verify the validity of the proposed technique. The result shows that the algorithm is capable of performing the fault locations with accuracy.*
Keywords: Discrete wavelet transform, Fault location, Probabilistic neural network

1. **Introduction.** Nowadays, transmission lines are more complicated as a large grid owing to increasing demand of electric power. In an interconnected-electrical transmission system, a precise protection scheme is required in order to ensure the extreme level of the system reliability. Generally, when fault occurs on transmission lines, detecting fault is very necessary in order to clear fault before it generates the damage to the power system. The traditional method of signal analysis is based on Fourier transform, but the fault signals are non-stationary transient so the signal analysis methods with Fourier transform are not quite efficient. Recently, the development of an algorithm for detecting faults in the transmission lines has been progressed, resulting in transient-based techniques [1]. For the transient-based protection to be accurately applied in operation, the application of wavelet transform is used [1-9]. The advantage of the wavelet transform is that the band of analysis can be adjusted to allow high-frequency and low-frequency components to be precisely detected. As a result, the wavelet transform is not intended to replace the Fourier transform in analyzing steady state signals. It is an alternative tool for analyzing non-stationary or non-steady state signals. This is due to that the wavelet transform is very effective in detecting transient signals generated by the faults.

The wavelet transform was initially proposed by Magnago et al. [10]. In the literature for fault location, most researches [4,10-16] have only considered the fault location for single bus and two-bus systems but not for multi-terminal. The location of the fault was normally calculated using travelling wave approach, as presented in [10]. In addition, artificial intelligence (AI) has been also reported in the literature for fault location. In [11], the paper describes an artificial neural network-based algorithm for fault location. The inputs are phasors of pre-fault and superimposed voltages and currents from all phases