International Journal of Innovative Computing, Information and Control
Volume **8**, Number **1(A)**, January **2012**

ICIC International ©2012 ISSN 1349-4198
pp. 361-374

SELECTION OF PROPER ARTIFICIAL NEURAL NETWORKS FOR FAULT CLASSIFICATION ON SINGLE CIRCUIT TRANSMISSION LINE

Sulee Bunjongjit and Atthapol Ngaopitakkul

Faculty of Engineering
King Mongkut's Institute of Technology Ladkrabang
Chalongkrung Rd., Ladkrabang, Bangkok 10520, Thailand
knatthap@kmitl.ac.th

Received September 2010; revised January 2011

Abstract. *This paper proposes a new technique using discrete wavelet transform (DWT) and artificial neural networks for fault classification on single circuit transmission line. Simulation and the training process for the artificial neural networks are performed using ATP/EMTP and MATLAB respectively. The mother wavelet daubechies4 (db4) is employed to decompose high frequency component from these current signals. Positive sequence current signals are employed in faults detection decision algorithm. The variations of first scale high frequency component detecting faults are employed as an input for the training process. Back-propagation (BP) neural network, Radial basis function (RBF) neural network and Probabilistic neural network (PNN) are compared in this paper. The results are shown that average accuracy values obtained from PNN give satisfactory results with less training time.*

Keywords: Wavelet transform, Neural networks, Transmission line, Fault classification

1. **Introduction.** Protecting transmission line is an important task to safeguard electric power system. The precision protection scheme is necessary to be detected, classified and located accurately, and cleared as soon as possible. The development in power system protection technology has been progressed, especially in recent years. The method of symmetrical components is based on fault analysis for over 60 years in various protective relay applications. During 1980s, the several techniques used to detect and classify the faults on transmission lines are discussed, such as the variation of the voltage and current of the three phases [1], the ratio of the change in the magnitude of current to threshold value [2] and a statistical method based on a discriminate value [3].

During 1990s, there were widespread applications of artificial neural networks in power systems. Artificial intelligence (AI) has been reported in the literature for fault classification [4-8]. A fault detection and classification scheme based on genetic algorithm based neural networks is presented in [5]. A new approach to real-time fault detection and classification in power transmission systems by using fuzzy-neuro techniques is presented in [6]. In [7], this paper reports studies on five different neural network models applied to classification of faults on complex transmission lines. However, there are still problems associated with hardware such as the lack of good analog memories and the limited number of interconnections. By the end of the 1990s, the traditional method of signal analysis was carried out based on Fourier transform, but the fault signals are non-stationary transient, so the signal analysis methods with Fourier transform are not quite efficient. The development in the algorithm for detecting the faults on the transmission lines has been progressed and resulted in transient based techniques [9]. The transient based protection