CLASSIFICATION OF POWER QUALITY DISTURBANCES USING WAVELET AND PROBABILISTIC NEURAL NETWORK

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ABSTRACT

Power quality is a term used to describe electric power that motivates an electrical load and the load's ability to function properly with that electric power. The effects of the lack of power quality could suffer major loss especially in the business and industries. Appropriate mitigation procedures need to be taken in order to improve the power quality.

This project presents the classification of power quality disturbances in electrical power systems. Power quality is monitored and the disturbances waveforms are recorded in order to identify causes and sources of disturbances. The techniques for recognizing and identifying power quality disturbance waveforms are primarily based on visual inspection of the waveform. The application of Wavelet Transform analysis incorporated with Probabilistic Neural Network (PNN) is used to classify the disturbances events. The Wavelet Transform is applied first to the data of power quality disturbances. Then the disturbances data are analyzed using Multi-resolution decomposition. The Wavelet Transform is used to decompose the disturbances signal into smooth and detailed version which consists of the disturbance waveforms. Magnitude from the detail data is considered to do the training samples and then applied to Probabilistic Neural Network (PNN) to recognize and classify the events. The combination methods have successfully recognized he data disturbances and produce the result with accuracy of 95.6%. Although the classification is not perfectly achieved, it is proved that both combination of Wavelet Transform and Probabilistic Neural Network can be used as assistance for classified and improvement of power quality disturbances.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Power quality has become an important issue in power systems nowadays. The power quality has become major concerns to both electric utilities and customers. The growing concern about power quality in this decade is based largely on the daily increased use of modern sensitive computing equipment and other non-linear loads [1].The lack of power quality can affect industries, business, corporations or companies which can suffer loss of billions of dollars every year due to the disruption in daily operation [2]. Power quality disturbances can degrade the performances and efficiency of customers' loads, especially power electronic loads [3]. There are several factors in increasing concern about power quality. In this decade, the load equipment is becoming more sensitive to power quality problems. Today modern load equipments are containing microprocessor-based controller and power electronics devices are very sensitive to the present of the disturbances. Besides that, customers are becoming more mature and thus have better information about power quality disturbances.

Quite frequently, the source of disturbance originates within customer's plant or building. Surveys conducted in United States indicate that over 90% of the causes of power quality disturbances recorded, originate within the customer's or a neighbour's facility, due to the use of disturbance producing equipment, improper wiring and grounding or misapplication of mitigating equipment [4]. However, customers usually turn to the local utility to identify the problems. Dedicated engineers are given tasks to deal with customers' power quality concerns and also to provide appropriate mitigation procedures.