POWER QUALITY CLASSIFICATION WITH DE-NOISING SCHEME USING WAVELET TRANSFORM AND RULE- BASED METHOD

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ABSTRACT

A major concern within t he power industry and outside is to identify and minimize the power quality disturbances to prevent unnecessary losses due to equipment malfunction or failure in the power system or in consumer side. This thesis focuses on a Rule-Based method based on wavelet transform to detect and classify various events of power quality disturbances. In this model, Wavelet Multi-Resolution Analysis (MRA) technique was used to decompose the signal into its various details. Unique features from the 1^{st}, 4^{th}, 7^{th} and 8^{th} level details are obtained as criteria for developing a Rules-Based Algorithm for classifying disturbances that have occurred. Unfortunately, the signal under investigation is often polluted by noises, rendering the extraction of features a difficult task. The performance of the classification system would be greatly degraded. To overcome this difficulty and to improve the performance of the system, a de-noising scheme is proposed to be used together with the system. In the proposed de-nosing scheme, a noise shrinkage threshold is used to minimize or eliminate the noise coefficients in the 2^{nd} compressed detail obtained after Discrete Wavelet Transform. Based on a recursive hypothesis testing, the threshold is determined adoptively according to the background noises of the signal. The model is then simulated by using MATLAB tools and tested with MATLAB generated signals and some field data obtained from Power Quality Data Interchange Format (PQDIF) user group. Simulation produces satisfactory result in identifying the disturbance and proves that it is possible to use this model for power disturbance classification even in a noisy environment. A comparative study with Probabilistic Neural Network system has proved that the proposed system is better because it needs less memory space and shorter code execution time. Thus it is a suitable model to be used in real time implementation through a Digital Signal Processor (DSP)-based embedded system for power quality disturbances detection and classification.