

A Pyramid Algorithm for the Haar Discrete Wavelet Packet Transform

Authors: Edith T. Luhanga and Matthew L. Luhanga

Abstract

One area of application of the discrete wavelet transform (DWT) has been the detection and classification of physiological signals such as electroencephalography (EEG) signals. Anomalies in EEGs yield very low frequency signals which are ideal for analysis using the DWT. Anomalies in mechanical systems yield high frequency signals. The structure of the DWT makes it an un-ideal tool for the analysis of such signals. Such signals are, however, ideal for analysis using the wavelet packet transform (WPT) in which Mallat's pyramid algorithm is applied to the multiresolution analysis (MRA) of both the approximation and detail subspaces of a signal. As a contribution to the computer-aided signal processing of non-stationary signals, this paper develops a pyramid algorithm for the discrete wavelet packet transform (DWPT) from two-scale relations for wavelet packets. The algorithm is used in the derivation of the fast Haar discrete wavelet packet transform (FHDWPT) and its inverse. It is found out that the FHDWPT is computationally as efficient as the fast Fourier transform (FFT).

Key words: Wavelet, Packets, Haar, Pyramid, Algorithm.