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IMAGE COMPRESSION USING Q-SHIFT AND SPECTRAL FACTORIZATION FILTER METHODS

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Abstract

The application areas for wavelets have been growing for the last ten years at a very rapid rate. Apart from its original intention of analyzing non-stationary signals, wavelets have been most successful in image processing and compression applications. Subband coding have long been used for compression, so using DWT has been a natural extension. Due to the compact support of the basis functions used in wavelet analysis, wavelets have good energy concentration properties. Most DWT coefficients usually are therefore very small, and they can be discarded without incorporating a significant error in the reconstruction stage. A variety of powerful and sophisticated wavelet-based schemes for image compression have been developed and implemented. Nevertheless these traditional approaches secure some severe limitations. Wavelets for example fail to capture regularities of contours, since they are not able to sparsely represent one dimensional singularity of 2-D signals. Recent developments in Complex Wavelet Transforms are classified into two important classes, Redundant CWT (RCWT), and Non-Redundant CWT (NRCWT). The important forms of RCWT include Kingsbury's Q-shift filters and Selesnick's spectral factorization Dual-Tree DWT (DT-DWT),that actually is taken for comparison in the paper. These redundant transforms consist of two conventional DWT filterbank trees working in parallel with respective filters of both the trees in approximate quadrature to obtain real and imaginary part of complex wavelet coefficients. This introduces limited redundancy and allows the transform to provide approximate shift variance and directionally selective filters while preserving the usual properties of perfect reconstruction and computational efficiency with good well balanced frequency responses. Set Partitioning In Hierarchical Trees algorithm (SPIHT) is used to compress images. Experimental results show that DT-DWT (K) coder outperforms DT-DWT(S) at all bit rates.

Keywords : Multi Resolution Analysis, Wavelet transforms, Redundant, Q-shift, SPIHT algorithm.