

# Compression and Processing of Still Images Using Wavelet Transformation

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In the last decade there has been an enormous increase in the exchange and storage of information. Together with this growth, there has also been a change in the type of information: visual information in the form of digital images has become increasingly important. This type of information especially gives rise to high transmission and storage costs. Therefore the development of reliable and fast compression techniques for several quality levels has become an important research topic. Many algorithms have been proposed in the literature and some of them have already been standardized. However, standardization is a time consuming process and development goes on. There is a need for additional standards and most of all for special purpose algorithms. The compression technique we would like to introduce uses multiple resolution of the signal, and is based on the wavelet theory. Our work focuses on the adaptive uniform scalar quantization of a 64-subband discrete wavelet transform image decomposition (DWT), followed by zero run-length and Huffman coding. The official specification is referred to as the wavelet/scalar quantization (WSQ) standard. In the essay we intend to cover the following topics:

- Explanation of the wavelet theory from the viewpoint of signal processing. In the analysis of signals it is often useful to observe a signal in successive approximations. This can be best described by the multiresolution analysis of signals. We introduce the wavelet expansion of signals and the dyadic subband tree.

- The image coding scheme as used in our experiments. 2D-DWT, quantization, bit allocation, entropy coding.

- Comparison of different compression techniques with special emphasis on WSQ and DCT algorithms (JPEG).

- Further development possibilities of the DWT in the field of video compression. Fundamental video coding schemes.

In the future, the variety of communication systems will be merged into one system that handles all types of information (multimedia). There will no longer be a clear distinction between PC, telephone and television. For this system, storage and transmission of the information will be standardized and designed to be, as much as possible, independent of the application area. For further research we would like to investigate the possibilities of applying the wavelet transform in the field of video communications. In the second part of the essay we introduce new techniques for accelerating the decoding phase of DWT based compressed still images and fast FIR filtering of digital images given in (scalar quantized) DWT domain. The proposed new filtering techniques cover spatially invariant and variant 2D FIR cases. The proposed methods offer significant reduction in the computational costs of the decoding and filtering operations. The methods can be applied in DWT based video compression schemes.