A review on wavelet based analysis of fractal image compression

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***Abstract*: Image compression is an exertion of data compression that encodes the original image by few numbers of bits as possible while preserving the quality required for the given application. Areas diverse for image compression are Satellite imagery, Digital cameras, Wireless telephony, Modems, Storage and transmission of CT scan and MRI etc. Fractal coding is one of the promising techniques for image compression where the image is divided into sub-block. Fast fractal with wavelet is used to compress the input image. The objective of combining wavelet and fractal coding is to increase the encoding speed and high compression ratio. A wavelet is a mathematical function used to split a given function or continuous-time signal into various scale components. Fast fractal encoding, normalized cross correlation with mean square error (MSE) with matching criteria is given to only low frequency components using quadtree partition. Quadtree partition is used for formation of range and domain blocks which can increase coding efficiency in terms of image quality, compression ratio and encoding time.**

***Index term*- Fractal coding, Wavelet transform, Image compression, Quadtree partition.**

Introduction

Image compression coding is for store the image into bit-stream as dense as possible and to display the decoded image in the monitor as original as possible. The objective of image compression is to diminish insignificance and redundancy of the image data in order to be able to store or to transmit data in an efficient form. In order to evaluate the performance of the image compression coding, most image compression systems are designed to minimize the MSE and maximize the PSNR. Fast fractal encoding, normalized cross correlation with mean square error (MSE) as matching criteria is given only low frequency components with quadtree partition. Other wavelet coefficients are predicted using non iterative fractal coding with variable size subtree representation. Here low frequency information is again decomposed to 1 level after fractal decoding to predict the lower resolution subband details.

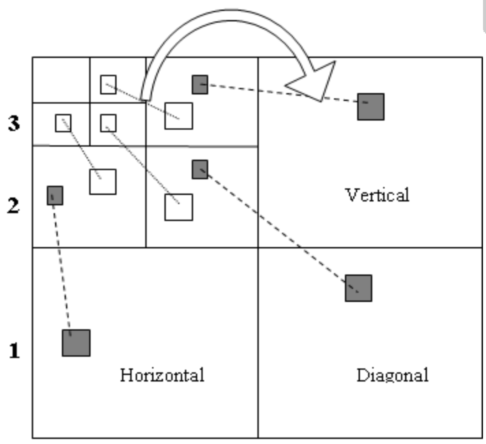


Fig1 Construction of wavelet subtree with three-level wavelet decomposition

Fractal compression: It is a lossy compression technique to digital images, form on fractals[1]. This method is appropriate for textures and natural images, relying on the fact that parts of an image often resemble other parts of the same image.

Quadtree partition: Is used for formation of range and domain blocks which can increase coding efficiency in terms of image quality, compression ratio and encoding time.[2]Wavelet transform of a function is the improved version of forier transform. It allows the components of a non stationary signal to be analyzed.

Wavelet based fast fractal image coding improves the visual quality of the decoded image at very low bit rate. The Discrete Wavelet Transform (DWT) decomposes an image into four sub images of smaller sizes namely LL, HL, LH and HH. Subband LL contains the low frequency information i.e. approximation coefficients and remaining three sub bands contains high frequency information i.e. detail coefficients. This procedure can be repeated for low frequency region to obtain a multilevel wavelet decomposition of an image. Approximation coefficients contain most of the energy of the image while detail coefficients contain less significant information. Therefore to increase coding efficiency these details are coded separately using fractal image coding. Detail coefficients can be organized into a sub tree structure with tree shape that can be efficiently coded. Significant similarity can be found between the detail sub bands at different levels with same direction and same spatial location. The wavelet transform coefficients are composed of three kinds of wavelet sub trees: horizontal, vertical and diagonal direction sub tree.

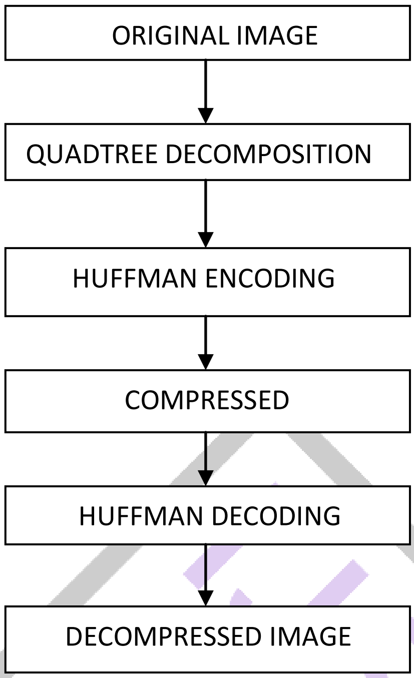
Literature Review

Frederique Cesbron, François Malassenet [1], "Wavelet and Fractal Transforms for Image Compression", Sixth Conference GRETSI, France, 1997,In an particular image high frequency components are poorly coded. This may be visually annoying, blurred images, artifacts at edges, loss of precision and detail coding. The basic functions used in the wavelet transform are all affine transformation of an original function. The densely carry wavelets are interpret by a scaling function that is the solution of a fractal. Three multi resolution fractal coders were studied here and by the parameters i.e. Haar, Daubechies. When the multiresolution fractal coder corresponding of the first parameter set is tested on the original **128 x 128**"Lenna" image. The gain in PSNR is 4db. High frequency is coded with the multiresolution fractal coders than the conventional 1dB. **G. M. Davis [2],** "A wavelet based analysis of fractal image compression", IEEE Transaction on Image Processing, vol. 7, no. 2, pp. 141–154, Feb.1998.It introduced a new wavelet-based framework for analyzing block based fractal compression schemes**, in** this framework the well-established transform coder paradigm in order to address the fractal block Coders. This new algorithm indicate that fractal coders derive much of their effectiveness from their ability to efficiently represent wavelet zerotrees.Self-quantization is effective for quantizing isolated straight edges and zerotrees because these features are self-similar. A significant fraction of subtrees in natural images are well-approximated by zerotrees, suggesting that fractal coders' ability to encode zerotrees cheaply is a major source of their effectiveness.**M.Antonini, M.Barlaud, P.Mathieu, I.Daubechies.[3].** "Image coding using wavelet transform", IEEE Transaction on Image Processing, vol. 1, no.26, pp. 205-220, June 1992.It uses a wavelet transform to acquire a set of biorthogonal subordinate class of the images, the original image is disintegrate at various scales using pyramidal algorithm architecture. The decomposition is along the vertical and horizontal directions and sustains the fixed number of pixels required to describe the image. The receiver to recognize a picture as quickly as possible at minimum cost, it present a progressive transmission scheme that the wavelet transforms is particularly well adapted to progressive transmission. This method enables high compression bit rates while maintaining good visual quality through the use of bit allocation in the sub images and also adapted to progressive transmission at very low bit rate.

Methodology

We propose a method for image compression using fast fractal image compression and wavelet. The very important factor which is always been a demand in telecommunication, Digital transmission. We are using a wavelet based image compression. The method is used for better the visual quality of the decoded image. The proposed algorithm to code the wavelet coefficients. A wavelet disintegrate image basically has non-uniform distribution of energy within and across subbands. This motivates us to partition each subband into various regions depending on their importance and then allot these regions with various quantization levels. The proposed coding algorithm is on the set partitioning in hierarchical trees (SPIHT), which is an efficient bit-plane encoding method that creates M embedded bit sequence through M stages of number of quantization.

FLOW CHART



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[4] Al-Fahoum A, Harb B, “A Combined Fractal and Wavelet Angiography Image Compression Approach”, the Open Medical Imaging Journal, vol: 7, pp. 9-18, 2013.
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