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An Inventive Approach for Image Scaling using Data Compression with Wavelet Transform Techniques

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Abstract— It presents the comparison of the performance of discrete wavelets and Single-level inverse discrete 1-D wavelet transform for implementation in a still image compression system. Image compression is a method through which we can calculate the storage space of images which will helpful to calculate THR SORH, L2 norm. The performances of these transforms are compared in terms of Mean squared error (MSE) and CR, BPP PSNR etc. The main objective is covert indexed image to gray scale image. These results provide to perform single-level and multilevel image decompositions and reconstructions

Keywords—Image Compression, Discrete Wavelet Transform, inverse Discrete Wavelet Transform

I. INTRODUCTION

The Discrete Wavelet Transform (DWT) of image signals produces a non-redundant image representation, which provides better spatial and compared with other multi scale representations such as Gaussian and Laplacian pyramid. Recently, Discrete Wavelet Transform has attracted more and more interest in image de-noising. The DWT can be interpreted as signal decomposition in a set of independent, spatially oriented frequency channels. The components can be assembled back into the original signal without loss of information. The mathematical manipulation, which implies analysis and synthesis, is called discrete wavelet transform and inverse discrete wavelet transform. An image can be decomposed into a sequence of different spatial resolution images using DWT.

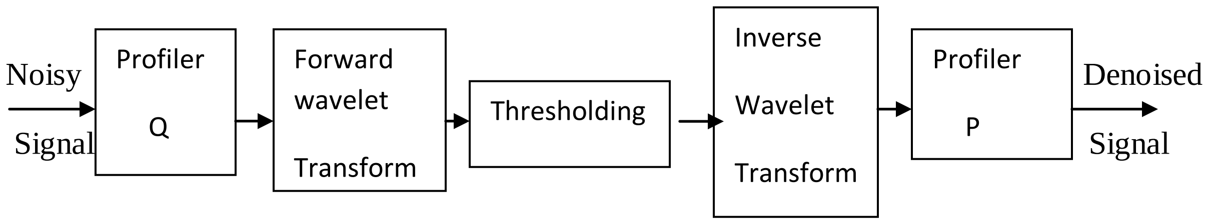

Figure1: Diagram of wavelet based image De-noising

The Discrete Wavelet Transform (DWT), based on time-scale representation, provides efficient multi-resolution sub- band decomposition of signals. It has become a powerful tool for signal processing and finds numerous applications in various fields such as audio compression, pattern recognition, texture discrimination, computer graphics etc. Specifically the 2-D DWT and its counterpart 2- D Inverse DWT (IDWT) play a significant role in many image/video coding applications.[3]

The wavelet transform describes a multi-resolution decomposition process in terms of expansion of an image onto a set of wavelet basis functions. Discrete Wavelet Transformation has its own excellent space frequency localization property.[4]

II. LITERATURE REVIEW

Image compression is a method through which we can reduce the storage space of images which will helpful to increase storage and transmission process's performance. In this paper, we present the comparison of the performance of discrete wavelets like Haar Wavelet for implementation in a still image compression system. The performances of these transforms are compared in terms of Mean squared error (MSE) and Energy Retained (ER) etc. The main objective is to investigate the still image compression of a gray scale image using wavelet theory. This is implemented in software using MATLAB Wavelet Toolbox and 2D-DWT technique.[1]

The image de-noising naturally corrupted by noise is a classical problem in the field of signal or image processing. De-noising of natural images corrupted by Gaussian noise using wavelet techniques is very effective because of its ability to capture the energy of a signal in few energy transform values. The wavelet de-noising scheme thresholds the wavelet coefficients arising from the standard discrete wavelet transform. In this paper, it is proposed to investigate the suitability of different wavelet bases and the size of different neighborhood on the performance of image de-noising algorithms in terms of PSNR. [2]

In contrast, the algorithms in transform domain, such as DCT, DWT have certain robustness against some multimedia processing. In this work the authors propose a novel steganographic method for hiding information in the transform domain of the gray scale image. The proposed approach works by converting the gray level image in transform domain using discrete integer wavelet technique through lifting scheme. This approach performs 2-D lifting wavelet decomposition through Haar lifted wavelet of the cover image and computes the approximation coefficients matrix CA and detail coefficients matrices CH, CV, and CD. [5]

III. DISCRETE WAVELET TRANSFORM

DWT is a transformation technique is used to represent an image in a new time and frequency scale by decomposing the input image into low frequency, middle and high frequency bands. The value of low frequency band is the averaging value of the filter whereas the high frequency coefficients are wavelet coefficients or detail values. The DWT can be used to decompose image as a multistage transform. In the first stage, an image is decomposed into four sub bands LL1, HL1, LH1, and HH1, where HL1, LH1, and HH1 represent the finest scale wavelet coefficients, while LL1 stands for the coarse level coefficients, i.e., the approximation image. Fig.1 shows the one level wavelet decomposition of an [6]

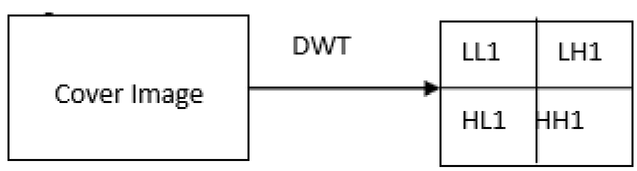

Fig. 2 one level of Wavelet Decomposition

IV. INVERSE DISCRETE WAVELET TRANSFORM

The DWT represents the signal in dynamic sub-band decomposition. Generation of the DWT in a wavelet packet allows sub-band analysis without the constraint of dynamic decomposition. The specific decomposition will be selected according to an optimization criterion. The Discrete Wavelet Transform (DWT), based on time-scale representation, provides efficient multi-resolution sub- band decomposition of signals. It has become a powerful tool for signal processing and finds numerous applications in various fields such as audio compression, pattern recognition, texture discrimination, computer graphics etc. Specifically the 2-D DWT and its counterpart 2- D Inverse DWT (IDWT) play a significant role in many image/video coding applications. [3]

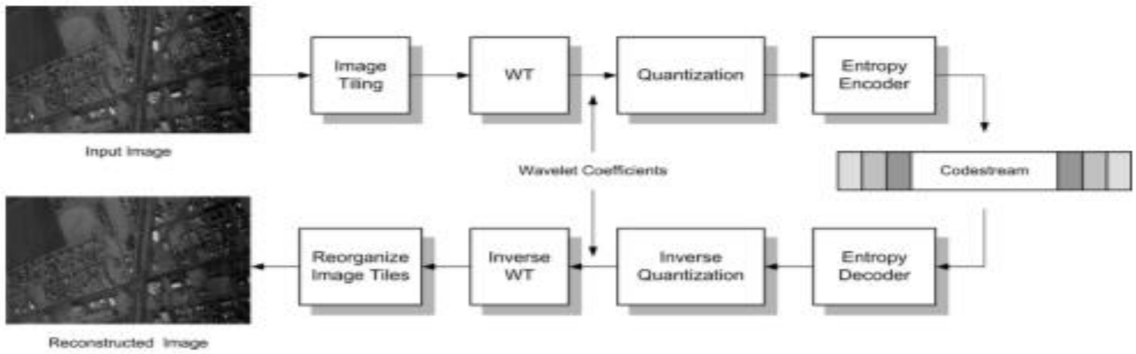

Figure 3 IDWT Decomposition

The DWT architecture, the input image is decomposed into high pass and low pass components using HPF and LPF filters giving rise to the first level of hierarchy. The process is continued until multiple hierarchies are obtained. A1 and D1 are the approximation and detail filters.

V. COMPERISION OF IMAGE COMPRESSION

In the DWT transformation, the image is taking into HL, LH, HH, LL Ratios. Then the image is moved into DWT transforms, and then DWT Quantization is processed. After that the process is move to DPCM encoder. Then the compressed image will come IDWT. The IDWT transformation of the image is taken in to the pixel ratio us nxn matrix formation. Then the image is transforms into the IDWT quantization. Then the compressed image will come us output. The output image has the good compression ratio. The PSNR value of the compressed image is good us expected.

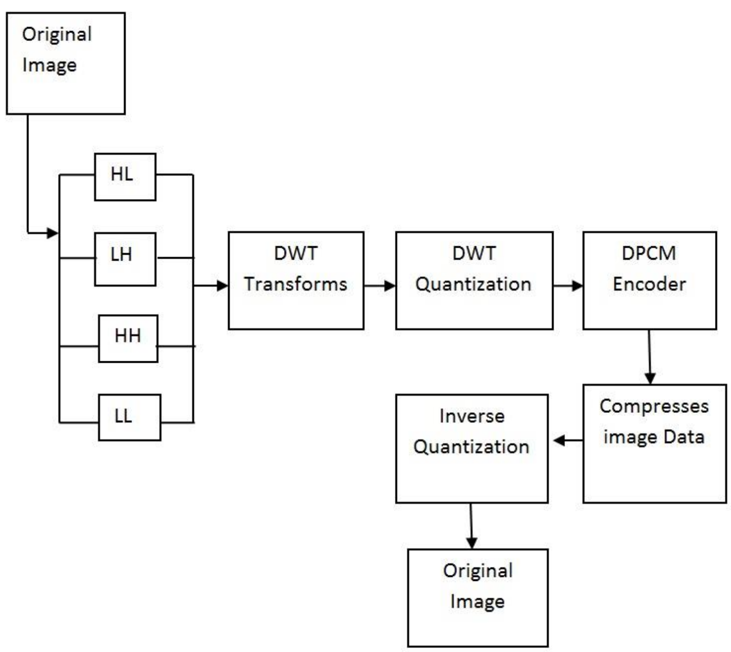

Figure.1.1.Architecture of DCT and DWT Comparison

Performance	**DWT**	**IDWT**
Multi Resolution	**YES**	**NO**
Filter Banks	**NO**	**YES**
Fast Computation	**YES**	**NO**
Low Memory and Power	**YES**	**NO**

Table 1.1 Performances of DCT and DWT Comparison

VI. CONCLUSION

In this study, the image de-noising using discrete wavelet transform is analyzed. The experiments were conducted to study the suitability of different wavelet bases and also different image sizes. Among all discrete wavelet bases performs well in image de-noising. The design is simulated using MATLAB software.

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