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Enhanced Technique for Watermarking Using MFHWT

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Abstract: ***A common watermarking techniques are used for copy right protection. In this watermarking scheme should achieve the features of reliability and security of the image. This paper represents the watermarking algorithm in the DWT domain and WPT using an Modified Haar Wavelet Transform (MFHWT) evolutionary algorithm to improved the quality of the image. The proposed algorithm is to decompose the original image using DWT and WPT according to the size of watermark . The Modified Haar Wavelet Transform (MFHWT) is a simple and efficient algorithm.***

Keywords - Digital watermark, Wavelet Transform, Discrete wavelet Transform (DWT), Wavelet Packet Transform (WPT) , MFHWT (Modified Haar Wavelet Transform).

I. INTRODUCION

The use of digital media for images and video sequences has some serious implications for copyright issues. In the old days, it was really difficult to pirate the images without negatives. In the old days, it was really difficult to pirate the images without negatives. Today, scanners being inexpensive and easily accessible, it is possible to influence the images. Internet is practically available everywhere. It has lack of control over reuse of data or images. In watermarking the information is embed into the image that enables the copyright owner to be identified; beside with any another information. Watermarking can be visible or invisible.

The requirement of a watermarking scheme is:

-The image must not be visibly degraded by the presence of the mask, while at the same time a unique identifier with high information content is produced.

- The spot must be readily recoverable by some form of comparison with the original image.
- The spot must be strongly defiant to detection and decoding without access to the original.

Watermarking system that has been studied widely in recent years (for still and moving pictures) is one of the promised methods. Digital image watermarking is the replacement between image deprivation verses ease in removal of the inserted watermark via compression, filtering or cropping. This technique can also provide a substitute solution for image authentication. Digital watermarking provides a complete solution that embeds private information into digital signals exist and grow up. The progress of better scheme for copyright protection need to be continues. Watermarking system that has been studied widely in recent years (for still and moving pictures) is one of the efficient methods. The one of the main features of watermarking are quality of the image. There are a number of techniques have been developed for watermarking. Some of them the watermarks are applied on the spatial domain. The main disadvantage of spatial domain watermarking is that a frequent picture cropping operation may remove the watermark. Other than spatial domain watermarking, frequency domain approach have also been used. The spatial-domain techniques directly modify the intensity values of some selected pixels while the frequency-domain techniques modify the values of some transformed coefficients. The watermarking scheme which is based on the frequency domains can be classified into the Discrete Fourier Transform (DFT), Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) domain methods. This paper represents the proposed algorithm MFHWT which shows the better quality in comparative to the Haar wavelet transform.

II WAVELET TRANSFORM

Wavelet functions are used**,** when the signal in time for its frequency content is analyzed. Wavelet decomposition can be expertly performed by a pyramidal algorithm. Wavelet is obtained through scale stretching and disarticulation to the basic wavelet. In addition, wavelet decomposition is based on layer, and in each layer the scale parameters wavelet decomposition is changing, so the wavelet decomposition is conceded out on different scales, known as multi-resolution analysis. Wavelets are contained in both time (space) and frequency (scale) domains. Hence it is easy to confine local features in a signal. The multi-resolution wavelet decomposition phenomenon of an image is shown in figure 1.

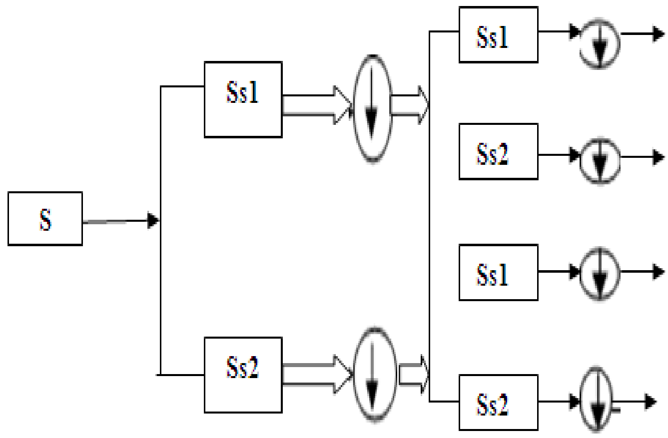

Fig. 1 Multi-resolution wavelet decomposition of an image

In the wavelet transform domain the general features and the details of a signal can be analyzed. After wavelet transform the two-dimensional image is decomposed into four sub-images and each of them is a district size of the original image. The sub-images are a low-frequency sub-band which can be decomposed frequently and the others are high-frequency sub-bands in the horizontal direction, vertical direction and diagonal direction correspondingly. After wavelet transform the image is in the forms of a tree structure arranging from low to high frequency bands. Every wavelet coefficient in the low-frequency sub-band is a root of the tree, which has three children locating at three mediocre low-frequency sub-bands respectively. The other sub-bands all have four children locating at the higher sub-bands.

A. Discrete Wavelet Transform (DWT):

The transform of a signal is just an additional form of representing the signal. The Wavelet Transform provides a time-frequency representation of the signal. The Discrete Wavelet Transform (DWT), which is based on sub-band coding, is originating to yield a fast computation of Wavelet Transform. DWT is easy to implement and reduces the computation time and resources required. In DWT, the pixels when distorted are arranged from the most significant pixel to the least significant pixel. DWT helps separate the image into parts (or spectral sub-bands) of differing importance. The DWT is compute by successive low pass and high pass filtering of the discrete time-domain signal. This is called the Mallat algorithm or Mallat-tree decomposition. In the figure 1, the signal is denoted by the sequence **S**. The low pass filter is denoted by Ss1 while the high pass filter is denoted by Ss2 . At each level, the 'high pass filter produces facet information, while the low pass filter associated with scaling function produces coarse approximations.

B. Wavelet Packet Decomposition (WPT):

WPT was first introduced by Coifman *et al.* for dealing with the nonstationarities of the data better than DWT does. Wavelet packet transform (WPT) is a generality of the dyadic wavelet transform (DWT) that offers a prosperous set of decomposition structures. WPT is related with a best basis selection algorithm. The best basis selection algorithm decides a structure of decomposition among the documents of possible bases, by measuring a data dependent cost function. After thresholding the number of nonzero coefficients used as the cost function.

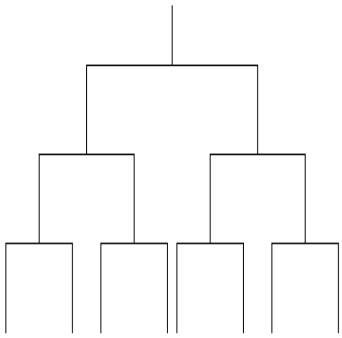

Fig 2. A Wavelet packet decomposition tree.

In this Fig 2. Shows full tree decomposition and this will be a subset of that full tree, chosen by the best basis selection algorithm. The main difference between the wavelet packets transform and the wavelet transform is that, in the wavelet transform dyadic wavelet decomposition is achieved by iterative two-channel perfect reconstruction filter bank operations over the low frequency band at each level and in the wavelet packets, the basic two-channel filter bank can be iterated either over the low-pass branch or the high-pass branch as shown in Fig.2.

1.) Established a parent child link for WPT coefficients:

Wavelet packet decomposition is shown in the fig 3. It is straightforward to represent a parent children link across bands.

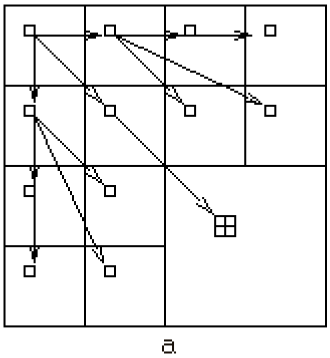

Fig 3. Examples of decomposition structures

The parent children link can be established in the same way as in the dyadic wavelet decomposition case

III THE PROPOSED ALGORITHM:

Modified Fast Haar Transform (MFHT) can be done by just pleasing (w +x + y + z) □4 instead of (x + y)/2 for approximation and (w +x .y -z) /4 instead of (x- y)/2 for differencing process. 4 nodes are considered at a time. The calculation for (w+ x .y -z)/4 will yield the aspect coefficients in the level of n-2. To obtain specify coefficients, differencing process (x.y)/2 still require to be done. The decomposition can be through by using matrix formulation. In the proposed work, MFHWT algorithm is used which can reduce the memory requirement and the amount of inefficient movement of Haar coefficients. MFHWT can be done by following steps.

Step1: Read the image as a matrix.
Step2: Apply MFHWT, on the entire matrix of the image along row and column wise.
Step 3: Wavelet decomposition MFHWT of the input matrices computes the approximation coefficient matrix and details coefficient matrices obtained.
Step 4: In MFHWT, first average sub signal, (a' =a1, a2… an/2), at one level for a signal of length N i.e. f = (f1, f2, f3, f4… fn) is

$$a_m = \frac{f_{4m-3} + f_{4m-2} + f_{4m-1} + f_{4m}}{4},$$

m= 1,2,3,4,……..N/4,

And first detail sub signal, (d'= d1, d2, d3….dn) at the same level is given

$$d_m = \{ \frac{f_{4m-3} + f_{4m-2} + f_{4m-1} + f_{4m}}{4},$$

m=1,2,3,4,……..N/4,

Step 5: After this MFHWT we get a transformed image matrix of one level of input image.
Step 6: For reconstruction process, applying the inverse.
Step 7: Calculate MSE and PSNR for reconstructed image.

IV IMAGE QUALITY MEASUREMENT

The principle of measures the image quality metrics, some arithmetic index is calculated to identify the reconstructed image quality. The image quality metrics present some measure of closeness between two original and watermarked digital images by exploiting the differences in the arithmetical distribution of pixel values. The most commonly metrics which are used for comparing the quality are Mean Square Error (MSE) and Peak Signal to Noise Ratio (PSNR). Between two images, PSNR block computes the peak signal-to-noise ratio, in decibels. This ratio is frequently used as a quality measurement between the original and a watermarked image. If the Higher is PSNR, then better the quality of the watermarked image or reconstructed image. The MSE represents the cumulative squared error between the watermarked and the original image, whereas PSNR represents a measure of the peak error. The lower the value of MSE, then lower the error. To compute the PSNR, the block first calculates the mean-squared error using the following equation:

$$MSE = \frac{\sum_{MN}[I1(m,n) - I2(m,n)]^2}{M * N}$$

In the previous equation, M and N are the number of rows and columns in the input images, respectively. Then the block computes the PSNR using the following equation:

$$PSNR = 10log10\left(\frac{R^2}{MSE}\right)$$

In the previous equation, R is the maximum fluctuation in the input image data type. For example, if the input image has a double-precision floating-point data type, then R is 1. If it has an 8-bit unsigned integer data type, R is 255, etc

V CONCLUSION:

This paper has presented an image watermarking technique for copyright protection. In these watermarking techniques the embedded process is performed using DWT and WPT. The improved wavelet transformation has upgraded the quality of an image. The proposed approach has many advantages. In Modified Haar Wavelet Transform (MFHWT) algorithm is one algorithm which can reduce the memory requirement and calculation work. The fast transformation is the main benefit of MFHWT. It improves the quality in comparative to haar which is measuring by PSNR and MSE.

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