An Extensive Method to detect the information from Digital Images

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***Abstract*— There are many types of digital security algorithms, but each type corresponds with a certain detecting method to detect the secure information, However, the embedding method is usually unknown, so that it is not possible to know whether the hidden information exists or not. In this paper we discuss the DCT and DWT based technique, which is introduced an image independent, non blind watermarking technique and achieves robustness, high fidelity and better pay load capacity of very smooth images too. Obviously, the extensive method can be realized and the method is valuable in theory and practice.**

Keywords— Discrete Cosine Transform, Discrete Wavelet Transform, Digital Watermarking, multimedia, invisibility

I. INTRODUCTION

Uses of digital multimedia are increasing from last two- three decades which has given the advantages of efficient storage, easier manipulation and faster transmission. But such media has made the task of pirates and hackers easier for copying the media without any change.

To overcome such problem new technique named digital watermarking is used. Here to prevent the originality of multimedia file watermark is inserted to the original file without any degradation. The file which contents the watermark with original data is called the watermarked multimedia file. The multimedia file which is used here is digital image [6].

The classification of watermarking techniques is done under various categories like, Robust vs. Fragile, Blind (public) vs. Non – blind (private), Visible vs. Invisible and Image Independent vs. Image Dependent[1,11].

The robust watermarking allows extracting the watermark from the watermarked file after significant amount of degradation to it. But in the fragile watermarking, if the watermark file is changed a little then also the watermark cannot be retrieved

Blind watermarking technique doesn't need the original file for extraction but non – blind technique needs. When the watermark is visible within the original file then it is called visible watermarking and if the watermark cannot be seen within the watermarked file after embedding then it is called invisible watermarking [2]. If the embedding process of watermarking depends only on the watermark then it is called image independent and if the process depends on watermark and on the original file both then it is called image dependent one.

For digital images digital watermarking can be performed in two domains: Spatial and frequency. One of the simplest methods of spatial domain is to change the Least Significant Bit of the original image by the watermark bits to get the watermarked image. Such change is not at all noticeable by the human eyes. But the disadvantage is if the LSB of the image is intentionally changed with either all 0's or all 1's then the whole information of watermark is lost and can never be retrieved. So the other spatial domain watermarking method is change the intensity level of the original image depending on the watermark data [3]. But again this method is not robust at all.

To achieve robustness to certain extent frequency domain methods are used. One of the methods of this domain is DCT (Discrete Cosine Transform) - here the whole image is divided in two 8x8 blocks and then the DCT is applied to it[5]. In the mid – bands of the block the watermark bits are inserted and then again Inverse DCT is applied to get the watermarked image. This method is more robust, having good information hiding capacity and creates less visual effects. The other technique of frequency domain is DWT (Discrete Wavelet Transform)**,** here the whole image is divided into four bands (LL - approximate, LH – Horizontal, HL – Vertical and HH - Diagonal). The watermark information is embedded to horizontal and vertical wavelet bands of the image as the edges and textures changes creates very less visual effects[12].

The method proposed here takes advantages of both DWT and DCT. Here the original image is divided into different wavelet coefficient bands at the specific level using DWT and then DCT is applied to its horizontal and vertical bands. Once achieving the cosine coefficients, watermark bits are embedded to the mid – bands of the DCT blocks. After embedding the bits Inverse DCT and then Inverse DWT is applied to the image to get the watermarked image.

The algorithm is described in section 2, experimental results are shown in section 3 and conclusion is shown in section 4.

II. PROPOSED METHOD

A. Image Embedding Process

To embed the watermark to the cover image, first of all apply the DWT to the original image to the necessary level [5, 12]. Once getting the wavelet coefficient bands apply DCT to the 8x8 blocks of the horizontal and

vertical sub bands of DWT. When DCT coefficients are achieved, use the mid bands of 8x8 blocks to embed the watermark information as shown in the fig. 1 using the following equation:

$$I' = I + \alpha \qquad \text{Eq.1}$$

Where, I' is modified DCT coefficients, I is original DCT coefficients and α is embedding factor which is positive if the watermark bit is 1, and is negative if the watermark bit is 0.

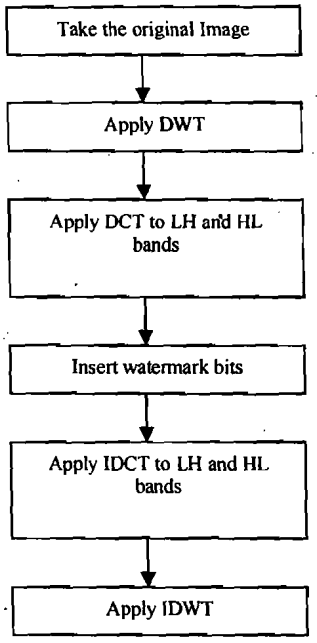


Figure 1: Image Embedding Process

Here the watermark bits which are inserted to the DCT mid-bands as shown in fig. 2: i^{th} bit uses first band, i+1 bit uses second band, i+2 uses third one and i+3 fourth one of one 8x8 block, similarly successive blocks of same size accommodates 4 - bits of watermark.

Once the data are inserted, apply Inverse DCT to the according bands and then Inverse DWT to the whole image to get the watermarked image.

B. Image Extraction Process

To extract the watermark as shown in fig. 3, get both the original and watermarked image. Apply DWT to both the images at the same level as embedding process. After that apply DCT to both images' horizontal and vertical bands. Now compare the DCT coefficients of both the images. Depending on the alpha value, if the watermark bit is 0, the original image has higher DCT coefficient value and if the watermark bit is 1 then the watermarked image has the higher DCT coefficient values. Check for all the mid – bands of the whole image and extract the watermark bits. Save the extracted watermark bits to a file and then display it.

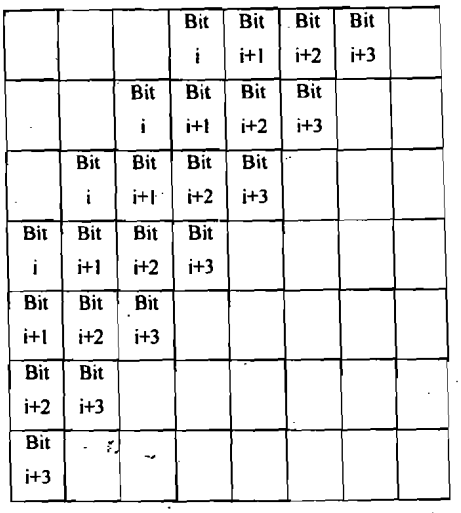


Figure 2: Image bit position in DCT Block

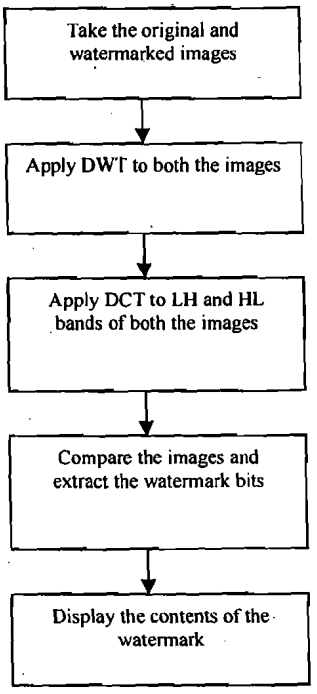


Figure 3: Image Extraction Process

III. IMPLEMENTATION

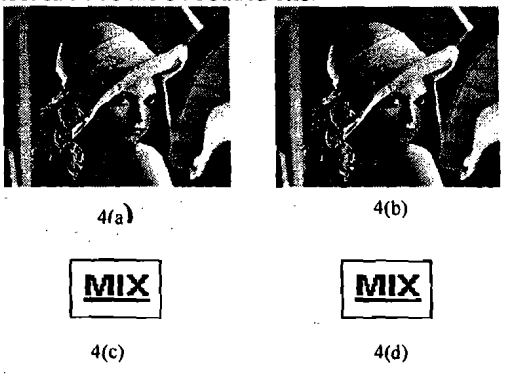
We use the computer: Intel Dual Core Processor, 512 RAM with windows XP operating system. Experimental environment MATLAB 7.0. We take Gray scale image cameraman and RGB image peppers as experimental object and use the objective evaluation standards PSNR to take this paper evaluation criterion.

IV. PERFORMANCE ANALYSIS

In this section, some of the results are presented to

demonstrate the invisibility and better payload capacity of the proposed watermarked image. The images which are taken here are of 256x256 bits greyscale images. The Lena test image is shown in fig 4(a) and the watermark to be embedded is shown in fig 4(c). The size of watermark taken is 50x40 binary images. Single level wavelet transform of original image is taken using Daube hies' tap – 6 filter [10].

Watermarked Lena images obtained using the proposed watermarking method is shown in fig 4(b). Here the choice of $\alpha = 1$ if watermark bit is 1 and $\alpha = -1$ if the watermark bit is 0. It can be seen that there is almost invisible difference between the watermarked and the original image, thus it proves the requirement of watermark invisibility and hence gives high fidelity [4]. The reconstructed watermark is shown in fig 4(d), which is almost same as the embedded one.



4(a) 4(b)

4(c) 4(d)

Figure 4: (a) The test Lena Image (b) Watermarked Images (c) Original Watermark (d) Extracted Watermark

Numbers of other images are tested for the same algorithm and the results in terms of PSNR values are shown in the table 1.

V. CONCLUSION

In this paper, DWT – DCT based watermarking method was proposed. Binary image was used as digital watermark.

Wavelet transform was used to obtain multiresolution decomposition of the host image. Experimental results show that proposed watermarking method results in almost invisible difference between watermarked image and original image. Moreover this, the method gives better payload capacity than other methods.

TABLE I
PSNR VALUESOF DIFFERENT IMAGES

Sr. No.	Types of Images	PSNR
1	Airplane	+49.04 dB
2	Baboon	+44.55 dB
3	Bird	+49.53 dB
4	Boat	+46.63 dB
5	Bridge	+44.86 dB
6	Camera man	+46.80 dB
7	Circles	+44.66 dB
8	Couple	+47.89 dB
9	Crowd	+47.75 dB
10	Goldhill	+48.16 dB
11	Lena	+48.60 dB
12	Peppers	+47.57 dB

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