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A Watermarking Method for Digital Image Self-Recovery

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ABSTRACT: Now a day's technologies as growing as piracy of data, copied of data and editing in existing data also increasing rapidly. Digital water marking is one of the methods for the protection of digital content, digital marking is a method by which data can be secured by hiding data in any image and at the end we identifying the authentication of data by extracting water image from image one. For this many of technology in image processing has already been introduced and in this paper we are worked with 2-D DCT method for encryption and decryption of water marking information which is based on size of the image, the watermark's embedding and extraction had been performed on image for verifying this watermarking algorithm in MATLAB.

Keywords: 2-D DCT, embedding, extracting image, Peak signal to noise ratio, watermarking.

1. INTRODUCTION

Digital image processing and watermarking is wide area of research now a days and many of technologies and algorithm were applied on different objects (host images) to betterment and introducing newly things in this area. Here we worked on watermarking technology which algorithm never introduced before that is 2-D DCT, watermarking using DCT, IDCT and DWT had already been observed but in this work we used DCT in different ways which perform along a signal dimension.

Figure 1 shows basic concept of watermarking process where signal s take as an image and embedded with a watermark image by encryption algorithm and at the end decrypt the water image by same algorithm used.

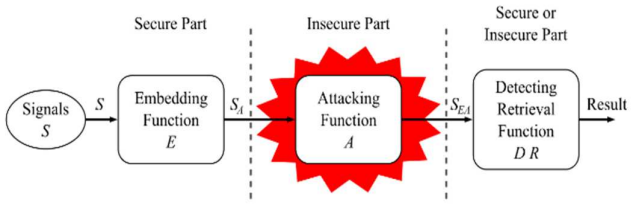

Figure 1: Digital image watermarking process [4].

As we all know that digital watermarking introduced by developers as the solution to the need to provide value added protection on top of data encryption and scrambling for content protection. In general a digital watermark is a technique which allows an individual to add hidden copyright information or other verification message to digital media. Watermarking is the process that embeds data called a watermark or digital signature or tag or label into a multimedia object such that watermark can be detected or extracted later to make an assertion about the object. Digital watermark is a sequence of information containing the owner's copyright data. It is inserted visibly or invisibly into another image so that it can be extracted later as an evidence of authentic owner. Usage of digital image watermarking technique has grown significantly to protect the copyright to ownership of digital multimedia data as it is very much prone to unlawful and unauthorized replication, reproduction and manipulation. The watermark may be a logo, label or a random sequence. A typical good watermarking scheme should aim at keeping the embedded watermark very robust under malicious attack in real and spectral domain [1, 2, 3].

2. DESIGN AND IMPLEMENTATION

To check robustness of watermarking process and self-recovery image after algorithm applied we design a GUI tool in MATLAB as shown in figure 2 and operation handled through it described in figure 3, 4, 5 and figure 6[9, 10, 11].

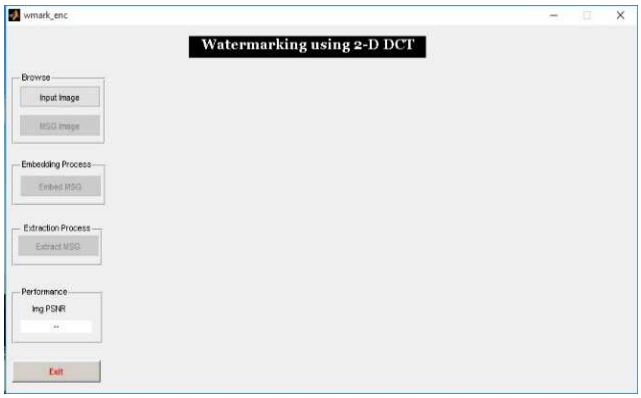

Figure 2: GUI structure of 2-D DCT algorithm performing watermarking through it.

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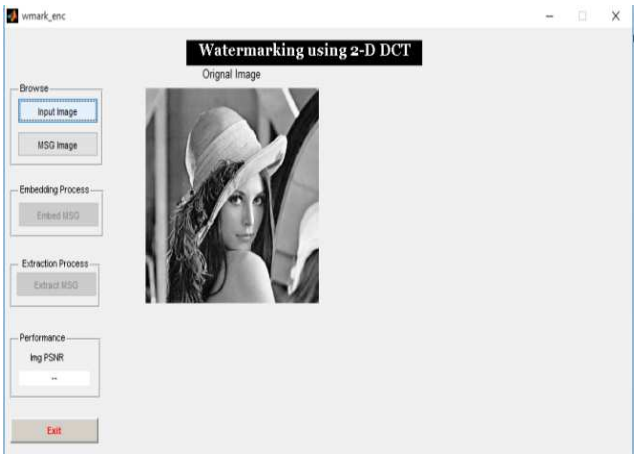

Figure 3: Import host image of leena (original) using GUI

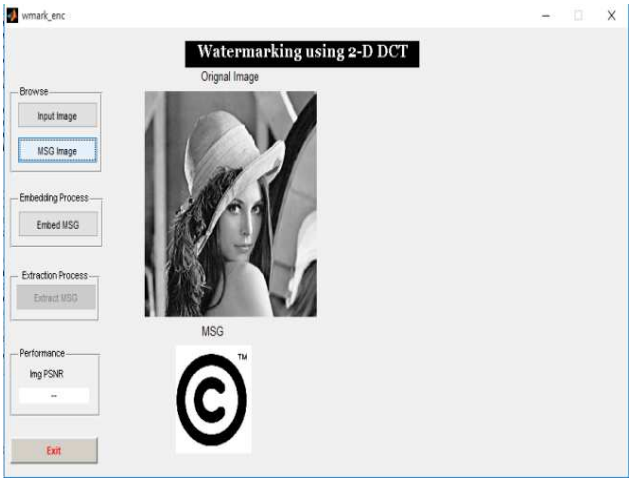

Figure 4: Import watermark image using GUI

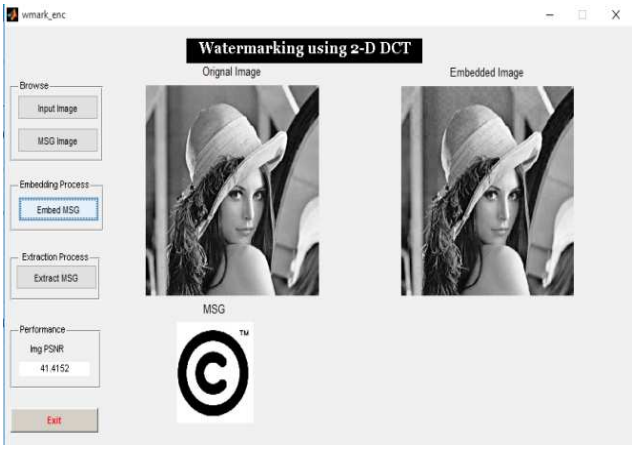

Figure 5: Embedded watermark image on original image using GUI

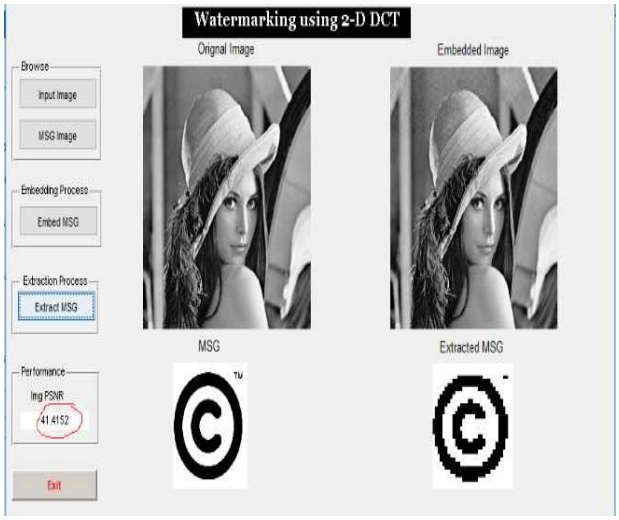

Figure 6: Extracting watermark image with PSNR value.

3. METHODS

Watermarking algorithms for digital images are developed to not only detect piracy or to check the image tampering, but also to recover the lost content to some extent. In this paper, a new watermarking scheme is introduced to extract good quality watermarking digital image signals with self-recovery feature. For this purpose 2-D DCT method, applied on different host images (all are original and different in size quality and looks) which different in their dimension and calculate the peak to signal noise ratio of each images for judged recover watermarking image quality from different host images.

The discrete cosines transform (DCT) and discrete Fourier transform (DFT) are closely related to each other. DCT is a separable linear transformation; that is, the two-dimensional transform is equivalent to a one-dimensional DCT performed along a single dimension followed by a one-dimensional DCT in the other dimension [5, 6]. The definition of the two-dimensional DCT for an input image A and output image B is

$$B_{pq} = \alpha_p \alpha_q \sum_{m=0}^{M-1} \sum_{n=0}^{N-1} A_{mn} \cos \frac{\pi(2m+1)p}{2M} \cos \frac{\pi(2n+1)q}{2N}, \quad \begin{matrix} 0 \le p \le M-1 \\ 0 \le q \le N-1 \end{matrix}$$

Where

$$\alpha_p = \begin{cases} \frac{1}{\sqrt{M}}, & p = 0 \\ \sqrt{\frac{2}{M}}, & 1 \le p \le M-1 \end{cases}$$

And

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$$\alpha_q = \begin{cases} \frac{1}{\sqrt{N}}, & q = 0 \\ \sqrt{\frac{2}{N}}, & 1 \le q \le N-1 \end{cases}$$

M and *N* are the row and column size of A, respectively. If you apply the DCT to real data, the result is also real. The DCT tends to concentrate information, making it useful for image compression applications.

Peak signal-to-noise ratio

It the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Many of the signals have wide range and PSNR mathematically expressed in db and for calculating this dimensions of the correct image matrix and the dimensions of the degraded image matrix must be identical[7, 8].

PSNR = 20*log (max (max (f)))/ ((MSE) ^0.5)

Where the MSE (Mean Squared Error) is

MSE = (1/ (m*n))*sum (sum ((f-g). ^2))

4. RESULTS

A number of experiments are performed on the watermarked image to test the resilience of the proposed scheme towards common image processing attacks. Figure 7 shows watermark input image which is common for all testing images.

Figure 7: Watermark input image

Embedded Images after watermark image is applied

Figure 8: Embedded watermark image over host image (original one) (a) leena (b) cameraman girl

Figure 9– Extracted watermark image from (a) and (b) respectively.

Table 1: PSNR values and remarks

Host Input Images	PSNR	Remarks
Leena	41.0413	Best recovery
Cameraman girl	40.0146	Good recovery

The watermarking algorithm proposed in this paper aims to improve the PSNR values of the watermarked image with respect to the original or the host image. This paper aims at producing a higher value of PSNR 41.416 for image leena and 40.046 for cameramen girl host images, as we can see result of both images in table 1.

5. CONCLUSION

In this paper we were found extracting watermark images results from various host images which different in their size applied by common watermark image and collective result after extraction watermark process and PSNR value of particular extraction shows that 2-D DCT method is most appropriate method to retrieve good quality watermark image.

Experimental results demonstrate that the watermark is robust to most of the signal processing techniques and geometric distortions. Result suggest that the proposed scheme can be used to extract a good quality watermark for various image processing attacks like JPEG compression, average filtering, median filtering and cropping.

Future Scope: In this research there is more scope to future work on color visibility after 2-D DCT algorithm applied now it takes B/W background default.

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