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DIGITAL WATERMARKING USING DISCRETE WAVELET TRANSFORM TO ALLEVIATE SIGNAL TO NOISE RATIO

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Abstract: *A watermark is inserted in a cover image in Digital Image watermarking (DIWM), so that the resulting watermarked signal is resistant to any interference induced by either normal data processing in a friendly environment or malicious attacks in an unfriendly environment. Now watermarks are inserted in digital files such that rightful owners can claim control of their records to maintain authenticity. Nevertheless, these images (like fingerprints) are broadcast with greater volume over networks and the possibility for attacks during transmission is a significant concern. Recipients need a system that can validate their image validity. When the files are watermarked so authenticating the files is easy for the user. Nonetheless, deciding that the right image was originally received and transmitted without modification involves the use of data that the user would like not to send (i.e. the watermark itself or the original file).*

Index Terms - *DWT, AWM. RWM, two-dimensional separable dyadic DWT, low pass band (LL)*

I INTRODUCTION

DWT Domain Watermarking - Wavelet transform is a spatial processing tool for the time domain, with defined size of the window and interchangeable shapes. Differentiated performance in high-frequency portion of transformed DWT signals is very good time.

There is also very strong differentiated frequency rate in its low frequency component. This will easily distill the information coming from the signal. The basic concept of discrete wavelet transformation (DWT) in image phase is to decompose the image in a multi-differentiated way into sub-image of different spatial domain and independent frequency area. It is decomposed into 4 frequency districts, which is one low frequency district (LL) and three high frequency districts (LH, HL, HH), after the initial picture has been translated into DWT. When the low-frequency district information is converted from DWT, the sub-level district frequency information is collected. The following figure reflects the method for watermarking in DWT [8]:

Discrete wavelets use different wavelet filters, such as Hair filter, Bi-orthogonal Daubechies filters. This filter is for you Decomposes images at different frequencies, including Lowe Photo size (LL), horizontal (HL), vertical (LH), and HH (diagonal). This is efficient and uses quick filters Production. LL is selected because it is bigger and smaller than some (LH, HL). The stronger the degree it is

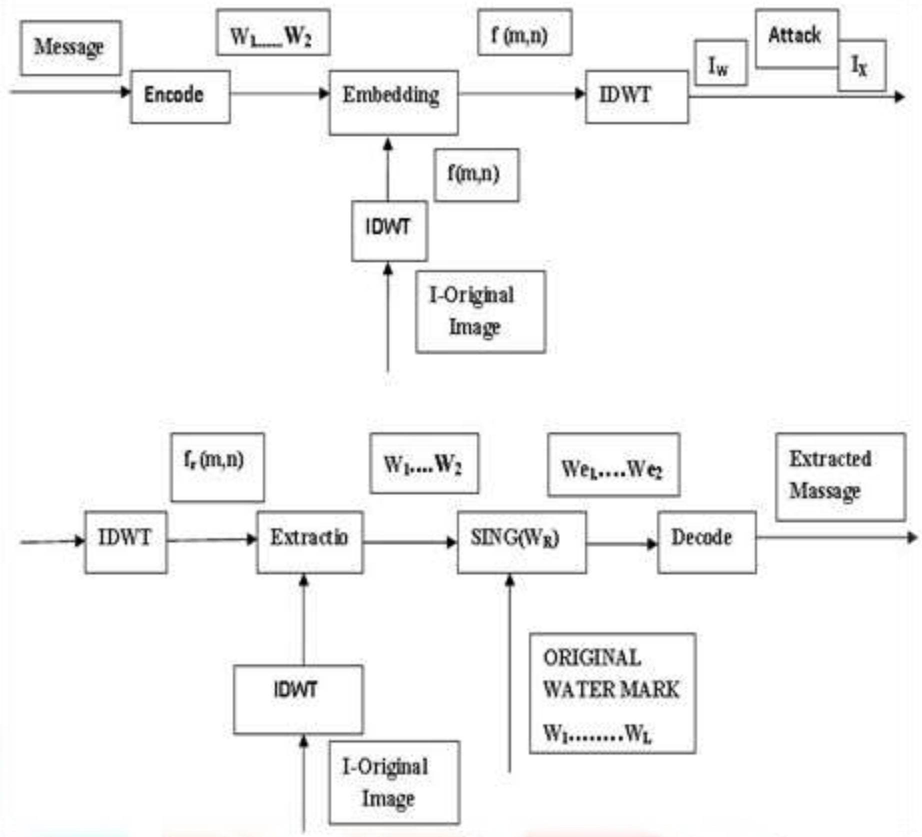

Figure-1: Watermark system in DWT

In two-dimensional separable dyadic DWT, of decomposition step generates four data bands, one corresponding to the low pass band (LL), and three others corresponding to the high pass bands horizontal (HL), vertical (LH), and diagonal (HH). In the lowest resolution low pass band, the decomposed image displays a coarse approximation image, and in higher bands, three details. To gain another degree of decomposition the low pass band can be further decomposed. This process is continued until achieving the required number of rates as determined by the application [2].

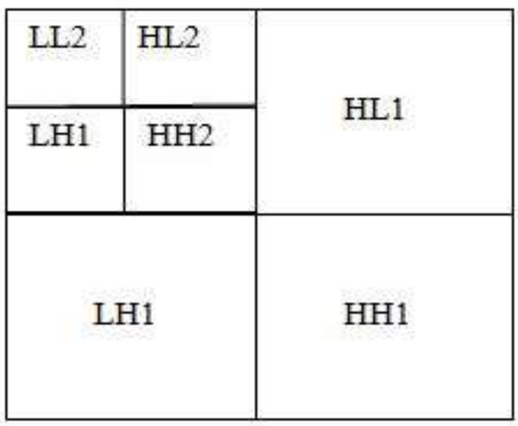

Figure- 1: DWT decomposition with two levels

The proposed watermarking system is given in the following process:

II EMBEDDING WATERMARKING

Input: Cover image, watermark image.
Process: 1- using two-dimensional separable dyadic DWT, obtain the first level decomposition of the cover image *I*.
2. Modify the DWT coefficients in the LL band:

$$LL_{w\,i,j} = LL_{\,i,j} + \alpha_k w_{ij}\ , i,j = 1, \dots, n \qquad \text{equ2.1}$$

3. Apply inverse DWT to obtain the watermarked cover Image, *Iw*.
Output: Watermarked image.

III EXTRACTING WATERMARKING

Input: Watermarked cover image.

Process:

1. using two-dimensional separable dyadic DWT, obtain the first level decomposition of the watermarked (and possibly attacked) cover image I_w^* .
2. Extract the binary visual watermark from the LL band:

$$w_{ij} = (LL_{w,ij} - LL_{ij})/\alpha \quad \text{equ2.2}$$

Output: watermark image.

IV SIMULATION RESULTS

Since the magnitudes of DWT coefficients are larger in the lowest band at each level of decomposition, it is possible to use a larger scaling factor for watermark embedding. For the other 3 bands, the DWT coefficients are smaller, allowing a smaller scaling factor to be used. The resulting watermarked image does not have any degradation leading to a loss in its commercial value. In the below experiments, we measured the visual quality of watermarked and attacked images using the Signal To-Noise Ratio (SNR), SNR measures are estimates of the quality of the reconstructed image compared with an original image. The fundamental idea is to compute the value which reflects the quality of the reconstructed image. Reconstructed image with higher metric are judged as having better quality.

The visual quality of extracted visual watermarks is measured by the Similarity Factor (SF). The DWT was performed using Matlab with the wavelet filter. The chosen attacks were JPEG compression (with 3 quality factors), also we measured a compression ratio (CR) it defined by compression Ratio=image bytes/compressed bytes.

For first levels of decomposition, the proposed watermarking scheme was tested using six types of attacks. The DWT was performed using Matlab. The chosen attacks were JPEG compression (with 3 quality factors), blurring, adding Gaussian noise, filtering, histogram equalization, intensity adjustment and rotation. The scaling factor we use it with three different values 0.09, 0.5 and 0.8.
The following data calculated from run mat lab code for DWT watermarking for different value of quality factor and alpha (gain).

V First Level Decomposition

In the 256x256 gray scale cover image Cameraman and 128x128 visual watermark copyright.

Figure – 2: a) Cover Image b) Watermark Image

The watermarked image in LL, LH, HL and HH bands are presented respectively in Figure 3 for different value of scaling factors and different quality factors, and the number below each image denotes the SNR value. Figure 3 contains the watermarks extracted from the four bands for each value of alpha and QF. The numbers below the images are the SF values. According to Figure 3 we can note that watermark embedding in the LL band is most resistant to JPEG compression than other bands. The attacked images are presented in Figure 4 together with the tools and parameters used for the attacks. The number next to the label below each image denotes the SNR value. Figure 9 contains the watermarks extracted from the LL band for each of the attacks. The numbers next to the images are the SF values. According to Figure 4 and Figure 5, it is possible to note the resistance of watermarked image for each attack using either subjective human evaluation or objective SF [9].

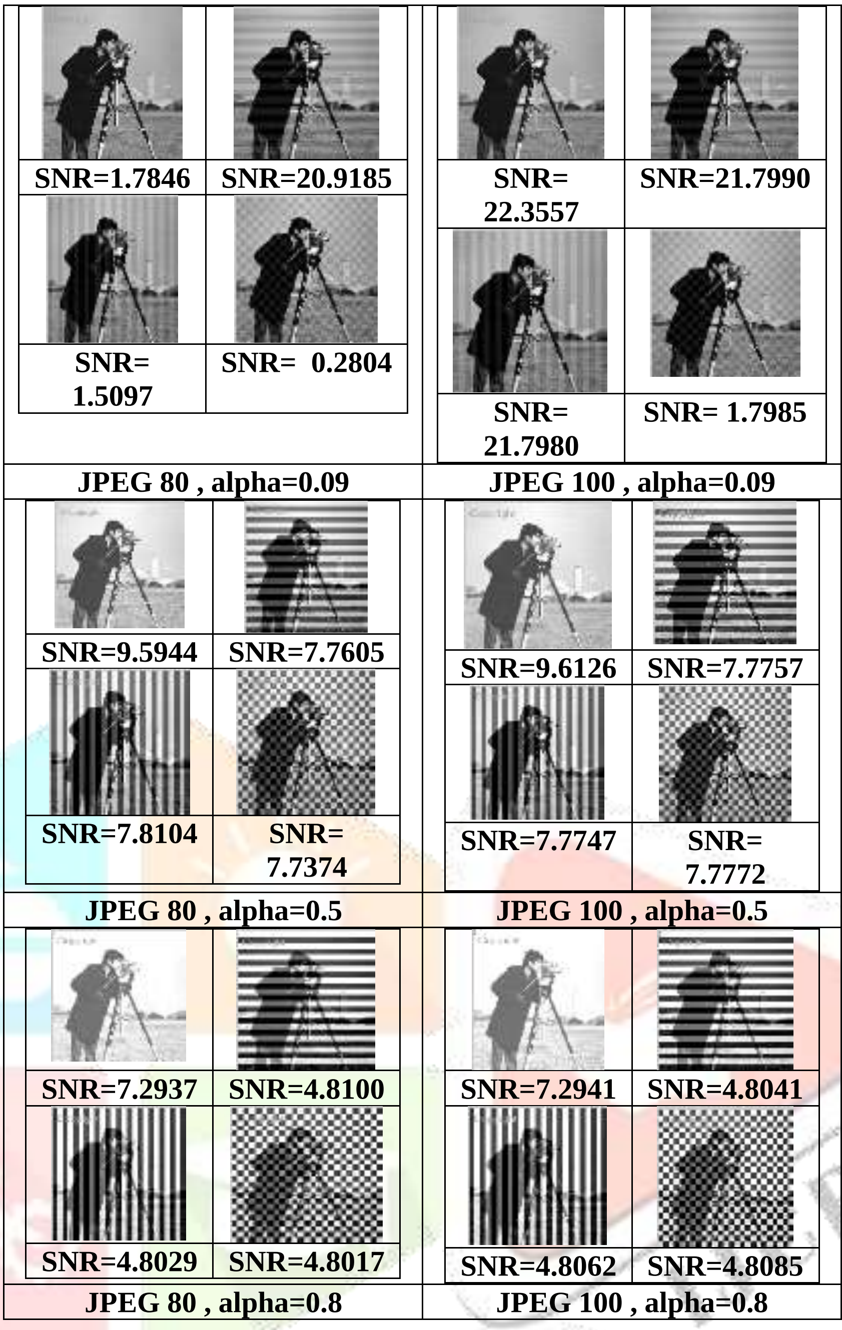

Figure 3: Watermarking image SNR in LL, LH, HL and HH bands

The key point to emphasize is the collection of watermark components for recovery bit will decide the recovery process's progress. Therefore, the more watermarks are added, the more details will be preserved about authentication and recovery. Hence, further watermarks usually result in more reliable identification of malfunctions and better efficiency of image recovery. The number of watermarks should however be selected while still protecting the image against serious distortion. Therefore, we must select at the same time between enhancing the precision of distortion detection and the consistency of the retrieved image, while maintaining the image quality to be used in future studies [4]

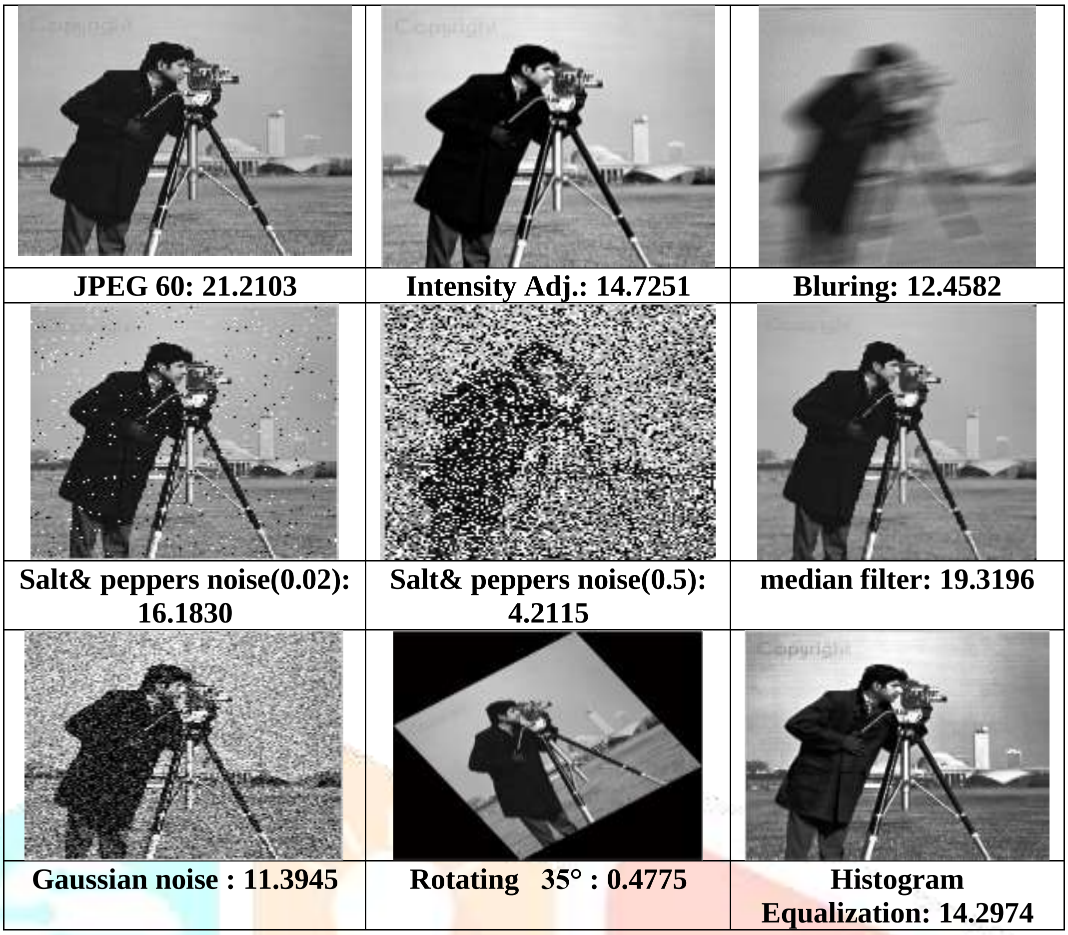

Figure 4: Attacks on the watermarked image on LL band with Gaussian noise

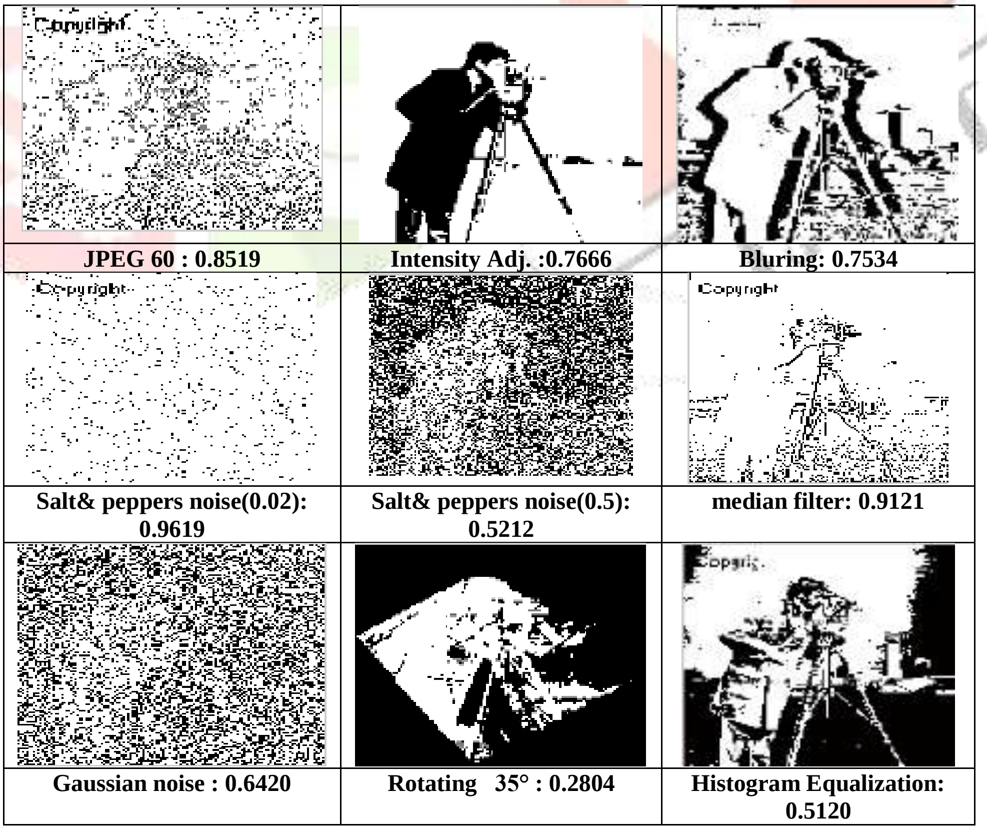

Figure 4: Recovered watermarked from image on LL band after attack showing SF

TABLE NO 1- Metric's value of all retrieved watermark after some attack

SR NO.	ATTACK	AWM SNR	RWM SNR
1	No attack	21.2103	0.8519
2	Intensity adjustment	14.7251	0.7666
3	Salt paper noise	4.2115	0.9619
4	Median filter	19.3196	.9121
5	Rotating 35^0	0.4775	0.2804
6	Gaussian noise	11.3945	0.6420
7	Histogram equalization	14.2974	0.5120

VI CONCLUSIONS - DWT has been used in digital image watermarking most commonly due to its excellent spatial localization and multi-resolution properties, which are close to the experimental representations of the human visual system. Further performance improvements in DWT-based digital image watermarking algorithms could be obtained by increasing the level of DWT and from this technique we can minimize the signal to noise ratio of the watermarked image in to image and Zhu Yuefeng from Hefei University of Technology, China, digital image watermarking algorithms focused on double transform domain and self-recovery. Provided the dual watermarking algorithm for dual two value image watermarking, there is clearly inadequate watermarking knowledge in the expression with a gray image watermark. The proposal embedded in the carrier image on the carrier image on the dual watermark involves a two watermark image and a gray image watermark algorithm, enhancing the watermark knowledge while preserving the initial two values of watermark robustness at the same time.

VII FUTURE SCOPE -The development of digital watermarking using and discrete wavelet transform with the low cost and less code complexity using Mat Lab. We must replace several other turn with watermarking. So we can quickly watermark any text much like the task query file. This method of water marking reduce to noise and without any form of attack with possible production of watermark techniques and reduction of SNR ratio.

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