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Digital Color Image Watermarking using DWTDCT Coefficients in RGB Planes

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Abstract

Digital image watermarking is used to identify the authenticity and integrity and to show the identity of its owners. This paper presents a more secure method for copy right protection. In the proposed method, the color image is decomposed into 3 color channels Red, Green and Blue and then DWT and DCT are applied to B channel of the R, G and B channels. The colored Watermark image is decomposed into R, G, B channels and DCT is applied to all the channels separately. R, G, B channels of watermark image are embedded into mid frequency coefficients of B channel already selected. The performance of proposed algorithm is measured by using Mean Square Error, Peak Signal to Noise Ratio, Standardized Correlation and Normalized Correlation. A comparative study of proposed scheme with the existing methods which uses DWT-DCT transforms is carried here and results shown.

Index terms— discrete cosine transform (DCT), discrete wavelet transformation (DWT), normalized correlation (NC), peak signal to noise ratio (PSNR).

1 Introduction

ow a days we can transmit any type of information either data(in the form of image) or images(pictures) by using the Internet. The data may also accessible by unauthorized persons while transmit data through ordinary commercial information transmitting channel like Internet. So for providing data security we need advanced authentication methods. One of such authentication method is digital watermarking.

Data hiding techniques can be classified into 2 types: Spatial domain [1] and Transform domain [2 3 **??** 5].Transform domain techniques are Discrete Wavelet Transform (DWT) [2,3,4], Discrete Cosine Transform (DCT) [5] and Discrete Fourier Transform (DFT). Spatial domain techniques are Least Significant Bit insertion (LSB) etc. In our proposed method we use combination of Discrete Wavelet Transform and Discrete Cosine Transform **??**6 7] for embedding the watermark images.

Authors ? ? : Department of CSE, Asst. Professor, ANU, Guntur, India. E-mails : anu.konda.chaitanya@gmail.com, kancherla123@gmail.com esreddy67@gmail.com cones are sensitive to red light, 33% are sensitive to green light, and only 2% are sensitive to blue light. Human eye is less sensitive to blue light, so we embed the image in blue channel.

The performance is measured by the PSNR, SC and NC and also apply different attacks like salt & Pepper, Gaussian Blur, Gaussian Noise, Sharpening& Cropping and analyze the results. a) Discrete Wavelet Transform Discrete Wavelet Transform [24] decomposes an image into 4 multi-resolution sub-bands. Those are LL1, LH1, HL1, HH1.In this LL1 contains the original information and HH1 contains edges and textures. If we embed the watermark information in LL1 and HH1 the image quality is disturbed. So, we cannot embed the watermark information in these two sub-bands. The human visual system is less sensitive to HL1 than LH1. So, we can identify the sub-band HL1 then apply the 2 nd level DWT to that sub-band and we get LL2,LH2,HL2,HH2 sub-bands and select HL2 for embed the watermark.

2 b) Discrete Cosine Transform

The sub-band (HL2) divided into 8×8 blocks. Apply DCT [27] to each block. Each block contains lowfrequency, mid-frequency and high-frequency subbands. Generally we choose the mid-frequency subbands for embedding the watermark image. If we compress the image then high-frequency coefficients are generally removed. The low-frequency sub-bands are the visualized components. So we can't insert in low and high-frequency sub-bands.

3 II.

4 Proposed Method

This method involves the following steps: 1. Decompose the image into 3 color components: red, green and blue. 2. Apply 2 levels DWT to Blue channel and then convert it into frequency components using DCT. IV.

5 Results

We use 3 color images candle, flower, lotus and leaf of size 1024 × 1024 for testing this method. The watermark image used for embedding is shown in figure4 of size 32 × 32.The figure 3 shows the results before watermarking and after watermarking of the original color image. Figure 4 shows the results of watermark and extracted watermarking.

6 a) Attacks

Salt & Pepper noise with noise density 0.002 is added to the watermarked images, Gaussian blur with disk radius 1,sharpening with parameter 0.5,cropping with 20 percent, Gaussian noise is added with length=2 and theta=4 and the corresponding PSNR of the original and watermarked after attack, NC of the original watermark and extracted watermark after attack.

7 b) Comparison Results

Table 5 shows the comparison results with the existing transformation methods Bi-Ortho [7], DCT-Coef [21], DWT-DCT based on the NC value between original watermark and extracted watermark if the watermarked image undergoes any attacks.

8 Conclusion

This robust watermarking technique is proposed for increasing the security of data hiding and robustness and quality compared to existing algorithms. For improving the security we use the frequency transformations DWT and DCT applied to the Blue channel of original image and embed the color watermark image.

Our future work is to implement Video watermarking by embed the watermark image in the video instead of image.

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[2] F Digital Color Image Watermarking using DWT-DCT Coefficients in RGB Planes

[3] FDigital Color Image Watermarking using DWT-DCT Coefficients in RGB Planes

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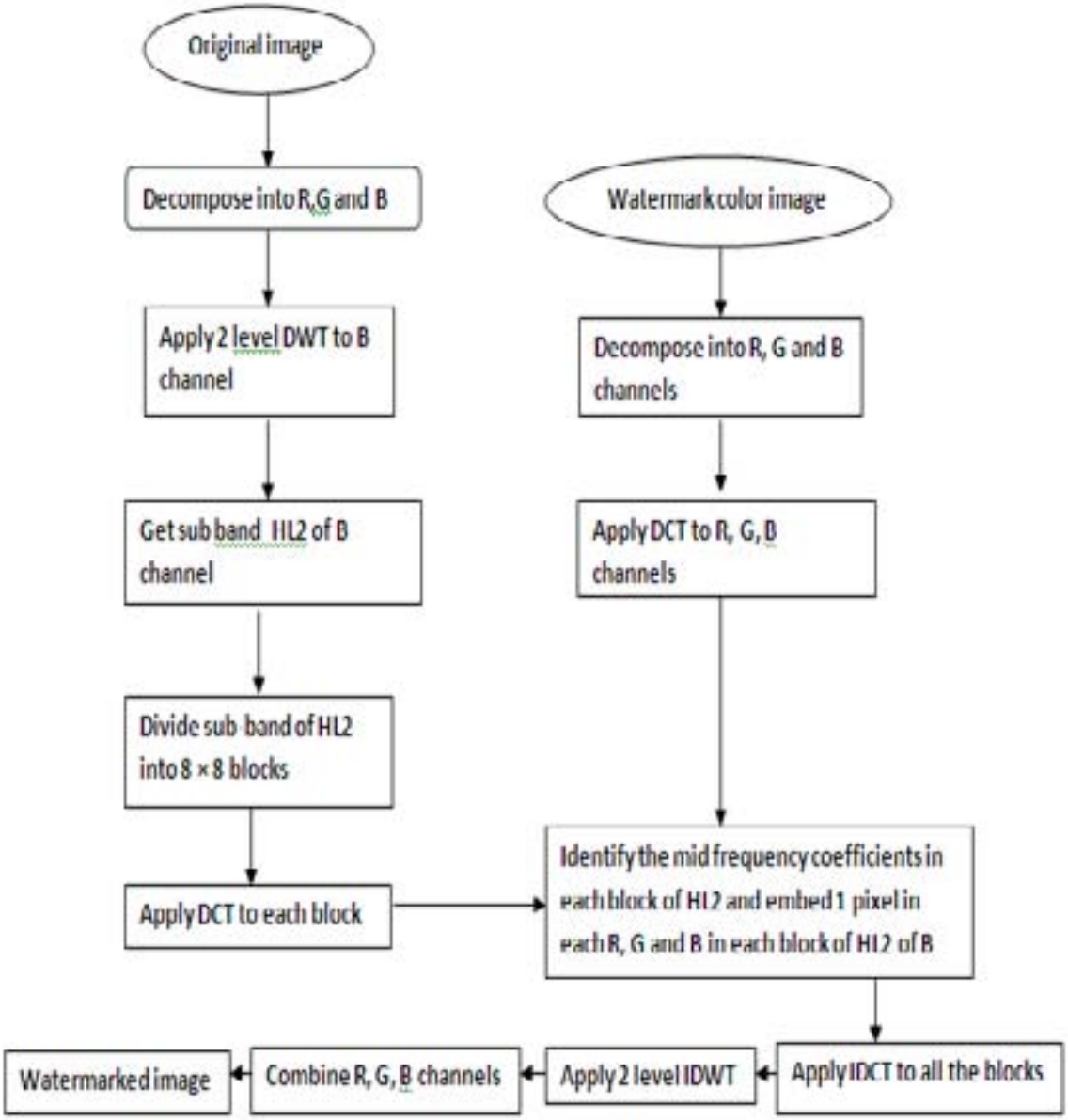
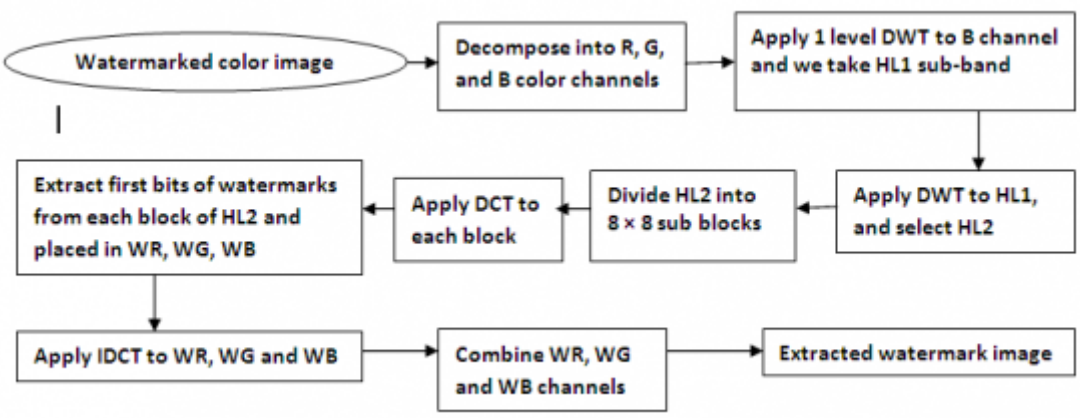
Figure 1: 3 . 2 F&



1

Figure 2: Figure 1 :



2

Figure 3: Figure 2 :F

3

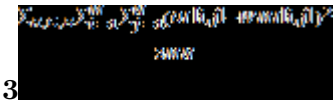


Figure 4: Figure 3 :

4

Figure 5: Figure 4 :

1

	images	
Image	MSE	PSNR
Candle	3.5699e -005	92.6042
Flower	4.4328e -005	91.6640
Lotus	3.5049e -005	92.6841
Leaf	3.5678e -005	92.6068

Figure 6: Table 1 :

2

Image	NC	SC
Candle	1	1
flower	1	1
Lotus	1	1
leaf	1	1

Figure 7: Table 2 :

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watermarked images after attacks

	PSNR(dB)			
	Candle	Flower	Lotus	Leaf
Salt and Pepper 79.6051		79.1953 79.3784 79.7989		
Gaussian Blur	89.1485	76.3084 94.6734 88.8786		
Sharpening	75.5086	63.5381 79.8306 75.2392		
Gaussian Noise 78.2971		78.3414 78.3462 78.0324		
Cropping	90.1163	89.0328 90.1372 89.9924		

Figure 8: Table 3 :

4

	watermark after attacks			
		NC		
	Candle Flower Lotus			Leaf
Salt and Pepper		0.9995	1	1
Gaussian Blur	0.9974	0.9974	0.9974 0.9974	
Sharpening	0.9507	0.9507	0.9507 0.9507	
Gaussian Noise	0.9998	0.9998	0.9998 0.9998	
Cropping	1	1	1	1

Figure 9: Table 4 :

5

Attack	Bi-Ortho	DCT-Coef	DWT-DCT
Salt and Pepper	0.8518	0.998	0.9995
Gaussian Blur	–	0.998	0.9974
Sharpening	–	0.995	0.9507
Gaussian Noise	0.8575	0.996	0.9998
Cropping	0.8484	0.920	1
	VI.		

Figure 10: Table 5 :

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