

Multilevel Image based Data Security using Combined Approach of Lsb_Dct Watermarking

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ABSTRACT

Digital watermarking is a method which is used to verify texts, image, video etc. Watermarking Technique is not only used for Authentication, it's also used for security, image protection, rights of documents. In this perspective experiment we used edge detection technique in watermarking for the purpose of highly authentication of image. Here we used combined approach of LSB-DCT watermarking for multilevel image based data security, in LSB-DCT approach author used edge of original image as a watermark image which is calculated by sobel edge detection technique this watermark is embedded on original image with the help of LSB watermark approach. After the first watermarking process is completed author embedded next watermark on the original image with the help of DCT Watermarking. In this experiments author explain effect of noise on dual watermarked image with the help of PSNR, SNR and Correlation coefficient.

Keywords

LSB, DCT Watermarking, Edge Detection, PSNR, SNR.

1. INTRODUCTION

Digital watermarking is a method which allows a separate to enhance secreted copyright announcements or additional confirmation messages to digital image, audio, or video signals and documents. Image watermarking provide security of paper currency and other important .Digital watermarking can be a form of steganography [1], in which data is hidden in the message without the end user's awareness.Digital watermarking is a process of inserting data (watermark) into a hypermedia object to help to defend the owner's right to that object. The inserted data (watermark) may be either visible or invisible [5].

2. LSB WATERMARKING:

Now a digital image, data can be inserted directly into each bit of image data or the more busy areas of an image can be calculated so as to hide such Messages in less noticeable parts of an image. Tirkel et al were one of the first used methods for image watermarking. Two techniques were offered to hide facts in the spatial domain of images by them. These approaches were constructed on the pixel value's Least Significant Bit (LSB) adjustments. The algorithm offered by Kurah and McHugh's to insert in the LSB and it was known as image downgrading [7].

3. DCT WATERMARKING:

Discrete-Cosine-Transform or DCT is a standard transform domain Watermarking technique. The DCT permits an image to be fragmented up into different frequency bands i.e. the high, middle and low frequency bands so creation it at ease to choose the band in which the watermark is to be inserted. The

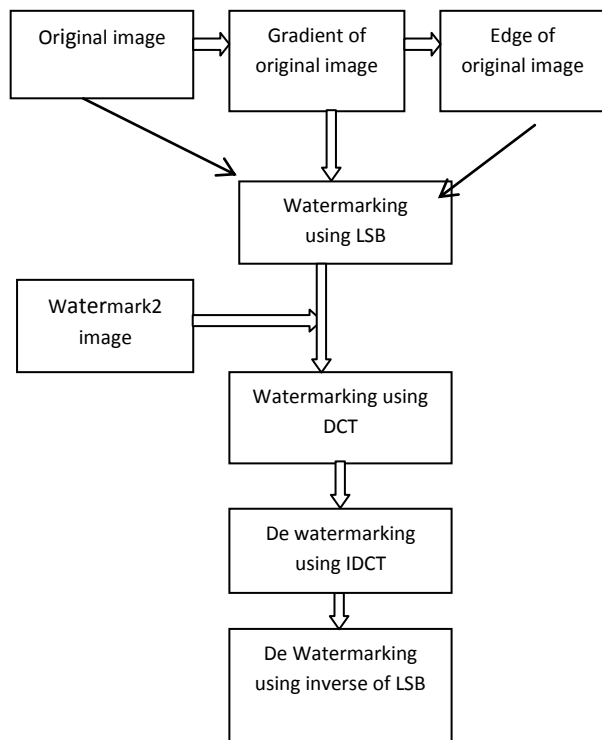
literature survey tells that generally the middle frequency bands are chosen because inserting the watermark in a middle frequency band does not scatter the watermark info to greatest visual significant parts of the image i.e. the low frequencies and also it do not overexpose them to deletion through compression and noise attacks where high frequency components are targeted [8].

4. EDGE DETECTION

Edge detection is the method of localizing pixel intensity changes. The edge detection has been used by several areas such as segmentation, object recognition, and target tracking, etc. Therefore, the edge detection is main parts of image processing. There mostly exist several edge detection approaches (Sobel [9, 10], Prewitt [11], Roberts [12], and Canny [13]). These methods have been offered for identifying changes in images. Early methods determined the best gradient operator to detect sharp intensity variations [14]. Normally apply derivative operation on image for identifying edge. Derivative based approaches can be characterized into two sets, specifically first and second order derivative approaches. First order derivative based methods depend on calculating the gradient some directions and merging the result of each gradient. The value of the gradient magnitude and orientation is estimated using two differentiation masks [15].

5. ALGORITHM STEPS:

- 1) Take an original image.
- 2) Edge Detection of Original Image Using Sobel Edge Detection Operator.
- 3) Consider the edged of original image from step2 as watermark1 image.
- 4) Replace LSB of Original Image by MSB of watermark1 image (edge of original image).
- 5) Display original image and watermarked1 image.
- 6) Consider Watermarked1 image as original image for DCT Watermarking
- 7) Load any other new image as a watermark.
- 8) Apply DCT Watermarking, to find watermarked2 image.
- 9) Apply inverse DCT we find watermark2 and original image (watermarked1 image).
- 10) Apply Inverse of LSB to find watermark1 (edge of original image) and original image.



Key part of this paper is effect of noise on dual watermarked image. In figure 2, this describes the impact of noise (different-2 type of noise) on watermarked image. Its explain what the effect of noise with different-different variance on the watermarked image. Firstly we see the watermark1 is embedding in original image using LSB Watermarking process after LSB approach watermark2 is inserting in watermarked1 image using DCT approach. After the completion of dual watermarking process author explain impact of noise on dual watermarked image. In figure2 it shows the attack of different-2 type of noise on the dual watermarked image. in this paper author simulate the experimental result using MATLAB software .here we simulate what the effect of watermark and recover watermark image when the noise are attacked on watermarked image.

In the below Table.1 it show the PSNR (peak signal to noise ratio), MSE (mean squared error), and Histogram of images. Here we see the PSNR between watermarked1 and watermarked2 image is high compare to other but MSE is low. And similarly PSNR between watermark2 and recoverwatermark2 is low but MSE is high compare to other.

Figur1. Dual watermarking using LSB_DCT Approach

Table1: histogram, psnr, mse comparisons of image

	IMAGE	HISTROGRAM	MSE	PSNR
ORIGINAL IMAGE			-----	-----
WATERMARK1 IMAGE			483.33	21.32
RECOVERWATERMARK IMAGE				
WATERMARK2 IMAGE			831.70	18.97
RECOVER WATERMARK2 IMAGE				
WATERMARKED1 IMAGE			65.37	30.01
WATERMARKED2 IMAGE				

6. EFFECT OF NOISE

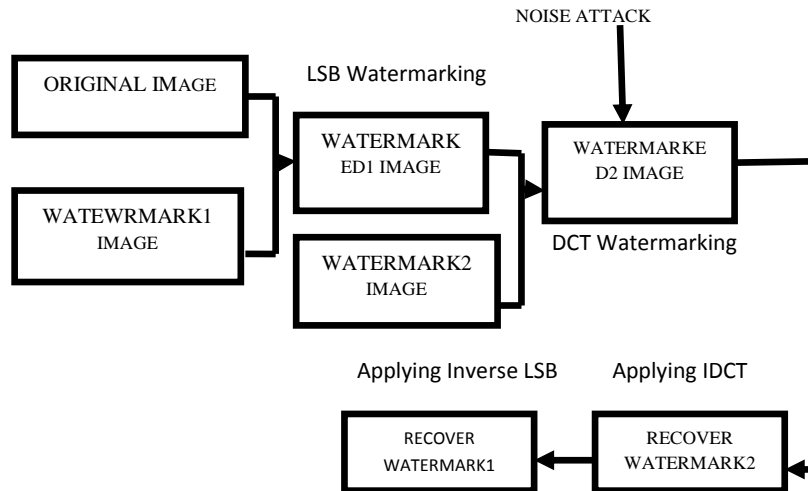


Figure2: attack of noise on dual watermarked image

For checking the performance of above algorithm, the experiments are simulated with the MATLAB software. The experiments follow the conversion of original image into edge of original image using sobel operator, this edge image works as watermark1 image and it embed into original image using LSB watermarking and find watermarked1 image. After the LSB watermarking author take another watermark image (watermark2) which embed with watermarked1 image with the help of DCT watermarking and obtained watermarked2 image after the competition of watermarking process we used de-watermarking process one by one. At first we used IDCT process and find recover image (watermark2 image), after IDCT author used Inverse of LSB and find recover image (watermark1 image).

7. EXPERIMENTAL RESULT AND ANALYSIS:

In this experiment author mainly show the effect of noise on watermarked image. In table2, table3 and table4 represent PSNR, SNR, and CORRELATION COEFFICIENT between watermark image (watermark1 and watermark2) and recover watermark image and explain what the effect of quality of image when different-2 noise are attacked on watermarked image. table2 represent quality of image in the form of SNR (signal to noise ratio), PSNR (peak signal to noise ratio), CC (correlation coefficient). table3 show the effect of speckle noise with different-2 variance on dual watermarked image. Similarly table4 show the effect of salt and pepper noise with different-2 variance on dual watermarked image and table4 explain the impact of Gaussian noise with different-2 variance on dual watermarked image. In table2, table3 and table4, **W1** Represent watermark1 image, **RW1** Represent recover watermark1 image after the completion of watermarking process. Similarly **W2** Represent Watermark2 image and **RW2** Represent recover watermark2 image.

In the below Graph1 [A], Graph1 [B], Graph1[C] and Graph2 [A], Graph2 [B] Show the image quality when different-2 noise are attacked on watermarked image. In graph1[A], Graph1[B], Graph1[C] represent the PSNR values between watermark1 and recover watermark1 is more when the salt & pepper noise are attacked compare to speckle and

Gaussian noise. Similarly SNR values are also high between them compare to speckle and Gaussian noise. But Correlation Coefficient is high when speckle noise is attacked.

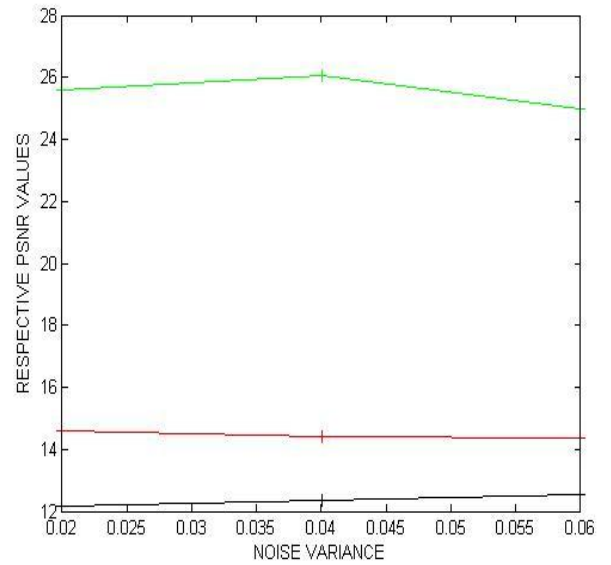
Similarly In Graph2[A], Graph2[B] represent the PSNR values between watermark2 and recover watermark2 is more when the salt & pepper noise are attacked compare to speckle and Gaussian noise. Similarly in Graph2 [B] show SNR values are also high between them compare to speckle and Gaussian noise.

Table2: Impact of Speckle noise on watermark and Recover watermark

COMPARISON		W1 & RW1	W2 & RW2
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS 0.020	PSNR	14.6150	15.9095
	SNR	9.8233	10.388
	CC	0.0755	0.0940
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS.0.040	PSNR	14.4028	15.9096
	SNR	9.6116	10.386
	CC	0.0716	0.0937
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS 0.060	PSNR	14.3821	15.9062
	SNR	9.590	10.38
	CC	0.0707	0.0945

Table3: Impact of salt and pepper noise on watermark and recover watermark

COMPARISION		W1 & RW1	W2 & RW2
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS 0.020	PSNR	25.5776	27.1281
	SNR	22.786	22.291
	CC	0.0720	0.6417
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS.0.040	PSNR	26.074	27.120
	SNR	21.283	22.281
	CC	0.0669	0.6406
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS 0.060	PSNR	24.992	27.088
	SNR	20.201	22.250
	CC	0.0612	0.6359



Graph 1[A]

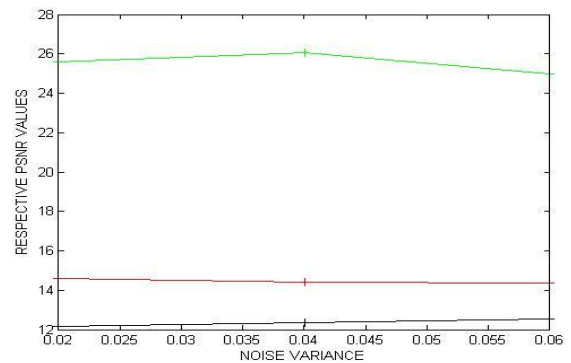
8. OUT PUT GRAPH

InGraph1[A],Graph1[B],Graph[C]andGraph2[A],Graph2[B], Green Line show Salt & Pepper Noise, Red Line Show Speckle noise and Black Line represent impact of Gaussian Noise.

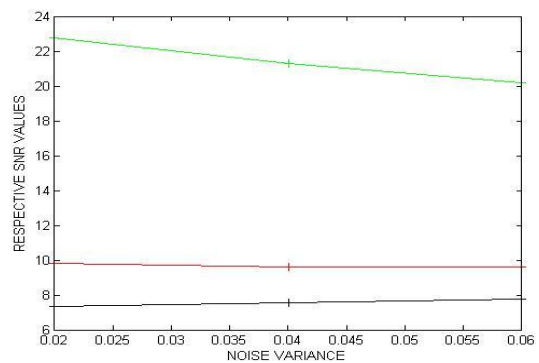
Graph1[A],Graph1[B],Graph[C] Represent PSNR,SNR,CC comparison between watermark1 and recover watermark1.andGraph2[A],Graph2[B],represent PSNR , SNR comparison between watermark2 and recover watermark2

Table4: Impact of Gaussian noise on watermark and recover watermark.

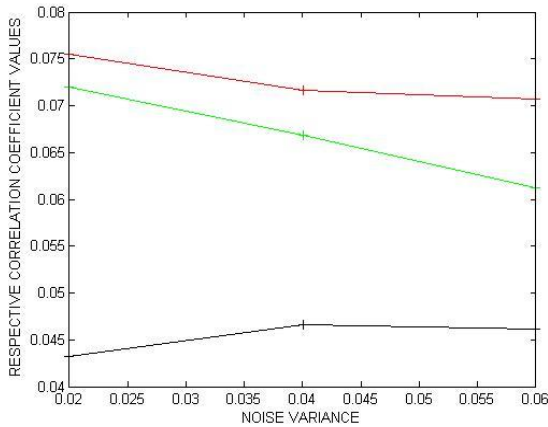
COMPARISION		W1 & RW1	W2 & RW2
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS 0.020	PSNR	12.1535	15.9096
	SNR	7.3623	10.3890
	CC	0.0432	0.0941
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS.0.040	PSNR	12.3514	15.9071
	SNR	7.5602	10.3865
	CC	0.0466	0.0933
PSNR , SNR AND CORRELATION COEFFICIENT WHEN NOISE VARIANCE IS 0.060	PSNR	12.561	15.9058
	SNR	7.7707	10.385
	CC	0.0461	0.0929



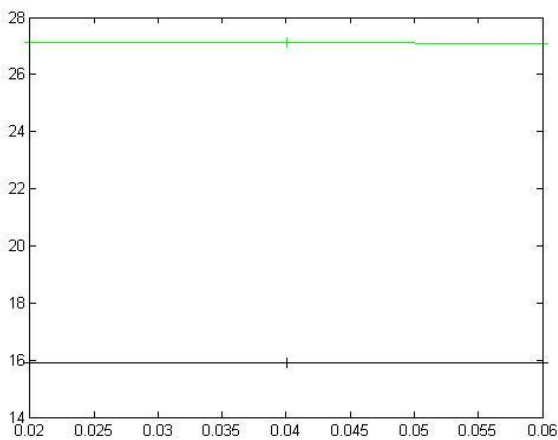
Graph 1[B]



Graph 1[C]



Graph 2[A]



Graph 2[B]

9. CONCLUSIONS

In this paper author combine edge detection with watermarking for the purpose of highly authentication of original image. And here author also combine LSB and DCT watermarking for the purpose of providing highly security of image. But in case of noise attack on watermarked image what the effect of watermark image and recover watermark image also explain. In this paper Author check quality of image in the form of PSNR, SNR, and Correlation Coefficient when different-2 type of noise with different-2 variance attack on watermarked image.

10. FUTURE SCOPE

Now a day's image watermarking is the largest area of research. In this paper author concentrates only multi-level image based data security using LSB and DCT watermarking and it also show the effect of noise on image. In future I would like to extend this research in such a way, to develop an application that remove the effect of noise on cover object and recover watermark image.

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