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Digital Data Protection using DWT and DCT for Security

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Abstract – Today *Data security is major concern. In this paper, is proposed data hiding (DH) algorithmic rule is projected for digital images. Rather than attempting to keep the PSNR value high, the projected algorithmic rule enhances the contrast of a host image to boost its visual quality. The side info is embedded in conjunction with the message bits into the host image so the initial image is totally retrievable. The proposed the discrete wavelet transforms and discrete cosine transform techniques are used. To our greatest knowledge, it's the primary algorithmic rule that achieves image contrast enhancement by DH(). Moreover, the analysis results show that the visual quality is preserved once a considerable amount of message bits have been embedded into the contrast-enhanced images, even higher than 3 specific MATLAB functions used for image contrast enhancement.*

Keywords*: Contrast enhancement, DWT, DCT, location map, reversible data hiding, and visual quality,*

I. Introduction

Data hiding, additionally known as data hiding, plays a very important role in data security. It aims at embedding imperceptible confidential information in cover media like still pictures, videos, audios, 3D meshes, etc. It consists of many branches like steganography, watermarking, visual cryptography, etc. Watermark has been intensively studied inside the community of signal method. in addition referred as invertible or lossless data hiding, DH is to embed a piece of information into a host signal to induce the marked one, from that the primary signal are exactly recovered once extracting the embedded information. The technique of DH is useful in some sensitive applications where no permanent modification is allowed on the host signal. Inside the literature, most of the projected algorithms are for digital photos to embed invisible info (e.g. [1]–[8]) or a visible watermark (e.g. [9]). To evaluate the performance of a DH algorithm, the hiding rate and thus the marked image quality are necessary metrics. There exists a trade-off between them as a result of increasing the hiding rate sometimes causes additional distortion in image content. to measure the distortion, the peak signal/noise ratio (PSNR) value of the marked image is typically calculated.

.In contrast, the additional modern algorithms (e.g. [5]–[8]) manipulate the additional centrally distributed prediction errors by exploiting the correlations between neighboring pixels thus less distortion is caused by information hiding. Although the PSNR of a marked image generated with a prediction error based algorithm is kept high, the visual quality can hardly be improved as a result of more or less distortion has been introduced by the embedding operations. For the images acquired with poor illumination, raising the visual quality is additional necessary than keeping the PSNR worth high. Moreover, contrast improvement of medical or satellite photos is desired to indicate the main points for visual examination. Although the PSNR worth of the improved image is typically low, the visibility of image details has been improved. Reversible data embedding, that is also known as lossless information embedding, embeds invisible data (which is named a payload) into a digital image during a reversible fashion. As a basic demand, the quality degradation on the image once information embedding ought to be low. An intriguing feature of reversible data embedding is that the reversibility, that is, one will remove the embedded information to restore the initial image.

II. Theory

Contrast enhancement techniques are used wide in image processing. One of the most common automatic procedures is discrete wavelet transform and discrete cosine transform. This is often less effective once the contrast characteristics vary across the image. Adaptive HE [3] (AHE) overcomes this drawback by generating the mapping for every pixel from the image during a surrounding window. AHE doesn't permit the degree of contrast improvement to be regulated. The extent to that the character of the image is modified is undesirable for several applications. One suggested technique [7] for

obtaining a range of effects between full HE and leaving a picture unchanged involves blurring the local image before evaluating the mapping.

Reversible (lossless) information hiding (embedding) technique that allows the exact recovery of the original host signal upon extraction of the embedded data. A generalization of the well-known LSB (least vital bit) modification is projected because the information embedding technique that introduces further operating points on the capacity-distortion curve. Lossless recovery of the initial is achieved by compression parts of the signal that are susceptible to embedding distortion, and transmission these compressed descriptions as a part of the embedded payload. A prediction-based conditional entropy coder WHO utilizes static parts of the host as side-information improves the compression efficiency, and so the lossless data embedding capacity.

III. Method

Security is main concern now days. Today all is digital that by need some trick to project our data, so through this system proposed efficient data hiding technique. We will propose reversible image data hiding technique with best quality of image for security. Digital watermarking is that the method of embedding data into digital multimedia system content such the data (which we tend to decision the watermark) will later be extracted or detected for a range of functions including copy interference and control. Digital watermarking has become an active and necessary space of analysis, and development and commercialization of watermarking techniques is being deemed essential to help address a number of the challenges faced by the speedy proliferation of digital content.

III .1. Discrete Wavelet Transformations

The wavelet transform has gained widespread acceptance in signal processing and image compression. Recently the JPEG committee has released its new image coding standard, JPEG-2000, which has been based upon DWT. Wavelet transform, decomposes a signal into a set of basic functions. These basis functions are called wavelets. Wavelets are obtained from a single prototype wavelet called mother wavelet by dilations and shifting [8]. The DWT has been introduced as a highly efficient and flexible method for sub band decomposition of signals. The 2DDWT is nowadays established as a key operation in image processing .It is multi-resolution analysis and it decomposes images into wavelet coefficients and scaling function. In Discrete Wavelet Transform, signal energy concentrates to specific wavelet coefficients. This characteristic is useful for compressing images [9]. Wavelets convert the image into a series of wavelets that can be stored more efficiently than pixel blocks. Wavelets have rough edges; they are able to render pictures better by eliminating the ―blockiness‖ . In DWT, a timescale representation of the digital signal is obtained using digital filtering techniques. The signal to be analyzed is passed through filters with different cut-off frequencies at different scales. It is easy to implement and reduces the computation time and resources required.

III .2. Discrete Cosine Transform (DCT)

The discrete cosine transform (DCT) is a technique for converting a signal into elementary frequency components. It is widely used in image compression. Here we develop some simple functions to compute the DCT and to compress images. The DCT is a close relative of the discrete Fourier transform (DFT). Its application to image compression was pioneered by Chen. In this work develop some simple functions to compute the DCT and show how it is used for image compression.

Taking these aspects into thought, operating throughout a frequency domain of some kind becomes very attractive. The classic and still most popular domain for image method is that of the Discrete-Cosine-Transform, or DCT. The DCT permits a picture to be shifting into completely different frequency bands, making it abundant easier to embed watermarking data into the center frequency bands of an image. The center frequency bands are chosen specified they have minimized them avoid the most visual necessary parts of the image (low frequencies) whereas not over-exposing themselves to removal through compression and noise attacks (high frequencies).

One such technique utilizes the comparison of middle-band DCT coefficients to code one bit into a DCT block. To begin, we tend to stipulate the middle-band frequencies (FM) of an 8x8 DCT block as shown below in figure.

FL is employed to denote the bottom frequency components of the block, whereas FH is utilized to denote the upper frequency components. FM is chosen because the embedding region on provide further resistance to lossy compression techniques, whereas avoiding vital modification of the quilt image.

FL is employed to denote the bottom frequency components of the block, whereas FH is used to denote the higher frequency components. FM is chosen as a result of the embedding region on offer more resistance to lossy compression techniques, whereas avoiding necessary modification of the duvet image.

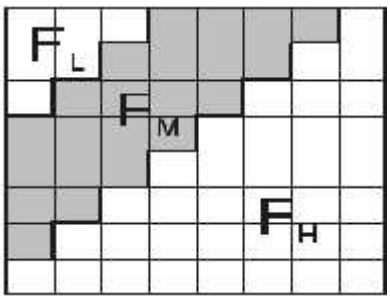

Fig.1 Definition of DCT Regions

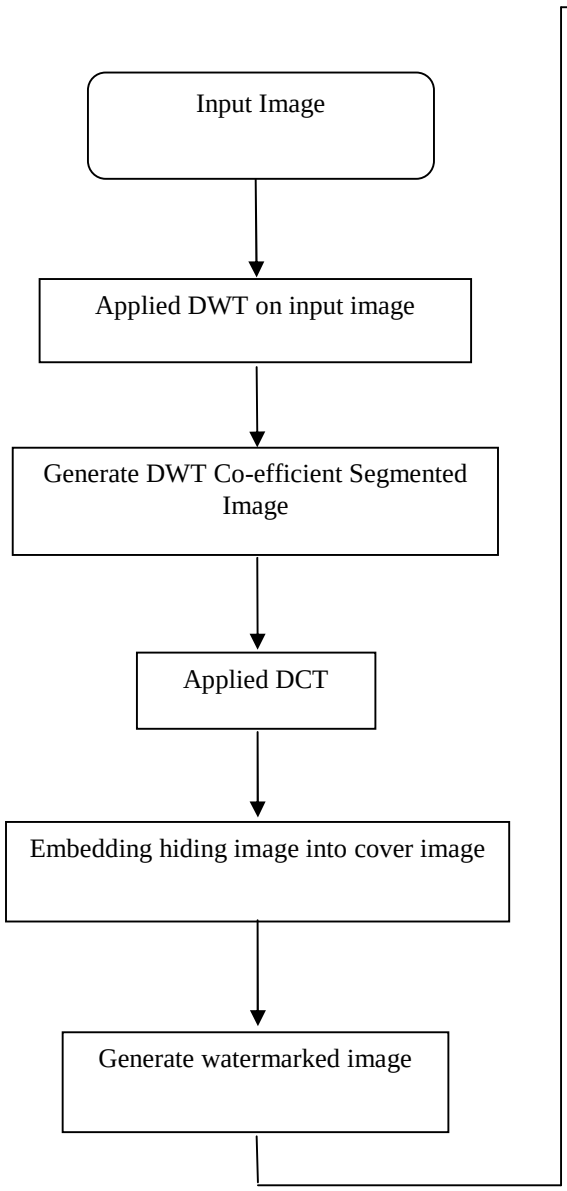

Fig.2 Flow diagram of embedding process

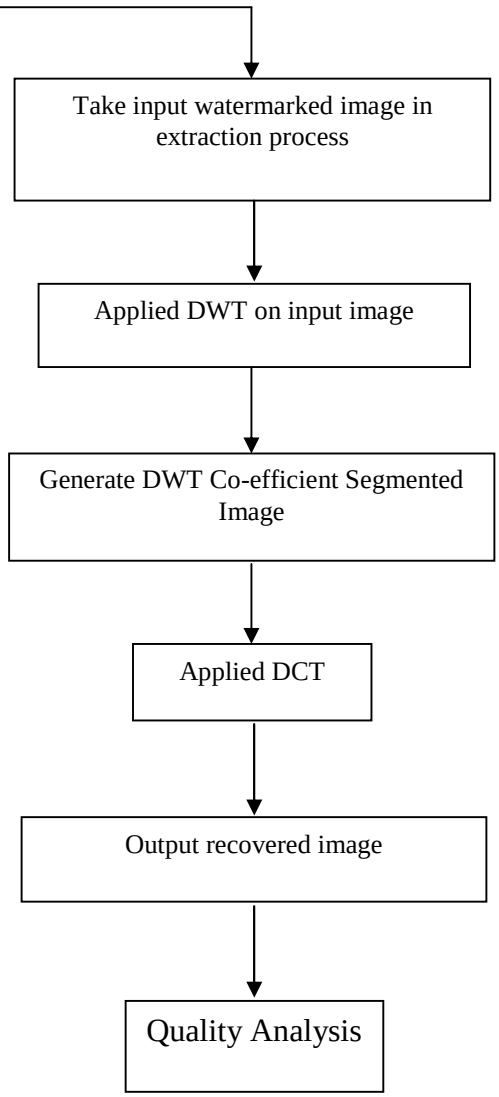

Fig.3 Flow diagram of extraction process

Fig.2 is the proposed system of the work. In this the flow diagram of proposed system steps by step working of the proposed work. Firstly we run the code then open the window. After that we write the guide in command window then open data hiding following steps window. In the data hiding embedding window firstly we browse the original image that is input image then applied discrete wavelet transform in the input image. We get the four segmented image after applied the DWT. That is Lower resolution image, Vertical band, Horizontal band and Diagonal band. Then applied discrete cosine transform. After that we browse logo for data hiding. Then perform the embedding process after that we obtain the watermark image in the output of embedding process.

In the data hiding extraction process firstly we take also browse data hiding image. Then applied discrete wavelet transform in data hiding image. We also obtain the segmented image in extraction process that is Lower resolution image, Vertical band, Horizontal band and Diagonal band. Then we applied the discrete cosine transform in the image. Then perform the data hiding extraction process after that we obtain the recovered data logo that is extracted output in the extraction process. Lastly we optimize the image quality by the quality analysis process.

IV. Result

In this the result section proposed algorithms are applied of proposed work. So simulation results are as follows in the below figure:

The comparison tables of Base paper and proposed work PSNR, MSE and SSIM value are shown in this section.

Fig.3 Third input image

This fig.3 shows the input image for Secure Data Hiding using dwt and dct.

(a) Lower resolution image

(b) Vertical band

(b) Horizontal band

(d) Diagonal band

Fig.4 Segmented images

This fig.4 shows the segmented image. The DWT applied on the input image after we get the segmented image. There are four segmented images are Lower resolution image, Vertical band, Horizontal band and Diagonal band.

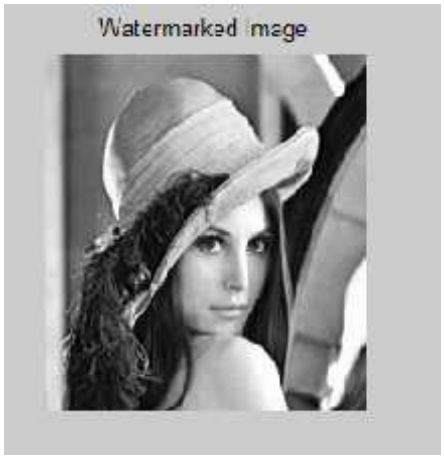

Fig.5Emedding output image

This fig.5shows the embedding output image. When we the process of embedding after that we get watermark image that is embedding output image.

In the extraction process this fig.5 shows the input image. We take the input is watermarked image in extraction process.

(a)Lower resolution image

(b)Vertical band

(c) Horizontal band

(d)Diagonal band

Fig.6 Segmented images

This fig.6 shows the segmented image. The DWT applied on the data hide image after we get the segmented image. There are four segmented images are Lower resolution image, Vertical band, Horizontal band and Diagonal band.

Fig.7 Extracted output image

This fig.7 shows the extracted output image. After extraction process we get the extracted output image that is recovered logo.

Table 1 Comparison table Comparison Of Nc Values From Extracted

Attack	Lena		Sailboat	
	Base	Proposed	Base	Proposed
No Attack	1.0000	1.00	0.9942	0.9953
Gaussian Low-pass filter[3 3]	0.9877	0.99	0.9781	0.983
Gaussian Low-pass filter[5 5]	0.9992	0.99	0.9764	0.982
Gaussian Noise 0.003	0.9347	0.95	0.9598	0.96
Gaussian Noise 0.05	0.7252	0.87	0.7208	0.78
Sharpening	1.0000	1.000	0.9926	0.99

Table 2 Comparison table Comparison Of Nc Values From Extracted

Input	**MSE**	**PSNR**	**SSIM**
Proposed	0.0681	59.7974	0.994

V. Conclusion

In this paper proposed the discrete wavelet transform and discrete cosine transform method are used for the hiding data and watermark for enhanced security. DWT and DCT can be applied on the image for obtaining the high frequency pictures and for robustness in geometrical attack. The proposed work PSNR value is higher than the previous work. So, our image quality is better than the previous image result.

References

[1] Hao-Tian Wu, Jean-Luc Dugelay, Yun-Qing Shi, “Reversible Image Data Hiding with Contrast Enhancement” IEEE signal processing letters, vol. 22, no. 1, january 2015

[2] Xinpeng Zhang “Watermarkin Encrypted Image” IEEE signal processing letters, vol. 18, no. 4, april 2011

[3] Wei-Liang Tai, Chia-Ming Yeh, Chin-Chen Chang "WatermarkBased on Histogram Modification of Pixel Differences" IEEE transactions on circuits and systems for video technology, vol. 19, no. 6, june 2009

[4] Jun Tian "Reversible Data Embedding Using a Difference Expansion" IEEE transactions on circuits and systems for video technology, vol. 13, no. 8, august 2003

[5] Yongjian Hu, Heung-Kyu Lee, Jianwei Li. "DE-Based Watermarkwith Improved Overflow Location Map" IEEE transactions on circuits and systems for video technology, vol. 19, no. 2, february 2009

[6] Z. Zhao, H. Luo, Z-M. Lu. and J.s.pan, "Watermarkbased on multilevel histrogram and sequential recovery" Int. J. Electron. Commun. (AEU), Vol. 65, pp. 814-826, 2011.

[7] M. Kuribayashi and H. Tanaka, "Fingerprinting protocol for images based on additive homomorphic property," IEEE Trans. Image Process., vol. 14, pp. 2129–2139, 2005.

[8] Y.T. N. Memon and P. W. Wong, "A buyer-seller watermarking protocol," IEEE Trans. Image Process., vol. 10, no. 4, pp. 643–649, Apr. 2001

[9] S. Lian, Z. Liu, Z. Ren, and H. Wang, "Commutative encryption and watermarking in video compression," IEEE Trans. Circuits Syst. Video Technol., vol. 17, no. 6, pp. 774–778, 2007

[10] L. Luo, Z. Chen, M. Chen, X. Zeng, and Z. Xiong, "Reversible image watermarking using interpolation technique," IEEE Trans. Inf. Forensics Secur., vol. 5, no. 1, pp. 187–193, 2010.