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DCT & DWT based Digital Image Watermarking using Matlab

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Abstract - *A process to insert a secret message or logo into the original image to provide a high level of security as the location of embedded information is secret and the watermark algorithm is not public that is known as watermarking [2].In this paper, image watermarking is done by two frequency domain techniques such as Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT).*

***Key Words*: watermark embedding, watermark extraction, DWT, DCT**

I. INTRODUCTION

The advancement of system media frameworks and blast of quick correspondence system has demoralized and damped the media content supplier i.e. creators ,distributors to allow the circulation of their archive on the system environment. [6]Watermarking has been summoned as an apparatus for the insurance of intellectual property right (IPR) of interactive media substance. In view of their advanced nature, sight and sound reports can be copied changed and diffused effectively. In this setting it is vital to add to a frame work for copyright security. Assurance against duplication and verification of substance. Watermark is extremely valuable in the examination paper since it can be utilized for dating, recognizing sizes, plant trademarks and areas We are living in the period of data where billions of bits of information is made in each portion of a second and with the appearance of web, creation and conveyance of advanced information (pictures, video and sound records, computerized stores and libraries, web distributed) has developed numerous fold. The computerized correspondence innovation, similar to web innovation stands up to different inconveniences identified with the protection and security of the information. Security methods are required as a result of unlawful access of information without authorization. In this manner, it is important to ensure in the web innovation. For giving the security of advanced information different strategies are utilized like encryption, unscrambling, cryptography, steganography and computerized watermarking. Advanced watermarking is an extremely creating field and utilized as a part of different applications which have been ended up being effective. The computerized watermarking has been connected in various picture handling procedures. The point of each application is to giving security of the computerized content. The computerized watermarking applications are Broadcast Monitoring, Digital Fingerprinting, Transaction Tracking, Copyright insurance, Temper Detection, Data Hiding and Content Authentication and so forth. More analysts are pulled in to the region of picture watermarking as a result of the property of the picture as it has a ton of excess data contained in it which can be abused to be utilized for watermark insertion. Numerous watermarking techniques for pictures are proposed. Watermarking procedures are comprehensively sorted into spatial area and change space procedures. While the spatial area procedures are having minimum intricacy and high payload they cannot withstand low pass sifting and regular picture preparing assault [3][4].

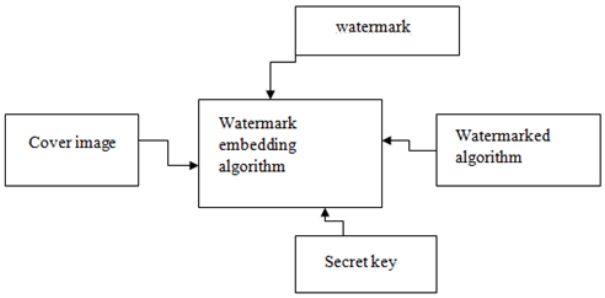

Figure1: Block Diagram of Watermarking

II. Techniques used

1.1 Discrete wavelet Transform

Discrete wavelet Transform (DWT) of the picture produces multi determination representation of a picture. The multi determination representation gives a basic system to

translating the picture data. The DWT investigations the sign at numerous determinations

$$w_{LLJ} = \sum\sum g(x)g(y)W_{llJ-1}(2\mu - x)(2\vartheta - y)_{N-1y=0N-1x=0} \quad \text{.....(1)}$$

$$w_{LHJ} = \sum\sum g(x)g(y)W_{llJ-1}(2\mu - x)(2\vartheta - y)_{N-1y=0N-1x=0} \quad \text{.....(2)}$$

$$w_{HLJ} = \sum\sum g(x)g(y)W_{llJ-1}(2\mu - x)(2\vartheta - y)_{N-1y=0N-1x=0} \quad \text{.....(3)}$$

$$w_{HHJ} = \sum\sum g(x)g(y)W_{llJ-1}(2\mu - x)(2\vartheta - y)_{N-1y=0N-1x=0} \quad \text{.....(4)}$$

Where J is the level of the 2-D DWT, h (n) and g (n) are the drive reaction. Figure 6 demonstrates the schematic outline of 2D wavelet change. By utilizing this figure we can dissect in which way the 2D wavelet change are performed [5].

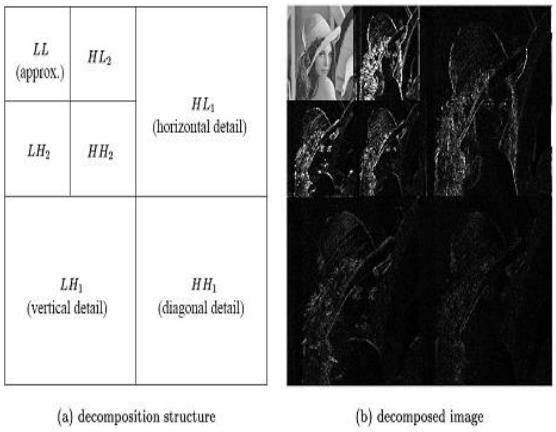

Figure2: Discrete Wavelet Transform

1.2 Discrete-Cosine-Transform

Discrete-Cosine-Transform or DCT is a prevalent change area watermarking system. The DCT permits a picture to be broken up into various recurrence groups to be specific the high, center and low recurrence groups subsequently making it less demanding to pick the band in which the watermark is to be embedded. It forms some different qualities and points of interest, for example, vector base great encapsulation about picture data, little computational multifaceted nature, high pressure proportion, low blunder rate, great disguising, et cetera, so it is viewed as the ideal change in the computerized picture preparing.[4]

The one dimensional DCT

$$c(\mu) = \alpha(\mu)\sum_{x=0}^{N-1} f(x)\ cos\ {}^{\pi(2x+1)\mu}/_{2N} \quad \text{.....1-D DCT}$$

For μ=0, 1 ,2.....N-1 similarly inverse transform is defined.

$$f(x) = \sum_{\mu=0}^{N-1} \alpha(u)c(u)\frac{cos\pi(2x+1)u}{2N} \quad \text{..... Inverse transform [2].}$$

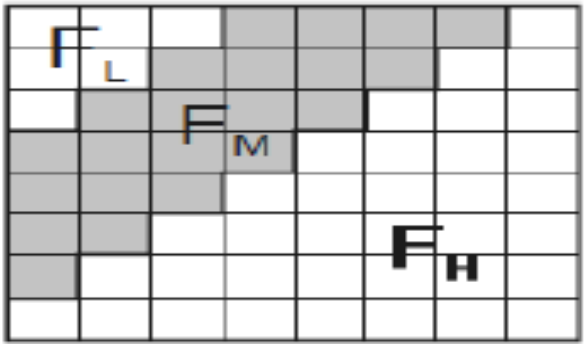

Figure 3: Discrete cosine transform[4]

III. Related work

Yadav S. et al [2015] this paper mainly deals with a different video watermarking technique based on frequency domain and their comparison is evaluated on the basis of Peak-Signal-To-Noise (PSNR) Ratio. This comparison is done in the MATLAB/Simulink which is an interactive tool for simulation purposes.

Gregory H. et al.[2014] provided a description of the application of digital watermarking for use in copyright protection of digital images The major processes involved in the watermarking processes are considered including , attack, an detection/extraction[1].

Gupta V. et al.[2014] purposed the various factors used in watermarking, properties and applications area where watermarking need to be used. and It classified watermarking technique algorithms based on the transform domain in which the watermark is embedded[2].

Ram B. [2013] purposed a new watermarking technique to add a code to digital images is presented: the method operates in the frequency domain embedding a pseudo-random sequence of real numbers in a selected set of DCT coefficient[3].

IV Simulation Model

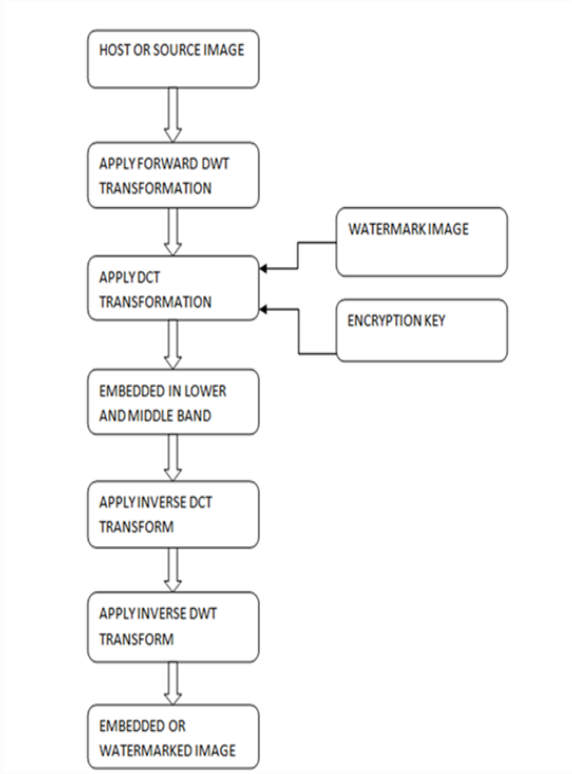

Figure 4: Simulation Model of Watermarking

V Result & Discussion

This paper deals with the watermarking of still images for copyright protection. The watermarking information that will be used includes handwritten signatures and mobile phone numbers. The reason for this is they are more informative compared to pseudo random sequences. The watermarking information will be encoded before inserting it in the still images[8]. The embedding of the coded watermark information will be performed in the frequency domain rather than the spatial domain. The DCT will be used for this purpose. The watermarks should be invisible and cause minimal distortion [9] to the host images. The objective of this research is to develop new algorithms that can embed and extract the watermarking data and satisfy the above requirements. The performance of the developed algorithms will be assessed by testing them using a variety of grey level and color images. The aim of this research is to develop powerful watermarking techniques that preserve the intellectual property of still images. The new techniques utilized. Both one dimensional and two dimensional are used to improve the robustness of the watermarking algorithms. The algorithms embed the Walsh coded watermarks in the low frequency coefficients of the DCT blocks [7].

Figure 3(a): original image

Figure 3(a) shows that original image taken from matlab directory that is cameraman image that image can be gray level or colored (RGB) image.

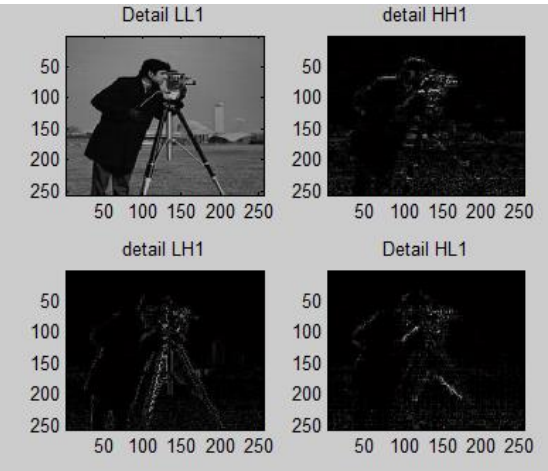

Figure 3(b): Discrete Wavelet Transform

Figure 3(b) Applying DWT to the gray scale image after applying DWT image is divided into 4 parts ie.LL1, HH1, LH1, HL1. In numerical analysis and functional analysis, a discrete wavelet transform (DWT) is any wavelet transform for which the wavelets are discretely sampled.

Figure 3(c): Discrete Cosine Transform

Figure 3(c) shows that selection of one sample from previous image and apply DCT on it DCT breaks the image into two different frequency components: low frequency and high frequency. Low frequency component contains high energy, high frequency component as it contains the low energy

Figure 3(e): Rotate Image

Figure 3(e) shows that rotation of image. When you rotate image, you specify the image to be rotated and the rotation angle, in degrees. If you specify a positive rotation angle, the command "imrotate" rotates the image counterclockwise; if you specify a negative rotation angle, the command "imrotate" rotates the image clockwise.

Figure 3(d): Blockproc Command

Figure 3(d) shows that image in which watermark is embedded by using block pro command. block Size is a two-element vector, [rows cols], that specifies the size of the block.fun is a handle to a function that accepts a *block struct* as input and returns a matrix, vector, or scalar Y.

Figure 3(f): Resize Image

Figure 3(f) shows resizing of image resize the image again, this time specifying the desired size of the output image, rather than a magnification value.

Figure 3(g): Output Image

Figure 3(g) shows the output image in which watermark is done.

EXTRACTION

In this paper, for the extraction of the watermark of the image the inverse discrete cosine transform (IDCT) technique is used.

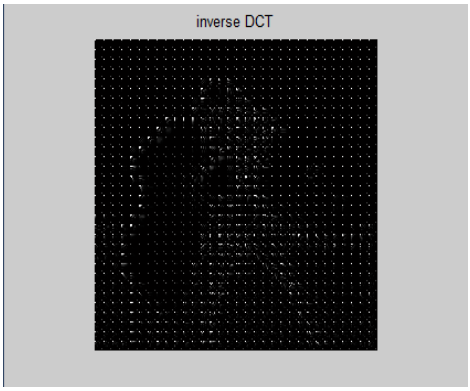

Figure 3(h): Inverse DCT

Figure 3(h) shows extraction process of the image using inverse DCT. The inverse DCT reconstructs a sequence from its discrete cosine transform (DCT) coefficients. The iDCT function is the inverse of the DCT function.

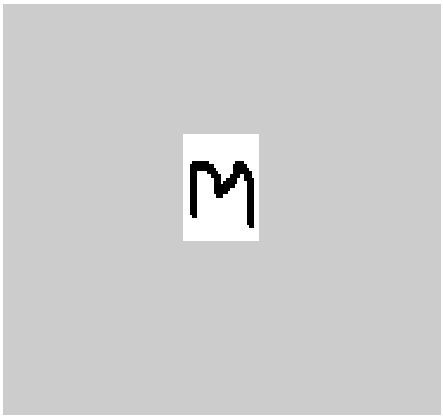

Figure 3(i): Extracted Watermark Image

Figure 3(i) shows extraction of the watermark of the image.

VI CONCLUSION

Digital Image Watermarking provides and ensures security, data authentication and copyright protection to the digital media through its various techniques. All the techniques have their useful applications. But Spatial Domain techniques did not provide robustness to the digital image as provided by the Frequency Domain Techniques and discrete cosine transform having more energy compaction then other technique.

VII . REFERENCES

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