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A Review of Digital Watermarking Strategies

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Abstract: ***This paper presents a robust watermarking technique photos. The planned technique involves many techniques to enable a secure and powerful watermarking. throughout this system the watermark is embedded in third level of DWT (Discrete movement Transform) and before embedding the watermark image is skillful chaotic secret writing method for its security, various necessary issue is that inside the planned technique watermark is embedded inside the kind of DCT (Discrete mathematical function Transform) with special constant shifting rule to attenuate the impact on main image. The performance of the planned watermarking is powerful to a selection of image process techniques, like JPEG compression, sweetening, resizing, and geometric operations.***

Keywords: Digital watermark, separate moving ridge rework, separate trigonometric function rework, chaotic coding.

I. INTRODUCTION

Watermarking may be a technique accustomed hide information or distinctive data at intervals digital multimedia system. Our discussion can focus totally on the watermarking of digital pictures, although digital video, audio, and documents are habitually watermarked[3]. Digital watermarking is turning into fashionable, particularly for adding undetectable distinctive marks, like author or copyright data. owing to this use, watermarking techniques square measure usually evaluated supported their invisibleness, recoverability, and lustiness. Our goal was to implement 2 totally different watermarking ways and measure their status to attack by varied image process techniques. in addition, we have a tendency to wished to form a user interface that may enable users unacquainted Matlab to feature and extract watermarks, further as measure their individual lustiness supported many morphological image attacks[4][1].

When learning concerning watermarking by bit-plane slicing at school, we have a tendency to were terribly interested to analyze the method by that one watermarks a picture, further because the degree to that the first image is modified by the watermarking method. to assist USA learn the way pictures will be watermarked, we have a tendency to determined to implement 2 watermarking techniques, watermarking by bit-plane slicing and watermarking victimisation the Cox methodology. It absolutely was very troublesome to come to a decision that watermarking ways to implement, as a result of their square measure a large number of various ways by that to watermark Associate in Nursing image[5]. The Cox methodology and therefore the bit-plane methodology allowed USA to require 2 terribly totally different approaches to watermarking. We have a tendency to have to be compelled to add each the special and frequency domain, further as having totally different goals for every methodology. Our bit-plane slicing approach is meant to figure primarily as a fragile watermark. A fragile watermark shows the degree to that changes square measure created to Associate in Nursing image[3]. The Cox methodology, on the opposite hand, is meant to be sturdy. It works within the frequency domain, permitting it to resist several common attacks to the image.

In implementing these ways, we have a tendency to had to find out and make the processes to feature a watermark and extract a watermark from digital images[6]. To guage the degree to that watermarking affects the first image; the user interface

was designed to show image distinction diagrammatically further as numerically in a very relative error format. This helps the user measure the invisibleness of the watermark, as they will compare the changes watermarking makes to the first image. once the user extracts a watermark from a picture, the distinction between the watermarks is additionally shown each diagrammatically and numerically. This can facilitate the user decide if a watermark will be systematically recovered with the given methodology.[7].

The rest of this paper is organized as follows. In section a pair of, we have a tendency to introduce the 2 transforms shortly. Section three describes the algorithmic rule. Section four presents the performance analysis to demonstrate the performance of this theme. The conclusion is drawn in Section five.

Advantages of digital watermarking are: copyright protection, pirate following, repeating protection, image authentication, hiding communication. [1][3]. The watermark may be a signal embedded into the host media to be protected, like a picture or audio or video. It contains helpful certifiable data for the owner of the host media, like producer's name, company emblem, etc; the watermark will be detected or extracted later to form Associate in Nursing assertion concerning the host media [2]. For this aim, digital watermarking techniques square measure developing and their range is growing, looking out all for the equilibrium between 3 criteria: information concealing capability, physical property, and lustiness, looking on the image domain illustration [8].

II. TRANSFORMS USED IN WATERMARKING

A. *DWT (Discrete Wavelet Transform)*

It is the tactic used here to rework the image from spatial domain to frequency domain. It furnishes exceptional localization in time and frequency for the image knowledge. The DWT processes the image by dividing it into four non overlapping multi-resolution subbands LL, LH, HL and HH. The sub band LL represents the coarse-scale DWT coefficients (the approximation) whereas the subbands gonadotropin, metric capacity unit and HH represent the finescale of DWT coefficients (the details), figure one illustrates this idea. to get successive coarser scaled wave coefficients, the subband LL is any rotten and dividing into four non overlapping multi-resolution sub bands is accomplished. This method is recurrent many times, that is decided by the applying at hand. Every level has numerousbands data like low–low, low–high, high–low, and high–high frequency bands. Moreover, from these DWT coefficients, the first images are often reconstructed. This reconstruction method is termed the inverse DWT (IDWT). If C[m,n] represents a picture, the DWT and IDWT for C[m,n] will equally be outlined by implementing the DWT and IDWT on every dimension and on an individual basis .blessings of embedding a watermark in a very wave remodeled image:

1. It performs AN analysis the same as that of the HVS. The HVS splits a picture into many frequency bands and processes every band severally.
2. Watermarking within the wave domain is compatible with the JPEG 2000 compression standards.
3. With DWT, the sides and textures ar typically exploited o.k. in high frequency subbands (HH, HL, and LH). Therefore, adding a watermark to those giant numbers of coefficients is tough for the human eyes to understand.
4. Wave processes knowledge at completely different scales or resolutions, light each giant and little options.

B. *DCT (Discrete cos Transform)*

A separate cos rework (DCT) expresses a sequence of finitely several knowledge points in terms of a add of cos functions oscillatory at completely different frequencies. The transform of a symptom is simply another style of representing the signal. It doesn't modification the knowledge content gift within the signal. separate cos rework is wide utilized in image and video compression applications like JPEG and MPEG. These multimedia system standards partition AN input image into eight × eight blocks at the moment the DCT for every block is computed. The watermarking techniques implant watermarking knowledge

into the center frequency bands of a remodeled image. the center frequency bands ar chosen specified they avoid the foremost visual elements of the image (the low frequencies) while not overexposing themselves to removal through compression and noise attacks (high frequencies). A second DCT is with efficiency computed by 1D transforms on every row followed by 1D transforms on every column. There ar completely different algorithms to cipher the second DCT. for instance, one such algorithmic rule is by exploitation matrix operation The M ×M rework matrix T is given by Equation (1) : In DCT domain we are able to have a 2-D watermark signal W, that is embedded within the middle band frequency of eight × eight DCT block. The eight × eight DCT coefficients Y(u,v) ar modulated per the subsequent equation: specially, a DCT could be a Fourier-related reworksimilar to the separate Fourier transform (DFT), however exploitation solely real numbers. DCTs ar such as DFTs of roughly double the length, operative on real knowledge with even symmetry (since the Fourier rework of a true and even operate is real and even), wherever in some variants the inputand/or output knowledge ar shifted by [*fr1] a sample. DCT, is correspondingly usually referred to as merely "the inverse DCT" or "the IDCT". 2 connected reworks ar the separate circular function transform (DST), that is such as a DFT of real and odd functions, and also the changed separate cos rework (MDCT), that relies on a DCT of overlapping data[2][4]. With AN input image, x, the DCT coefficients for the remodeled output image, y, ar computed per Equation.1 shown below. within the equation, x, is that the input image having N x M pixels, x (m, n) is that the intensity of the component in row m and column n of the image, and y (u, v) is that the DCT constant in row u and column v of the DCT matrix[6]

$$.y(u,v) = \sqrt{\frac{2}{MN}} \propto_m \propto_n \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} \left\{ x(m,n) \cos \frac{(2m+1)u\pi}{2M} \cos \frac{(2n+1)u\pi}{2N} \right.$$

$$\propto_u = \begin{cases} \frac{1}{\sqrt{2}} & for\ u = 0 \\ 1 & for\ u = 1,2, \ldots \ldots M-1 \end{cases}$$

$$\propto_v = \begin{cases} \frac{1}{\sqrt{2}} & for\ v = 0 \\ 1 & for\ v = 1,2, \ldots \ldots N-1 \end{cases}$$

ARNOLD'S CAT MAP

Arnold's Cat Map could be a transformation that may be applied to a picture. The pixels of the image seem to be every which way rearranged, however once the transformation is continual enough times, the initial image can appear. For digital sq. image, distinct Arnold mapping will be bring home the bacon by victimization following equation[1].

$$\begin{pmatrix} x \\ y \end{pmatrix} = \left[\begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \right] mod\ N$$

The values of matrix employed in on top of equation are often used as key so solely same matrix will reverse the coding.

III. METHODOLOGY

The projected technique may be represented by the subsequent steps.

1. Three level DWT is performed on the host image for rotten it into four non-overlapping multi resolution constant sets: LL3, HL3, LH3 and HH3. as shown in th figure one

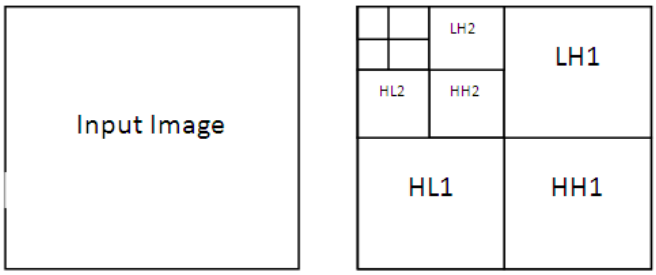


Figure 1: image with its moving ridge decomposition Blocks.

2. The watermark is resized and creates it up to as size of HH3.
3. The watermark is disorganised to a symptom with Arnold algorithmic rule for key times for ganing the disorganisedwatermark, key times are often seen as secret key.
4. DCT is performed on the disorganised watermark.
5. Diagonal mirroring of DCT coefficients are going to be performed.

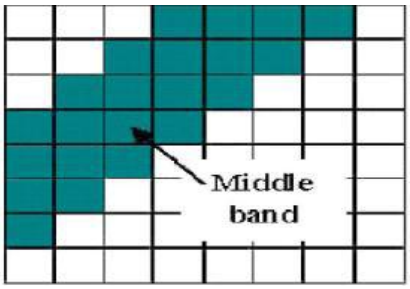


Figure 2: Mirroring of diagonal coefficients

6. The coefficients of reflected matrix are going to be scaled down by embedding issue.
7. The reflected coefficients matrix with HH3 is going to be replaced.
8. The 3 level IDWT are going to be performed to induce the watermarked image.
9. Perform three levels DWT of the watermarked image to retrieve the watermark then calculate the IDCT of HH3 block, at the moment perform the cat map decoding.
10. Perform the total procedure for all 3 (RGB) planes for the colour image.

IV. PERFORMANCE ANALYSIS

MSE (Mean square Error) and PSNR (Peak ratio Ratio) these measures area unit accustomed take a look at the performance of given algorithmic program for assess the qulity of watermarked image and original watermark. PSNR is that the magnitude relation between the utmost attainable power of a proof and also the power of corrupting noise that affects the fidelity of its illustration, several signals has a awfully wide dynamic vary, therefore PSNR is sometimes expressed in terms of the index sound unit scale.

The mean square error (MSE) is definitely outlined that for 2 mXn monochrome pictures I and K wherever one in every of the photographs is taken into account a loud approximation of the opposite is outlined as:

$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2$$

The PSNR is defined as:

$$PSNR = 10\log_{10}\left(\frac{MAX_I^2}{MSE}\right)$$

Here, the utmost potential constituent worth of the image - maxi. Once the pixels ar diagrammatic victimization eight bits per sample, this can be 255. The planned formula has been extensively tested on varied customary pictures. Table I summarizes the watermarking results.

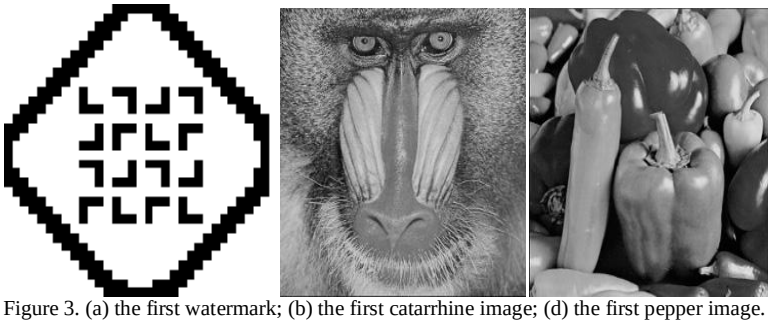
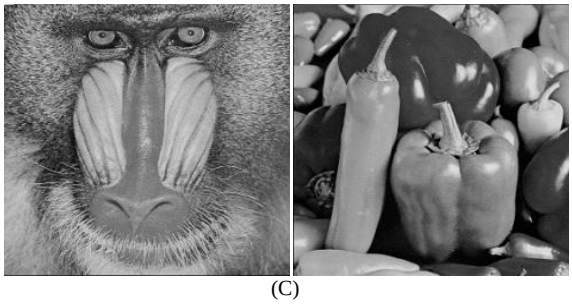


Figure 3. (a) the first watermark; (b) the first catarrhine image; (d) the first pepper image.

(A)

(B)



(C)

Figure 4. (a) the watermarked image victimization DCT; (b) the watermarked image victimization DWT; (c) the watermarked image victimization DCT-DWT

Image	PSNR with DCT	PSNR with DWT	PSNR with DCT-DWT
Barbara	49.02	91.5	92.0739
Baboon	35.57	91.5	92.3277
Peppers	49.02	91.5	92.0212

Table 1: Results for PSNR

Image	MAE with DCT	MAE with DWT	MAE with DCT-DWT
Barbara	0.0363	0.0371	0.0261
Baboon	0.0768	0.0888	0.0322
Peppers	00263	0.0361	0.0144

Table 2: Results for MAE

The results of attacks on watermarks indicate that there ar many issues which require to be resolved by vendors before watermarks will become a viable possibility for those people/organizations WHO wish to for good introduce proof of possession or the other information into their audio or image creations.

The problems that have got to be resolved by vendors are:

1. How effectively their image watermarking techniques will survive attacks by Stirmark, and different manipulation/transformation strategies once applied with intent to get rid of the watermark or just to edit it,
2. The basic downside that a lot of schemes offer no intrinsic manner of sleuthing that of 2 watermarks was more first: the method of marking is usually additive, or a minimum of independent. thus if the owner of the document d encodes a watermark w and publishes the marked version d + w and has no different proof of possession, a pirate WHO has registered his watermark as w' will claim that the document is his which the initial unmarked version of it absolutely was d + w − w'.
3. How effectively their audio watermarking techniques will survive the noise, MP3, echo removal and different strategies.

V. CONCLUSION

In this paper it's delineate, the watermarking technique is invisible and designed to take advantage of some aspects of the human sensory system this can be the most rison of recent developments within the digital watermarking of image. Several of those techniques square measure depends either on transparency (low-amplitude) or frequency sensitivity to make sure the mark's invisibleness. The physical property of the watermark is obtained additional in DWT as compare to DCT. From the results shown higher than it's evident that DWT is additional sturdy against attacks like cropping and resizing as compare to DCT and DCT-DWT is additional rhobust than each DCT and DWT.

References

1. Thi Hoang Ngan LE, Kim adorned Nguyen, Hoai Bac LE, "Literature Survey on Image Watermarking Tools, Watermark Attacks, and Benchmarking Tools", Second IEEE International Conferences on Advances in transmission, 2010, pp.67-73
2. Strong Blind Digital Image Watermarking mistreatment DWT and twin cryptography Technique, 2011 Third International Conference on procedure Intelligence, Communication Systems and Networks.
3. Strong Digital Image Watermarking supported Joint DWT-DCT Saeed K. Amirgholipour, Ahmad R. Naghsh-Nilchi
4. Santi Prasad Maity, Malay Kumar Kundu "Robust and Blind spatial Watermarking in Digital"Image"http://www.isical.ac.in/~malay/Papers/ Conf/ICVGIP_02_WM.pdf.
5. Abraham Nasir, Ying Weng, Jianmin Jiang "A New strong Watermarking theme for Color Image in spatial Domain"Signal- Image Technologies and Internet-Based System, 2007. SITIS '07. Third International IEEE Conference on 16-18 Dec. 2007.
6. Munesh Chandra, Shikha Pandel, Rama Chaudhary" Digital watermarking technique for safeguarding digital images"226-233, IEEE 2010.
7. Lijing Zhang, Aihua Li" strong watermarking theme supported singular price of decomposition in DWT domain"19-22, Asia-Pacific Conference on informatics IEEE 2009.
8. Apricot Jiansheng1, Li Sukang1 and Tan Xiaomei" A Digital Watermarking algorithmic rule supported DCT and DWT",104-107, International conference on net data Systems and Applications (WISA'09)2009.

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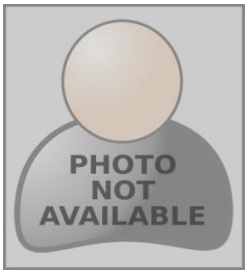

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