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EFFICIENT VISUAL CRYPTOGRAPHIC TECHNIQUE FOR GRAYSCALE IMAGES USING DWT AND WATERMARKING TECHNIQUE

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Abstract: Security places an important role in communication applications to secure the data transfers. Visual cryptography is most reliable technique in encryption and decryption of images. The paper proposes frequency domain visual cryptography technique using watermarking. The proposed approach uses DWT to transfer spatial domain to frequency domain. The LL band segment is used for further visual cryptographic process. The image is decoded using inverse DWT with high quality image. The proposed technique obtains high PSNR of 52.6391dB for Lena image

Keywords: DWT, Visual Cryptography, Watermarking, etc.

1.INTRODUCTION:

Security is an important issue in communication and storage of images in present era. A variety of encryption scheme have been proposed to ensure security of data. Image encryption has wide applications in internet communication, multimedia systems, medical imaging, telemedicine, military communication, etc [1].Cryptography is used to achieve confidentiality (amongst others) in transmission and storage of data. Traditional cryptographic schemes employ complex operations for encryption as well as decryption. In visual cryptography, the decryption is completely performed by the human visual system. This approach is very promising and user-friendly technique for security issues. However, Visual Cryptography is used to hide and carry secret information confidentially. Visual cryptography scheme is a secret sharing technique used for encrypting binary images. It splits a binary image into n shares, and gathering more than k shares can recover the secret image where k is the minimum shares required to recover the secrete image [2]. Watermarking is the technique of embedding a secret image into a cover image without affecting its perceptual quality so that secret image can be revealed by some process. One significant advantage of watermarking is the inseparability of the watermark (secret image) from the cover image. Watermarking schemes can be applied to video, audio and image based on the

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application [3].Watermarking schemes are done by following methods: spatial-domain watermarking schemes and frequency-domain watermarking schemes. In a spatial domain watermarking scheme, the watermark is embedded by directly modifying the spatial characteristics, such as pixel values and statistical traits. In contrast, frequency-domain watermarking schemes first transform an image into frequency domains, such as discrete Fourier transform (DFT), discrete cosine transform (DCT), and discrete wavelet transform (DWT), Fourier Mellin transform (FMT), Fractal transform etc. The watermark is then embedded by altering the frequency coefficients [4].

2 . PREVIOUS APPROACH:

A. DWT TECHNIQUE:

Discrete wavelet transform is a mathematical tool for representation of multi resolution images to view the image's spatial and frequency characteristics. Wavelets are special functions which are used as basal functions for representing signals. The discrete wavelet transform (DWT) used in this paper is Haar-DWT, the simplest DWT. Using Haar wavelet transform, an image I of size $M0\times N0$ pixels is decomposed into four sub bands $LL1$, $LH1$,$HL1$ and $HH1$ having size $M\times N$. The sub band $LL1$, which represents the course overall shape is the low frequency component, which contains the most of the energy of the image. The sub bands labeled $LH1$, HL1, and $HH1$ contain the higher frequency detail information.The first four Haar sub bands are represented by the following equations:

$$LL1(i,j) = \frac{1}{4}\sum_{x=0}^{1}\sum_{y=0}^{1} I(2i+x,\ \ 2j+y) \quad (1)$$

$$LH1(i,j) = \frac{1}{4}\sum_{x=0}^{1} I(2i+x,\ \ 2j) - \frac{1}{4}\sum_{x=0}^{1} I(2i+x,\ \ 2j+1) \quad (2)$$

$$HL1(i,j) = \frac{1}{4}\sum_{y=0}^{1} I(2i,\ \ 2j+y) - \frac{1}{4}\sum_{y=0}^{1} I(2i+1,\ \ 2j+y) \quad (3)$$

$$HH1(i,j) = \frac{1}{4}\{I(2i,2j) + I(2i+1,\ \ 2j+1)I(2i+1,\ \ 2j) - I(2i,\ \ 2j+1)\} \quad (4)$$

where $I(i,j)$ is the pixel value at the coordinate i,j of I and $LL1(\ i,j)$, $LH1(i,j)$, $HL1\ (i,j)$ and $HH1(i,j)$ are the coefficients at the coordinates of the sub bands $LL1$,$LH1$,$HL1$and $HH1$ respectively[4].

B. VISUAL CRYPTOGRAPHY:

Visual Cryptography (VC) was first introduced by Moni Noar and Shamir at Eurocrypt 1994. Visual cryptography is a new technique which provides information security which uses simple algorithm unlike the complex, computationally intensive algorithms of traditional cryptography. This technique allows Visual information (pictures, text, etc) to be encrypted in such a way that their decryption can be performed by the human visual system, without any complex cryptographic algorithms. This technique encrypts a secret image into shares such that stacking a sufficient number of shares reveals the secret image. Using secret sharing concepts, the encryption procedure encrypts a secret image into the shares(printed transparencies) which are

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noise like secure images which can be transmitted or distributed over an untrusted communication channel.VC technique can be applied for binary images, grayscale and color images.

C. Watermarking:

Watermarking is "Hiding of a secret message or information within an ordinary message and the extraction of it at its destination!"Some of the vital characteristics of the watermark are: hard to perceive, resists ordinary distortions, endures malevolent attacks, carries numerous bits of information, capable of coexisting with other watermarks, and demands little computation to insert and extract Watermarks. Generally, robust watermarking is used to resist un-malicious or malicious attacks like scaling, cropping, lossy compression, and so forth.

Watermarking techniques categorized based on the embedded data (watermark) are: visible and invisible. With visible watermarking of images, a secondary image (the watermark) is embedded in a primary image in such that it is perceptible to a human observer, whereas the embedded data is not detectable in case of invisible watermarking; nevertheless, it can be extracted by a computer program [6].

3.FINE-GRAINED METHOD:

The Grayscale secret image is transformed using DWT technique to reduce its dimensions. The reduced secret image is subjected to Visual Cryptographic method. This results in the formation of four Shares. Each of the shares embedded onto the different cover image using LSB watermarking technique. This avoids cheating attacks of the shares.During the Decryption phase, the shares from each watermarked images are extracted using watermark retrieval technique. The four shares are combined using Visual Cryptography decryption technique to recover back the original image. Inverse DWT is applied to decompress the recovered image. Hence original image is reconstructed.

A. EMBEDDING ALGORITHM

Input: Grayscales Image (Ig).

Output: 4 Watermarked shares. Subject the Input Image to DWT compression technique to reduce the dimension to half the size of the original image. In the proposed method we encrypt the Secret Image into 4 shares in such a way that every pixel in the

Secret image is represented by a 16 pixels in each of the 4 shares formed. The shares formed are themselves binary images.

Divide each pixel value of the image by 4.The image pixel value ranges from 0-63.

For each pixel value of the image, generate 4 random numbers between the ranges 1-16.

For each random number generate 16 pixels of binary values.

Watermark the 4 shares onto different cover images. The size of the cover image and shares should be same. The watermarking method replaces the LSB of every pixel of the grayscale cover image by the pixel bit value of the share at the same position. Thus 4 watermarked shares are formed.

B. EXTRACTING ALGORITHM

Input: 4 Watermarked shares.

Output: Recovered input image (Ig).

1. Extract the LSB bit of every pixel of watermarked image and generate the shares.

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2. In each Share, consider 16 pixels and count the number of black pixel. Add the pixel value and multiply by 4.

Repeat the process for whole share and generate the image.

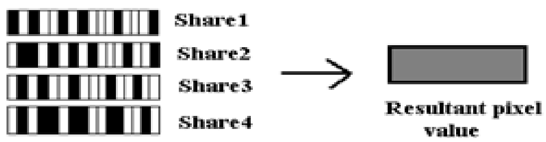

Figure 4 : Formation of resultant pixel value from four shares.

In the above example, the Total Number of Information pixels (black) present in all four shares combined is:

$$6+7+5+8=26$$

Thus Resultant pixel value = 26 * 4 = 104

3.Apply inverse dwt to the image to recover the original image (Ig).

C. BLOCK DIAGRAM

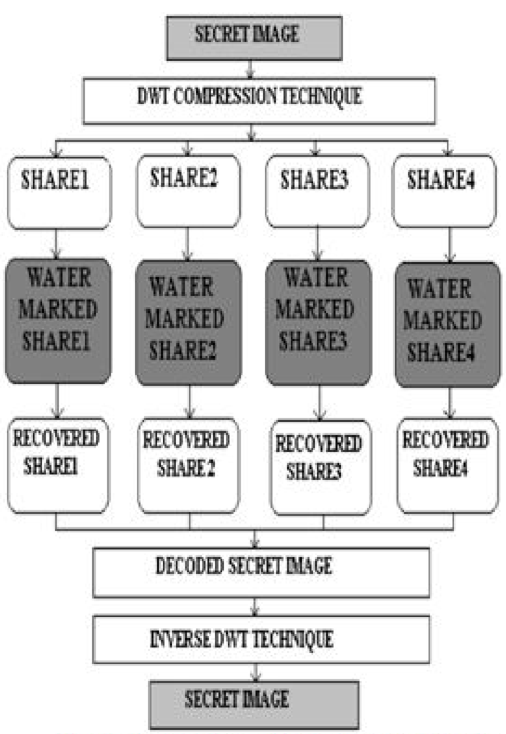

Figure 5 : Structure of the proposed scheme.

CONCLUSION:

It will be the concept behind the strategy in real time is to explore and exploit semantic link in the use of one of the databases through retai relating to the relationship and deal with the same manageable flat structure to reduce the processing delays in Much of the period, incurring small accuracy in the search for data loss is acceptable. This document proposes a plan in almost real time, known as RTS, to help analyze effective and affordable data within the cloud. Our design reduces the expense of existing systems to identify the similarity of files through the use of sensitive segmentation. Friendly namespace Due to the length of the linked list variable, it is likely that LSH HASH tables produce unbalanced loads and perform an unexpected query from vertical headers.

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