

Privacy Preserving Image Transmission Using Random Pattern Mosaic Images Steganography - Survey

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Abstract— In today’s digital world, privacy concerns for data over the internet have increased. In many communications we transmit digital images and these images contain confidential information. Making is vulnerable towards unauthorized personals attacking the image and leaking our information which demands higher privacy. So, there are a number of methods available for achieving this privacy, one of them being Steganography. This make use of Mosaic image creation which has two distinct techniques, DWT (Discrete wavelet Transform) and DCT (Discrete Cosine Transform). The cover image is arbitrarily selected and uses of this image to hiding of the secret image. Secret image and cover image is split into tiny fragments called tile image and target block respectively. A secret image hiding scheme is proposed with new security features. This scheme utilizes the mosaic images, which is created from the secret and target images. A mosaic image is similar to that of the target image. The secret image fragments are hidden in the target image by performing appropriate color transformations. In these paper we are describe different types of watermarking techniques and differentiate using advantage and disadvantages for future research direction.

Keywords— Steganography, Mosaic Image, DCT (Discrete Cosine Transform), DWT (Discrete Wavelet Transform).

I. INTRODUCTION

In today’s scenario the digital world is fully depended on the internet. Majority of the work is performed on the internet. Sharing of the information is based on different images and these images contain information relating to education, confidential military data, business data, etc. thus, maintaining security of this information is a very important task [1].

Steganography is technique of hiding the secrete message within an ordinary message and extracting it at its destination. Anyone else viewing the message will fail to know that it contains a secret or some encrypted data. There are two kinds of steganography by domain namely, Domain Frequency and Spatial Domain. Frequency Domain uses signal analysis on the cover. Discrete wavelet Transform (DWT) is a technique that is widely used in Frequency Domain Pattern. DCT is commonly used for multimedia (i.e. image/video) compression. The discrete cosine transform (DCT) helps separate the image into parts with respect to the image’s visual quality (high/low) and middle frequency components.

The mosaic imaging is the main method in this technique. Mosaic is the kind of art in which small piece of material such as glass or stone is composed together to form a single image called as mosaic. Creation of mosaic by computer is a new research area now days. Different mosaics can be created from a single image depending on their choice of tiles and their placement in the resulting image. There are different

types of mosaic that divide the secret image into tiles and then reconstruct the image by properly painting the tiles. These types of mosaic can also be called as tile mosaic [4].

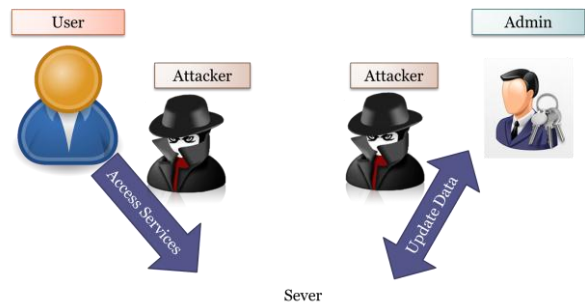


Figure 1. Network Scenario

Section I contains the introduction of basic approach for weather forecasting. II contain the related works of basic literature papers. Section III contain the methodology and algorithms section IV explain the comparative study between different algorithms, and at last conclusion and future scope.

II. RELATED WORK

Mr. Indrajeet Phutane and Dr. Sanjay Nalbalwar published a paper to improve the security of data hiding. They researched on today’s digital world and its digital data stating that all the work performed is fully depended on the internet

and that data transferred over the internet faces a major problem of an unintended person or any attacker to interfere on this communication and steal confidential information. So, a number of methods are used to hide the data but they talk about a new technology called mosaic image creation. In the mosaic image creation, images are fragmented into the different tiled blocks and then secretly hide another image into this tiled block so that the receiver side can decrypt this mosaic image using some key to obtain the original secure data. A secure image transmission technique is also utilized to protect confidential data that is being transmitted over the internet. Their research is protecting the data during its transmission and they created the mosaic image which has new set of pixel values which look almost the same as the target image [1].

Ya-Lin Lee and Wen-Hsiang Tsai also proposed the use of transforming the secret image into the target image by using mosaic image creation along with maintaining the different blocks to match between the target image and secret image by applying different colour models on both fragmented images. Fragmenting the secret image and transforming their colour characteristic to be those of the corresponding blocks of the target image was one of the main methods in their work. In the paper the colour transformation is done on RGB colour model. They recover the original image at receiver side without degrading the created mosaic images [2].

Anitha Devi and K B Shivakumar are discussing on new novel technique of fragmenting visible mosaic images. In their work the secret image is fragment into different tiles and then transformed by a colour which is similar to the target image and the transforming colour characteristic of individual fragments of secret image is in accordance with corresponding blocks of the cover image. In the next step fragmented image is created by partitioning the pay load and cover image transformation into tiles and sorting them in accordance with mean and standard deviation values of individual tiles. To evaluate effective result the peak signal to noise ratio and correlation factor have been used as various parameter [3].

Saravanan Chandran and Koushik Bhattacharyya have introduced a digital watermarking used for maintaining copyright information of the digital media. Digital watermarking is used for embedding information into the media files. The media file should be image, audio, video or text. In this paper two types of security are shown, cryptography and steganography. Cryptography hides the content of the secret image where steganography is hiding the message in media effectively. They are also analyzing performance of the Least Significant Bit (LSB), Discrete Cosine Transform (DCT), and Discrete Wavelet Transform (DWT). After the performance analysis they conclude that DCT algorithm is more suitable in comparison to LSB and DWT based algorithm [4].

Shahanaz N and Greeshma R are proposing a secret image hiding scheme with new security features. This feature

utilizes the mosaic image which is created from the secret and target image. The secret image fragments are hidden into the target image by performing appropriate color transformation. And after apply color transformation at the receiver side they apply inverse color transformation for the lossless recovery of secret image. Moreover, this color transformation is controlled by the proper underflow or overflow methods. With the use of specific keys secret image is retrieved from the mosaic image [5].

Tamanna and Ashwani Sethi talked about the data hiding scheme with the use of image steganography. Steganography is the process of transporting important information from just one destination to some other location by using general public network as part of stealth way. Steganography is to hide one image or information into another different image. In addition to this their technique includes a different method to used steganography on the secure data or information. And three different technique are used in their research to provide security to the data namely, LSB, DCT and DWT respectively [6].

III. METHODOLOGY

In the latest technological developments all the organizations and companies have a variety of procedures and methods to ensure the privacy and confidentiality of the information shared over the Internet. Considering our research topic, DWT and DCT are the methods selected for providing such security.

A. Discrete Wavelet Transform (DWT)

Discrete Wavelet Transform (DWT) is a method that is used to analyze the signal in the cover. There are two types of wavelet filtering, Low pass Filter (LPF) and High pass Filter (HPF), which produce four sub-bands that contain coefficient wavelet values, such as, LL- Horizontally and vertically low pass; LH- Horizontally low pass and vertically high pass; HL- Horizontally high pass and vertically low pass; HH- Horizontally and vertically high pass.

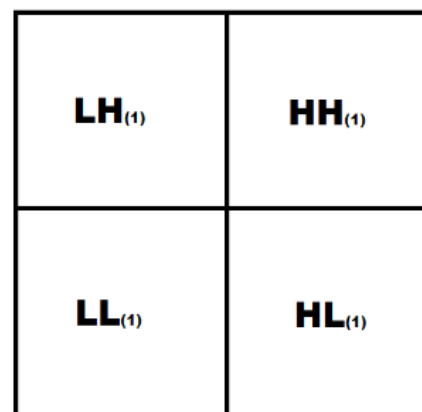


Figure 2 . 1-level sub band of 2-D DWT

Figure 1 shows the simple 2 phase decomposition of image using DWT.

B. ERROR METRICS

The following two error metrics are used in the performance analysis.

a) Mean Square Error

It is defined as the square of error between cover image and stego image. The distortion in the image can be measured using MSE.

$$MSE = \sum_{M,N} \frac{[I1(m,n) - I2(M,N)]^2}{M * N}$$

Where, M and N are the number of rows and column in the input image.

b) Peak Signal to Noise Ratio

It is the ratio of the maximum signal to noise in the stego image.

$$PSNR = 10 \log_{10} \frac{256^2}{MSE}$$

PSNR is measured in decibels (dB). PSNR is a good measure for comparing restoration results for the same image.

C. Discrete Cosine Transform (DCT)

Discrete Cosine Transform (DCT) separates the image into parts of differing importance (with respect to the image's quality). The DCT transforms a signal or image from the spatial domain to the frequency domain.

The general equation for a 1D (N data items) DCT is defined by the following equation.

$$c(u) = a(u) \sum_{i=0}^{N-1} X_i \cos\left(\frac{(2i + 1)u\pi}{2N}\right)$$

Where u=1, 2, 3...N-1.

The general equation for a 2D (N*M image) DCT is defined by the following equation.

$$c(u) = a(v) \sum_{i=0}^{N-1} \left[a(u) \sum_{j=0}^{M-1} X_j \cos\left(\frac{(2i + 1)u\pi}{2N}\right) \right] * \cos\left(\frac{(2i + 1)v\pi}{2M}\right)$$

Where u, v = 1, 2, 3.....N-1.

Here, the input image is of size N*m. C (i, j) is the intensity of the pixel in row i and column j; C (u, v) is the DCT coefficient in row u and column v of the DCT matrix.

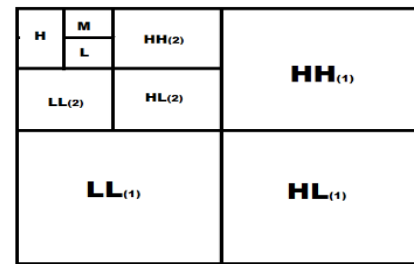


Figure 3: Combination of DWT and DCT Technique

IV. PROPOSED METHOD

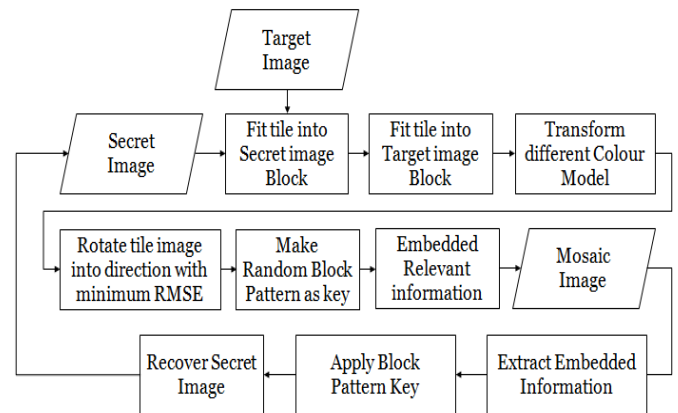


Figure 4: Overview of Proposed System

The Overview of the proposed system is shown in fig.3. The proposed method includes two main phases: 1) mosaic image generation and 2) secret image recovery.

In the first phase a mosaic image is generated, which consists of the fragments of an input secret image with modified colour properties that of the target selected. In the phase the steps performed are: 1) fitting of the secret tiles into target blocks, 2) transferring color characteristics of each line image in the secret image to become that of the corresponding target block in the target image; 3) rotating extracted to recover the secret image losslessly. The Phase includes two stages: (i) extracting the embedded each tile image to find the maximum match with target with respect to smallest RMSE value; and (ii) embedding relevant information in to the mosaic image for the future recovery of the secret image.

V. COMPARATIVE STUDY

➤ DCT

Pro - The watermark is implanted into the constants of the mid frequency, hence the reflectivity of any image will not be get altered, the watermark will not be able to be distant by any kind of attacks.

Cons - The method Block-DCT destroys the invariance attributes of system.

During the quantization step higher frequency components to be compressed.

➤ DWT

Pro – DWT method allows very good localization in the domains time and spatial frequency.

The looseness ratio is higher in relevance of human perception.

Cons – computing cost can be higher.

Compression time can be longer.

Can be seen noisy or blurred edges of images and video frames.

VI. CONCLUSION

In this paper, provide the better security to transfer a data into images. Create the mosaic image with the use of secret image and target image and fragment both images then transform Color model to match the tile with target image tile, and at the receiver side obtain that image using some special key. In feature using hybrid approach DWT-DCT will give batter results and also prevent against geometric attacks.

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