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Secure Transmission of Secret Image using Mosaic Image

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ABSTRACT: For various applications from various sources, images are frequently used and are transmitted through the internet, in such cases the security of the transmitted data through internet is quite important, these transmitted images may contain private or confidential information so that they should be secured from the leakages and hackers during transmission process, in order to achieve this many data secure techniques and methods have been proposed to ensure security of information being transmitted through internet. In this paper a technique for secure image transmission is done through transform a secret image using mosaic fragment visible images with the size almost the same and similar to the target image. As will randomly select the target image, Mosaic image should look similar to target image, which will be used to hide the secret image. In this proposed paper will use secret fragment visible mosaic image method, which is automatically created by composing small fragments of a given image to become the target image in mosaic form, in order to achieve effect of embedding the given image visibly but secretly in the resulting mosaic image. For resulting mosaic image will perform reversible color transmission in order to reduce distortion and also to recover the secret image exactly from the cover/input image. Good experimental results demonstrate the feasibility and effectiveness of the proposed method.

KEYWORDS*:* Mosaic image, secret fragment visible mosaic image, reversible color transformation.

I. INTRODUCTION

In recent years data hiding has been proposed as a likely technique for the motive of information privacy, authentication, fingerprint, protection, data mining, and copyright protection and etc. For various applications from various sources, images are frequently used and are transmitted through the internet, in such cases the security of the transmitted data through internet is quite important, these transmitted images may contain private or confidential information so that they should be secured from the leakages and hackers during transmission process, in order to achieve this many data secure techniques and methods have been proposed to ensure security of information being transmitted through internet. In field of digital image processing and Image Based Technique from last few years mosaic image has emerged as a very powerful technique. To mosaic an image is to mix overlapped graphics so that the combined image includes no obstructive boundaries in the transition region whilst maintaining the general appearance of the original images. In this paper we propose a new method that generates mosaic images with large database, further will compare both secret and target image and find the most similar target image. Firstly target image is selected, the given secret image is then divided into rectangular tiles, which then are fit into similar blocks in the target image according to a likeness criterion based on color variations. Next, to the corresponding block in the target image the color characteristics of each fragment tile image is transformed, resulting in a secret mosaic image which looks like the selected target image. This type of target image can be used for securing of a secret image in camouflage of any pre-selected target image.

A secret mosaic image is an image constructed by separating a given secret image into small tiles and transmitting these tiles of secret image in disguise of another image called as carrier image. The resultant mosaic image is such that it embeds the source image secretly such that all the fragments of the secret image are visible to user but they are so tiny in size and random in position such that the observer cannot able to guess or figure out how the secret image or source image would looks like. Thus the resultant mosaic image can be used for covert communication or for secret image transmission. In this proposed paper will use secret fragment visible mosaic image method, which is automatically

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created by composing small fragments of a given image to become the target image in mosaic form, in order to achieve effect of embedding the given image visibly but secretly in the resulting mosaic image. For resulting mosaic image will perform reversible color transmission in order to reduce distortion and also to recover the secret image exactly from the cover/input image. Good experimental results demonstrate the feasibility and effectiveness of the proposed method.

II. RELATED WORK

K.Naga Jyothi al.[1] has proposed An Algorithm Based On Secret-Fragment-Visible Mosaic Images For Secure Image Transmission Using Pixel Color Transformations. By using this pixel color transformation helps to get the lossless recovered image based on the untransformed color space values. Key generated in the code also helps to get the lossless data from the secret image. This same approach is performed on the videos to get the lossless data from the motion related videos. S.Merlinet al.[2] has proposed Covert Image Transmission Technique Using Mosaic Image measures. They used secret-fragment-visible mosaic image technique with nearly reversible color transmission scheme. The secret and target images of same size are used. The division of both images are matched according to the standard deviation of the division. To ensure a positive standard deviation for the secret image, a pseudorandom gaussian noise signal is added to the secret image. The experimental results show that the presented method has high embedding rate of with least distortion. Deepak.A.B.C et al. [3] has proposed have implemented an approach for image authentication in disguise of another image using color transformation technique and mosaicking image. They have considered simple LSB substitution for hiding data required for image recovery in the receiver side.
Shabana Vathelil Subair et al. [4] has proposed hiding of the secret image by color transforming their characteristics similar to the blocks of the target image. Such technique is necessary so for the lossless recovery of the transmitted secret image. The appropriate information is embedded into the mosaic image for the recovery of the transmitted secret image. Jaya.S et al. [5] has proposed a secure mosaic image transmission by reversible integer color transformation technique A scheme of handling the overflows or underflows in the converted pixels color values by recording the color differences in the untransformed color space is also proposed. The efficiency of the image recovered after transmission is also calculated in order to check the performance of the proposed technique. The proposed method is applied to database as well as real time image. A concept of tethering is used in order to extend the limitations of the proposed method.

III. PROPOSED SYSTEM

Figure1 represent the proposed architecture. In this section the method for the creation of secret fragment visible mosaic image is given; the detailed system architecture of creating mosaic image is shown in fig 1(a). Firstly user has to select the secret image and any random image of their choice as target image, in order to avoid suspicion it is advised to select target image of same field or background as that of secret image. Next, resize the secret and target image by apply pre-processing to both the secret and target image in order to check whether target and secret image is of same size. The next step is to divide the source image into small pieces called as tiles. For creating secret fragment visible mosaic image by proposed algorithm there is requirement that the number of blocks of target image should be same in size and number to that of secret image. So we divide both the target image and secret image by using same splitting technique.
The main problem in the splitting technique is how to choose a appropriate divided blocks of target image for each of the tile of secret image, in order to make it easy will calculate the mean of standard deviation of the pixels of the block as a similarity measure value to select most appropriate block B for each of the tiles T of secret image. Next, in order to create the mosaic image will use sorted sequence of standard deviation to form resultant image. That is we fit the firs tile in sequence Stile into the first block in sequence Starget, and accordingly fit the second tile in Stile to second block in Starget and process continues. In this way will keeps on fitting each of the tile T of secret image to form resultant mosaic image. It will look somewhat similar to the selected target image. Thus will get the noise free mosaic image , his will use to recover the secret image.
Figure 1(b) represents the proposed architecture for recovery of secret image. As the target and secret image color characteristics are different from one another it may happen that the resultant mosaic image may contain some distortion due to its color differentiations. So to reduce this distortion reversible color transformation is proposed so that the resultant mosaic image should look identical to that of target image. After transforming color characteristics of target and secret image, in order to enable better fitting of tile block to that of target block , we have to rotate resulting mosaic

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image with minimum RMSE i.e. (root mean square error) value with respect to target image. Finally we can recover the secret image in better efficient way.

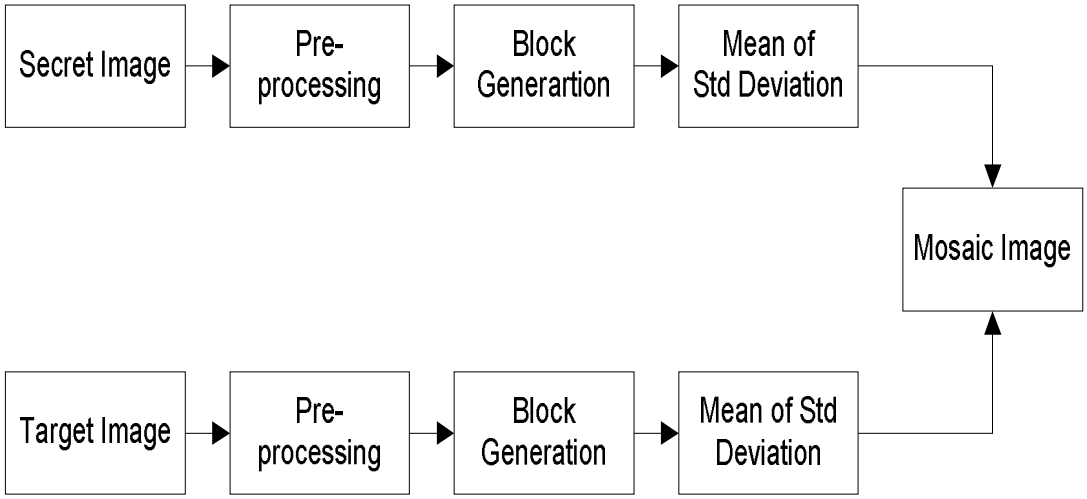

Figure 1(a): Block Diagram of Proposed Architecture for creating Mosaic Image

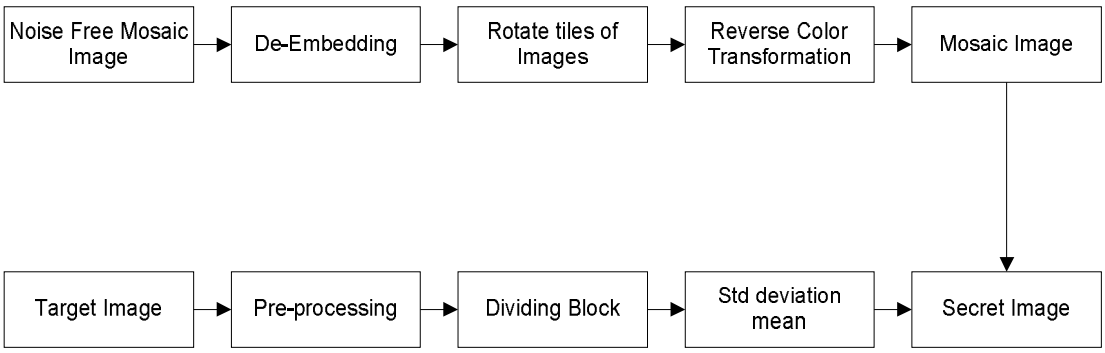

Figure 1(b): Block Diagram of Proposed Architecture for Recovery of Secret Image

Figure 1: Block Diagram of Proposed Work

A. Creation of Mosaic Image

Pre-processed secret and target image is divided into small pieces called as tiles. For creating secret fragment visible mosaic image by proposed algorithm there is requirement that the number of blocks of target image should be same in size and number to that of secret image. So we divide both the target image and secret image by using same splitting technique. The main problem in the splitting technique is how to choose a appropriate divided blocks of target image for each of the tile of secret image, in order to make it easy will calculate the mean of standard deviation of the pixels of the block as a similarity measure value to select most appropriate block B for each of the tiles T of secret image. Next, in order to create the mosaic image will use sorted sequence of standard deviation to form resultant image. That is we fit the first tile in sequence Stile into the first block in sequence Starget, and accordingly fit the second tile in Stile to second block in Starget and process continues. In this way will keeps on fitting each of the tile T of secret image to form resultant mosaic image. That will looks somewhat similar to the selected target image. Thus will get the noise free mosaic image , his will use to recover the secret image.

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B. Reverse Color Transformation

As the target and secret image color characteristics are different from one another it may happen that the resultant mosaic image may contain some distortion due to its color differentiations. So to reduce this distortion reversible color transformation is proposed so that the resultant mosaic image should look identical to that of target image.

For color transformation, let us consider T and B as two pixel sets described by $\{P_1, P_2, P_3 \dots \dots \dots P_n\}$ and $\{P_1, P_2, P_3 \dots \dots \dots P_n\}$ respectively, where T is used to represent secret image block and B is used to represent target image block. Let us further consider that each pixel P_i is represented by color (r_i, g_i, b_i) and each pixel P_i' is represented by color (r_i, g_i, b_i). Next we have to compute mean and standard deviation of T and B respectively by using formula given below.

$$\mu_c = \frac{1}{n}\sum_{i=1}^{n} C_i \quad ,\mu_c' = \frac{1}{n}\sum_{i=1}^{n} C_i' \tag{1}$$

$$\sigma_c = \sqrt{\left(\frac{1}{n}\sum_{i=1}^{n}(C_i - \mu_c)^2\right)}$$

$$\sigma'_c = \sqrt{\left(\frac{1}{n}\sum_{i=1}^{n}(C'_i - \mu'_c)^2\right)} \tag{2}$$

Where in this equations $C_i$and C'_idenotes C channel values of each pixel $P_i$and P'_i respectively, with c= r, g, or b and C= R, G, or B. In next step we have to compute new color (r''_i, g''_i, b''_i) for each P_i in T by using formula given below

$$C_i'' = q_c\,(C_i - \mu_c) + \mu_c' \tag{3}$$

Where qc is the standard deviation coefficient calculated by using $\left(q_c = \frac{\sigma_c'}{\sigma_c}\right)$ and c = r, g, or b. Now to compute original color value that is (r_i, g_i, b_i) of P_i we have to use inverse of (3) which is given by

$$C_i = \left(\frac{1}{q_c}\right)(C'_i - \mu'_c) + \mu_c \tag{4}$$

After performing color transformation by using formula given in above section it may be possible that new tile T' obtained after color transformation contain some pixels that might have overflow/underflow values. We have to deal this overflow/underflow values for that we have to convert all the pixel values above than 255 to 255 and pixel values less than zero to zero. To recover the color of original tile block T we have to record residual value that is the difference between original pixel value and converted one and record them as well.

C. Rotating Blocks to Allow it to Fit Better

As the target and secret image color characteristics are different from one another it may happen that the resultant mosaic image may contain some distortion due to its color differentiations, so to reduce this distortion reversible color transformation is done. After transforming the color characteristic of secret image tile T to that of corresponding target block B, to further improve the color characteristic and to enable better fitting of tile block T to that of target block B, we have to rotate resulting tile image T' yielded after color transformation into one of four directions i.e. 0°, 90°, 180°, 270° and compute the RMSE values Rotate tile into the optimal direction with the smallest RMSE value which yield rotated version of T' with minimum RMSE i.e. (root mean square error) value with respect to target image .

IV. EXPERIMENTAL RESULTS

Below figures show the experimental results of our proposed work. Fig.2 (a) is the cover image, which is considered as input image, along with the binary converted secret message. This image is converted into gray scale image shown in Fig.2(b) this gray scale image is enhanced by using Fuzzy Histogram Equalization method , then the resulting image is shown in Fig(c) along with the binary converted secret message is embedded by applying LSB technique to get embedded image shown in Fig.2(d), then the whole embedded image has to subjected to extraction process i.e. similar to the embedded process by applying LSB technique, lastly will get an extracted image which contains our secret message. So from proposed algorithm will get most accurate results when compared with other conventional methods.

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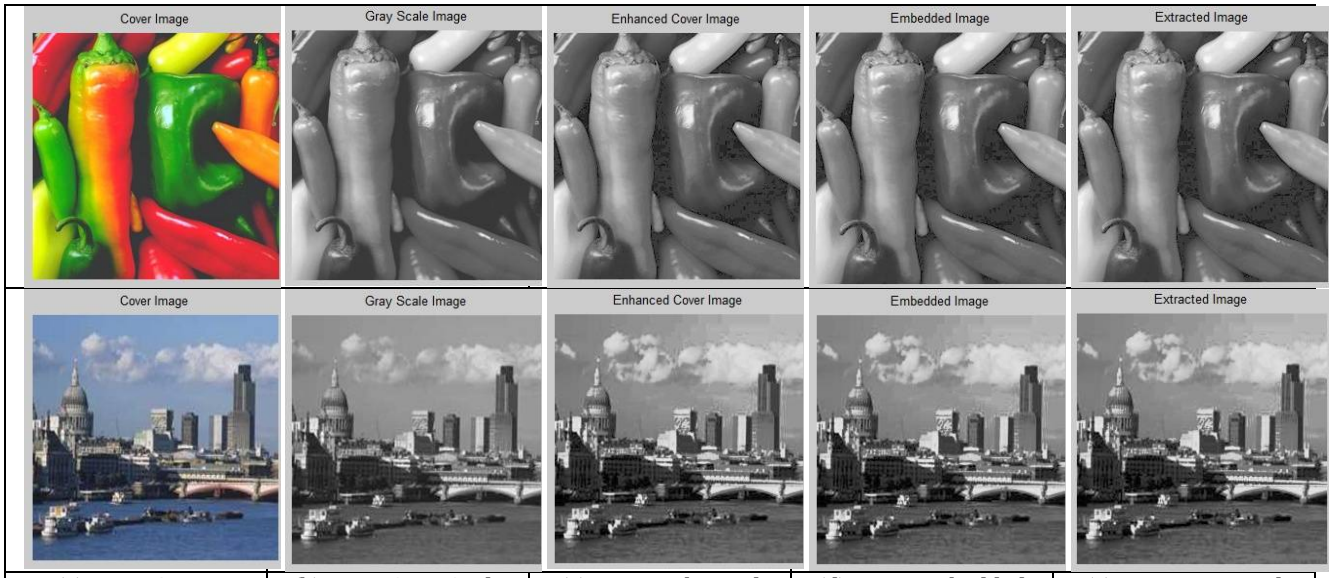

(a) Cover Image	(b) Gray Scale Image	(c) Enhanced Cover Image	(d) Embedded Image	(e) Extracted Image

Fig.2 Results of proposed Work.

IV. CONCLUSION

A new method for creation of secret mosaic image has been proposed in this paper. This technique allows user to select any target image of his their choice to create mosaic image and also user can select secret image and target image of almost the same size to create mosaic image. The resultant mosaic image can be used for securing the information being transmitted. The resultant mosaic image is used to recover the secret image without any distortion. In order to minimize root mean square error we implemented reversible color transformation on mosaic image and rotate tiles of mosaic image. The original secret image can be recovered nearly lossless from the created Mosaic images. Future studies may be directed to applying the proposed method to images of color models other than the RGB.

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