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A Reversible Color Transformations Based On Secret Fragment Visible Mosaic Digital Images

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ABSTRACT:

A mosaic image generation and transmission technique is planned, that transforms mechanically a given secret image into target image - referred to as secret – fragment - visible mosaic image of an equivalent size. The mosaic image, that appearance kind of like associate degree haphazardly chosen target image and will be used as a secret image, is yielded by dividing the key image into fragments and reworking their color characteristics to be those of the corresponding blocks of the target image. skillful techniques area unit designed to conduct the color transformation method in order that the key image could also be recovered nearly lossless. A theme of handling the overflows/underflows within the born-again pixels' color values by recording {the color|the color} variations within the untransformed colour area is additionally planned. information} needed for sick the key image is embedded into the created mosaic image by a lossless data concealment theme employing a key. Finally an equivalent approach may be performed on videos additionally that helps to eliminate the unsteady whole to realize the lossless information recovery in motion connected videos. The experimental results show smart strong behaviour against all incidental and accidental attacks and compare to the traditional algorithms.

Keywords:

Steganography, Data hiding, Image encryption, Secret Fragment Mosaic Image, reversible contrast mapping.

INTRODUCTION:

These days' pictures area unit a lot of often transmitted through the net from one supply to alternative, as a purpose of on-line photograph, documents storage, medical pictures, some confidential information and in the main military data.

there's no security for this to safeguard them from outflow or information harm. To secure this information loss there area unit 2 projected image transmission ways, image secret writing and information concealing. Image Secret writing could be a technique to urge associate degree encrypted image supported Shannon's confusion and diffusion properties. The encrypted image could be a noise image in order that nobody will acquire the key image from it unless they need the proper key. But, the encrypted image could be a empty file, that cannot offer any data before cryptography. To avoid this downside is information concealing that hides a secret message into {a cover|a willopy} image in order that nobody can apprehend the existence of the key information.

This technique causes the distortion of the result image inflicting the payload of the quilt image. If one needs to cover a secret image into a canopy image with identical size, the key image should be extremely compressed prior to. during this paper, a brand new technique for secure image transmission is projected, that transforms a secret image into a purposeful mosaic image with identical size. This method is controlled by a secret key, and solely with the key someone will recover the key image with none loss of information from the mosaic image. The mosaic image is that the results of arrangement of the fragments of a secret image in disguise of another image referred to as the target image.

FIGURE1. Result yielded by the proposed method. (a) Secret image of size (256*256). (b) Target image of size (256*256). (c) Secret-fragment-visible mosaic image of size (256*256) created from (a) and (b) by the proposed method.

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As associate degree illustration, Fig. one shows a result yielded by the projected technique. Specifically, when a target image is chosen willy-nilly, the given secret image is 1st divided into rectangular fragments referred to as tile pictures, that then area unit work into similar blocks within the target image, referred to as target blocks, per a similarity criterion supported color variations. Next, the colour characteristic of every tile image is reworked to be that of the corresponding target block within the target image, leading to a mosaic image that sounds like the target image.

The projected technique is new in this a purposeful mosaic image is made, in distinction with the image secret writing technique that solely creates empty noise pictures. Also, the projected technique will rework a secret image into a disguising mosaic image while not compression, whereas {a information|a knowledge|an information} concealing technique should hide a extremely compressed version of the key image into cowl|a canopy} image once the key image and therefore the cover image have identical data volume.

RELATED WORKS:

In the 1st part, a mosaic image is yielded, that consists of the fragments of associate degree input secret image with color corrections per a similarity criterion supported color variations.

The part includes four stages:
1.Fitting the tile pictures of the key image into the target blocks of a preselected target image.
2.2. reworking the color characteristic of every tile image within the secret image to become that of the corresponding target block within the target image.
3.3. Rotating every tile image into a direction with the minimum RMSE price with relation to its corresponding target block and
4.4. Embedding relevant data into the created mosaic image for future recovery of the key image.

In the second part, the embedded data is extracted to recover nearly lossless the key image from the generated mosaic image.
The part includes 2 stages:
I.Extracting the embedded data for secret image recovery from the mosaic image, and
II. sick the key image victimization the extracted data.

PROPOSED METHOD:

The method undergoes 2 phases such as: Generation of Mosaic Image and Secret Image Recovery. the subsequent flowchart shows the 2 phases thoroughly (fig 2).

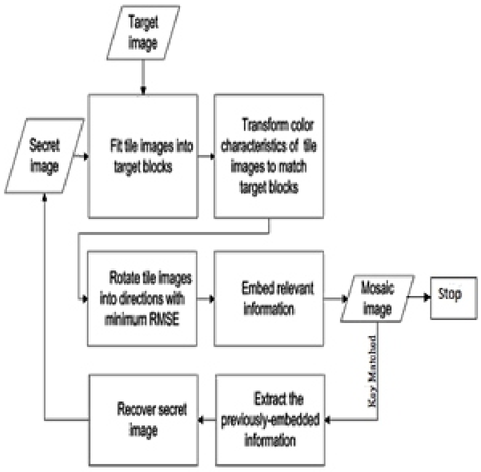

FIGURE2. Flow diagram of the proposed method

First we want to match the colour transformations, for that originally the key image is split into tile image is match into a target image target blocks. Since the colour characteristics of tile image and target block area unit altogether completely different from each other, we want to form them look alike, for that converts the colour characteristic of a picture. Target blocks and tile pictures area unit delineated as a pair of component sets, and therefore the color of each component is denoted by RGB. 1st we want to seek out the mean and variance of this tile image and target block. Next, we tend to cypher the new color values for these pixels. Here it'll be verified that the new color mean and variance of the ensuing tile image is capable that of target block.

Target Blocks and Rotating Blocks to Fit Better with Smaller RMSE Value:

In reworking the colour characteristic of a tile image T to be that of a corresponding target block B as delineated over, a way to opt for associate degree applicable B for each T may be a downside. For this, we have a tendency to use the quality deviation of the colours at intervals the block as a live to choose out the foremost similar for every T. Specially, we have a tendency to sort all the tile photos to create a sequence, S tile, and each one the target blocks to create another, S target, in step with the everyday l

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values of the standard deviations of the three color channels. Then, we have a tendency to work the first in S tile into the first in S target, work the second in S tile into the second in S target, and so on.Additionally, when a target block B is chosen to suit a tile image T and when the colour characteristic of T is reworked, we have a tendency to conduct an extra improvement on the colour similarity between the ensuing tile image and therefore the target block B by rotating into one amongst the four directions, 0°, 90°, 180°, and 270°, that yields a turned version of with the minimum root mean sq. error (RMSE) worth with reference to B among the four directions for final use to suit T into B.

Secret Image Recovery:

In order to recover the key image from the mosaic image, we've got to implant relevant recovery data into the mosaic image. Specifically, the strategy conducts forward and backward number transformations.The method yields high information embedding capacities near the best bit rates and has very cheap quality according to date the data needed to recover a tile image T that is mapped to a target block B includes: 1) the index of B; 2) the optimum rotation angle of T; 3) the truncated means that of T and Band the quality deviation quotients, of all color channels; and 4) the overflow/underflow residuals.

ALGORITHMS OF THE PROPOSED SYSTEM:

The elaborate algorithmic rules for mosaic image creation and secret image recovery is also declared in algorithm one and a pair of.

Algorithm 1: Mosaic Image Creation.

T-Target Image; S-Secret Image; F-Secret Fragment visible mosaic image
Stage 1: Fitting tile pictures of the key image into target image.

1.If the size of T is different from Size of S, Change the Sizes and Make them Identical.
2.Divide S into 'n' tiles and T into 'n' blocks.
3.Compute mean and standard deviation for each tile and block for three color channels.

$$\mu_C = \frac{1}{n}\sum_{i=1}^{n} ci$$

$$\mu_c' = \frac{1}{n}\sum_{i=1}^{n} c_i' \text{..............}(1)$$

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

$$\sigma_c' = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(c_i' - \mu_c')^2} \ldots(2)$$

Where μ_c , σ_c are the mean and standard deviation of tile images ; μ_c', σ_c' are the mean and standard deviation of target block image.

4.Compute average Standard deviation.
5.Sort both tiles images and block images.
6.Based on Average Standard Deviation values of blocks, map tile between S and T
7.Create F
Stage 2: Transforming the each tile of secret image to the corresponding target blocks of target image
8.Create Counting Table TB with 256 entries, each with corresponding to a residual value and assign an initial value to zero
9.Calculate mean and standard deviation for each mapping from secret to target.

10. For Each pixel p_i in each block of T with the color value of c_i transform c_i into a new value(r_i', g_i', b_i') using

$$c_i'' = q_c(c_i - \mu_c) + \mu_c' \text{......................}(3)$$

Where $q_c = \sigma_c/\sigma_c'$

Stage 3: Rotating each tile images.

11. Color similarity between the resultant tile T' and target block b by rotating T' into one of direction $(0^{\circ}, 90^{\circ}, 180^{\circ}, 270^{\circ})$
Which yield rotated version of T' with minimum RMSE with respect to B
Stage4: Embedding the secret image recovery information.
12. For each tile image T_i in Mosaic image F, construct a bit stream M_i for recovering T

$$M = t_1 t_2 \cdots t_m r_1 r_2 m_1 m_2 \cdots m_{48} q_1 q_2 \cdots q_{21} d_1 d_2 \cdots d_k$$

13. Concatenate the bit stream M_is of all T_i in F; use the secret key K to encrypt.

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14. Embed the bit stream I into mosaic image F by using reversible contrast mapping method [13] applies simple integer transformation to pair of pixel values. Specifically, the method conducts forward and backward integer transformation as follows respectively in which (x ,y) are a pair of pixel values and (x', y') are transformed ones

$$x' = 2x - y, \quad y' = 2y - x$$

$$x = \left[\frac{2}{3}x' + \frac{1}{3}y'\right]$$
$$y = \left[\frac{1}{3}x' + \frac{2}{3}y'\right]$$

Algorithm 2: Secret image recovery.

T-Target Image; S-Secret image: F-Mosaic image
Stage 1: Extracting embedded information from recovery.

1. Extract the bit stream M_t by Secret key
2. Decompose M_t into n bit streams M_1 through M_n.
3. Decode M_i for each tile T_i to obtain data items.
   Stage 2: Recovering the Secret image.
4. Recovering tile images by the following steps
- Rotate tile in reverse direction and fit the resulting block content into T to form initial tile image.
- Make use of Extracted Mean and related Standard Deviation quotients
- Compute the original pixel value

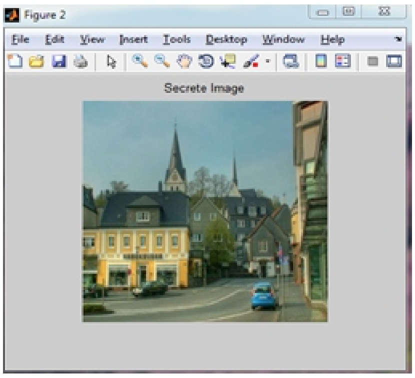
$$c_i = \frac{1}{q_c}(c_i'' - \mu_c') + \mu_{c.} \dots\dots\dots (4)$$

5. Compose all the final tile images to form the desired secret image S as output.

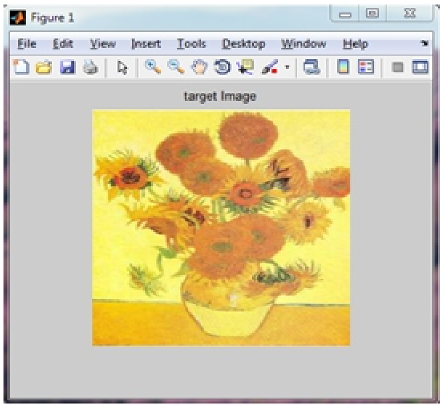
EXPERIMENTAL RESULTS:

A series of experiments are conducted to check the projected methodology victimisation several secret and target pictures with sizes 256 *256. to point out that the created mosaic image feels like the preselected target image, the standard metric of root mean sq. error (RMSE) is used.

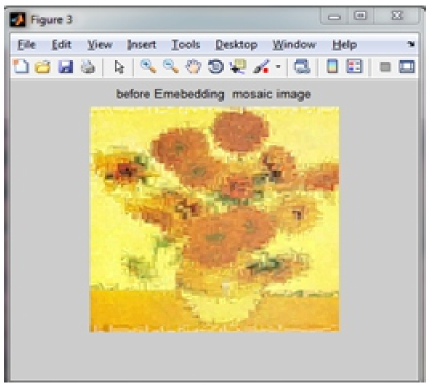
associate degree example of the experimental results of mosaic image shown in Fig.3; Fig.3(d) shows the when embedding created mosaic image victimisation Fig.3(a) because the Secret image and Fig.3(b)target image. The tile image size is 8*8.



3(a) Secret image



3(b) Target image



3(c) before embedding mosaic image

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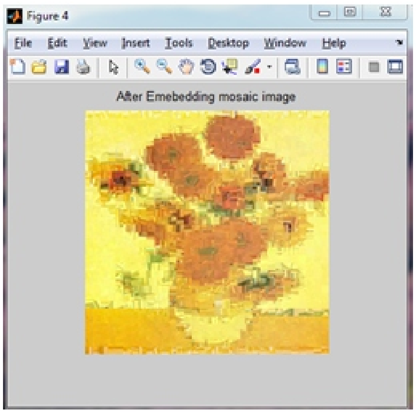
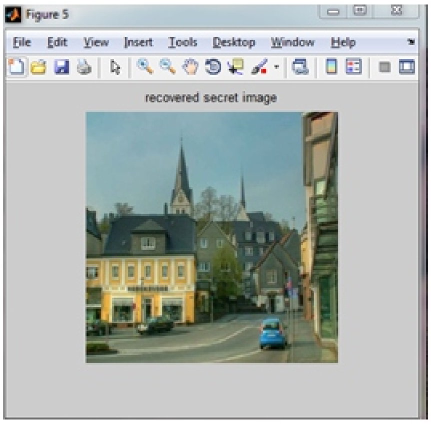


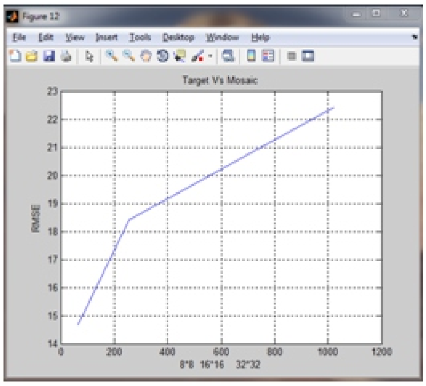
3(d) after embedding mosaic image



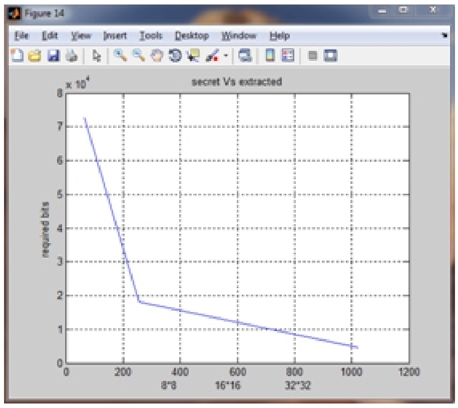
3(e) Recovered secret image

FIGURE3. An example of the experimental results of mosaic image created with tile image size 8*8.3(a) Secret image,3(b)target image,3(c)before embedded mosaic image,3(d)after embedded mosaic image .3(e) recovery of secret image

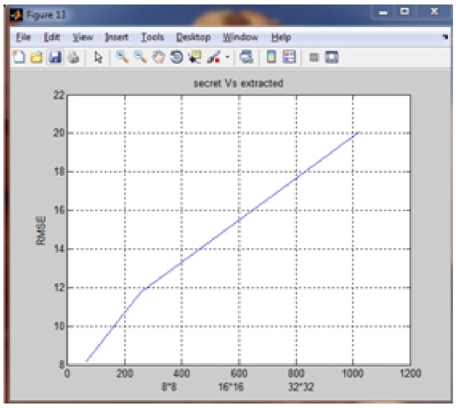
Furthermore, as shown in figure four, we've got drwn plots of varied parameter versus completely different tile image sizes as well as those of parameters of 4(a) RMSE worth of created mosaic pictures with reference to target pictures .4(b) numbers of needed bits embedded for sick secret pictures .4(c) RMSE values of recovered secret pictures with reference to original image.4(d) PSNR worth of created mosaic pictures with reference to target pictures.



4(a)



4(b)



4(c)

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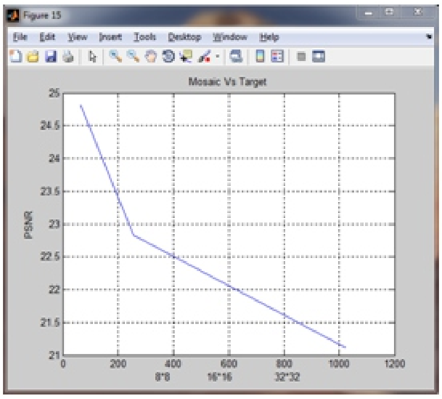

4 (d)

FIGURE4: Plots of tends of various parameters versus different tile image sizes (8*8, 16*16, 32*32) with input secret image shown previously. a) RMSE value of created mosaic images with respect to target images .b) numbers of required bits embedded for recovering secret images .c) RMSE values of recovered secret images with respect to original image. d) PSNR value of created mosaic images with respect to target images.

TABLE 1 Comparison of RMSE value with respect to different tile image sizes of created mosaic image with respect to target images

S.NO	Tile size	RMSE
1	8*8	14.664
2	16*16	18.403
3	32*32	22.428

TABLE 2 Comparison of Number of required bits embedded for recovering secret image of different tile images.

S.NO	Tile size	Required bits
1	8*8	72704
2	16*16	18176
3	32*32	4544

TABLE 3 Comparison of RMSE value with respect to different tile image sizes of Recovered secret image with respect to original secret image.

S.NO	Tile size	RMSE
1	8*8	8.124
2	16*16	11.753
3	32*32	20.089

TABLE 4 Comparison of PSNR value with respect to different tile image sizes of created mosaic image with respect to target image.

S.NO	Tile size	PSNR
1	8*8	24.805
2	16*16	22.832
3	32*32	21.115

If the recovery key doesn't matches with the key used for activity key then the method ends at that time, with none additional method.

CONCLUSION:

A Secure image Steganography technique is projected, wherever secret pictures square measure introduce into Associate in Nursing target image and encrypted with a key to transmit. Mosaic image that look the same as the target image is made with secret tile image and target image . Also, the first secret image s are often recovered nearly lossless from the created mosaic image Experimental results square measure shown the practicableness of secure transmission of image within the projected technique is nice. Future studies could also be directed to applying projected technique to video, wherever video frames square measure used as target image, by mistreatment video frames as a target image we are able to recover secret image with less RMSE price as compared to single target image.

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