A Novel Approach for Secured Image Transmission by Reversible Colour Transformations

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Abstract— Information security is becoming increasingly significant in the modern world. Secure Image Transmission has a potential of being adopted for mass communication. Numerous stenographic techniques for transmitting information without raising suspicion are found in. Recently, many methods have been proposed for secure image transmission, for which two common approaches are image encryption and data hiding. In image encryption, image is encrypted as a noise image by this it may arouse an attacker's attention during transmission in data hiding image hiding on a cover image, if the secret image is large compare to cover we have to compress secret image but this type of compression not practicable in many applications Conversely A new secure image Transmission technique is implemented, known as secret fragment visible mosaic image which allows the user to securely transmit an image under the cover of another image of same size, This method presents an approach where mosaic image generation has done by dividing the secret image into fragments and transforming their respective color characteristics into corresponding blocks of the target image. Usage of the Pixel color transformations helps to yield the lossless recovered image based on the untransformed color space values. Generation of the key plays an important role to recover the secret image from the mosaic image in lossless manner. Finally the same approach can be performed on videos also which helps to eliminate the flickering artifact to achieve the lossless data recovery in motion related videos. The experimental results show good robust behavior against all incidental and accidental attacks and compare to the conventional algorithms.

Key words: Mosaic Image, Secure Image Transmission, Color Conversion, Data Hiding

I. INTRODUCTION

Currently it's a crucial side to safeguard confidential information from unauthorized access. Transmission content is also text audio, still pictures, animation and video. The image from numerous sources are oftentimes used and transmitted through the net for numerous applications, like medical imaging system, and military image databases. These pictures typically contain direction in order that they ought to be shielded from leakages throughout transmission. There are 2 sorts of techniques used for secure image transmission .They are image cryptography and information concealing. Image cryptography uses natural property of a picture, like high redundancy and robust abstraction correlation. Shannon's confusion and diffusion properties are used get an encrypted image, the encrypted image contains noise, the attacker's grasp the right key they didn't get secret image. The encrypted image could be a noise image in order that nobody will acquire. The key image from it unless he/she has the right key. However, the write in code image could be a nonsense file, that cannot give extra info before decoding and will arouse an attacker's attention throughout transmission owing to its randomness in type . An alternative to avoid this downside is information concealing that hides a secret message into pictures in order that nobody can notice the existence of the key information, within which the information kind of the key message investigated during this paper is a picture .Existing information concealing ways primarily utilize the techniques of LSB substitution, bar chart shifting, distinction enlargement, prediction-error enlargement, algorithmic bar chart modification and separate cosine/wavelet transformations. However, so as to scale back the distortion of the ensuing image, and bound for the distortion worth is typically attack the payload of the quilt image.

During this project, a brand new technique for secure image transmission is planned, that transforms a secret image into an important mosaic image with an equivalent size and searching sort of a preselected target image. The transformation method in controlled by a secret key, and solely with the key will someone recover the key image nearly lossless type the mosaic image. The planned methodology is galvanized by Lai and Tsai, within which a brand new kind of pc at image, referred to as secret fragment-visible mosaic image, was planned. The mosaic image is that the results of transcription of the fragments of a secret image in disguise of another image referred to as to focus on image preselected from info.

In any case, an undeniable shortcoming of Lai and Tsai is the prerequisite of an expansive picture database so that they chose target picture. Utilizing their system, the client is not permitted to choose openly his/her most loved picture for utilization as the objective picture. It is therefore desired in this study to uproot this shortcoming of the strategy, while keeping in legitimacy, that is, it is planned to outline another technique that can change a mystery picture into a mystery part unmistakable mosaic picture of the same size that has the visual appearance of any uninhibitedly chose target picture without the need of a database. The proposed strategy is new in that a significant mosaic picture is made conversely with the picture encryption system that just makes aimless commotion pictures. Additionally, the proposed strategy can change a mystery picture into a recognizing mosaic picture without compression.

II. SECURE IMAGE TRANSMISSION

There are numerous advanced pictures are available in computerized correspondence framework which being sent over PC systems. With the expanding development of mixed media applications like sound, feature and pictures. Security is an essential viewpoint in advanced correspondence. There is one of the undeniable approaches to guarantee security is Image encryption. This procedure is attempt to change over unique picture to another picture which is difficult to comprehend and to keeps the picture secret between clients, in other word, it's critical that without unscrambling key nobody can get to the substance. Picture encryption has applications in web correspondence, interactive media frameworks, restorative imaging, telemedicine, military correspondence and so on. For security assurance of computerized pictures, encoded databases is a critical mechanical ability in multiparty data administration. There are numerous online administrations of webmail, for example, Gmail, photograph facilitating, for example, Flicker, and money related administration, for example, Mint.com, where clients store their private data on some remote server and the server gives functionalities to the client, for example, classification, pursuit and information examination.

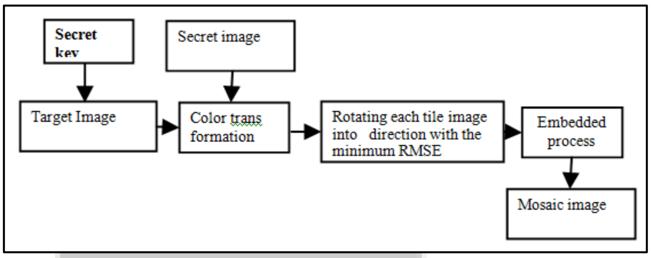

Fig. 1: Mosaic image creation block diagram.

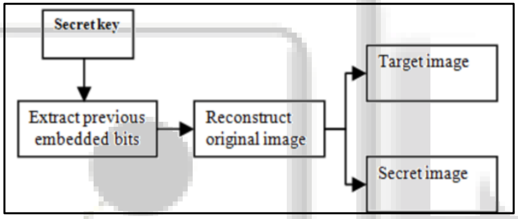

Fig. 2: Extract secret image and target image Block diagram.

The implemented method contains two phases

- Mosaic image Creation and
- Secret image recovery

In the first phase , a mosaic image is yielded which consists of the fragment of an input secret image with color corrections according to similarity criterion based on the color variation The phase include four stages:1)fitting the tile images of the secret image into the target blocks of the preselected target image; 2)transforming the color characteristics of each tile images in the target image; 3) rotating each tike image into a direction with minimum RMSE value with respect to its corresponding target block; and 4) embedding relevant information into the created mosaic image for future recovery of the secret image. In the second phase, the embedded information is extracted to recover nearly loss lessly the secret image from the generated mosaic image. The phase includes two stages: 1) extracting the embedded information for secret image recovery from the mosaic image, and 2) recovering the secret image using the extracted information.

In the first stage, a mosaic picture is made, which contains of the tiles of the info mystery picture with shading changes as per the installed based. Picture transmission procedure contains four stages. 1) Fitting tile pictures of the mystery picture into target picture; 2) Transforming the every tile of mystery picture to the relating target squares of target picture; 3) Rotating every tile with least RMSE esteem as for target obstruct; 4) Embedding the mystery picture recuperation data.

In the second stage, it contains two stages. 1) Extracting implanted data from recuperation; and 2) Recovering the Secret picture.

A. Mosaic Image Generation

Issues experienced in producing mosaic pictures are examined in this area with answers for them proposed.

1) Color Transformations between Blocks

In the first period of the proposed system, every tile picture T in the given mystery picture is fit into an objective square B in a preselected target picture. Since the shading qualities of T and B are not quite the same as one another, how to change their shading appropriations to make them resemble the other alike is the principle issue here. Reinhard et al. proposed a shading move conspire in this angle, which changes over the shading normal for a picture to be that of another in the lαβ shading space. This thought is a response to the issue and is embraced in this paper, aside from that the RGB shading space rather than the lαβ one is utilized to diminish the volume of the obliged data for recuperation of the first mystery picture.

2) Flow Chart

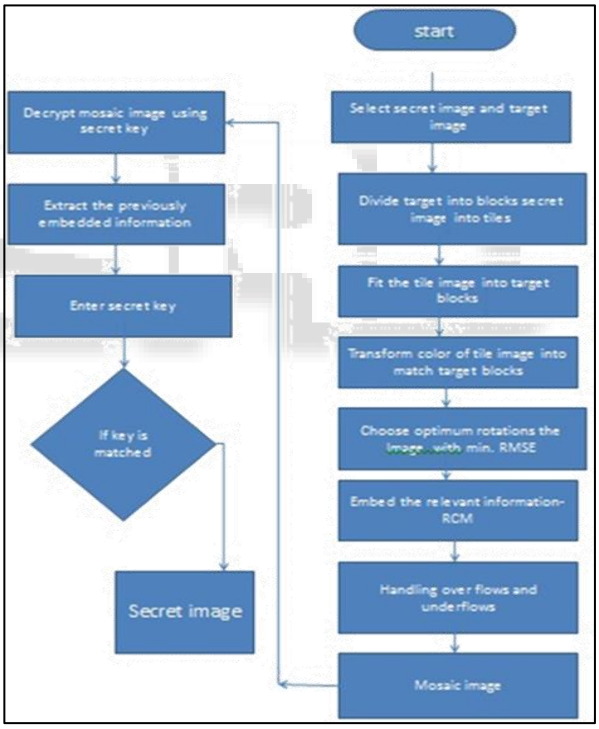
start
Select secret image and target image
Divide target into blocks secret image into tiles
Fit the tile image into target blocks
Transform color of tile image into match target blocks
Choose optimum rotations the image with min. RMSE
Embed the relevant information-RCM
Handling over flows and underflows
Mosaic image
Decrypt mosaic image using secret key
Extract the previously embedded information
Enter secret key
If key is matched
Secret image

Fig. 3: Flow Chart

All the more specifically, let T and B be depicted as two pixel sets $\{p_{1,}p_2, \dots \dots \dots \dots, p_n\}$ and $\{p'_1, p'_2, \dots \dots \dots \dots, p'_n\}$ individually. Let the shading of everyp_i be indicated by$\{r_i, g_i, b_i\}$ and that of every $p'_i$by (r''_i, g''_i, b''_i)at first, we figure the methods and standard deviations of T and B, individually, in each of the three shading channels R, G, and B by the accompany.

$$\mu_c = \frac{1}{n}\sum_{i=1}^{n} c_i \qquad \text{Eq } 3.1\mu'_c = \frac{1}{n}\sum_{i=1}^{n} c'_i \qquad (1)$$

$$\sigma_c = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(c_i - \mu_c)^2} \ \text{Eq } 3.3\sigma_c = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(c'_i - \mu'_c)^2} \ (2)$$

In which c_i and c'_iindicates the C-channel values of pixels p_i andp'_i, respectively, with c =r, g, or b and C=R, G, or B. Next, we compute new color values $(r_i'', g_i'', b_i'')$for each pi in T by

$$c_i'' = q_c(c_i - \mu_c) + \mu_c' \qquad (3)$$

in which $q_c = \sigma_c'/\sigma_c$is the standard deviation remainder and c=r, g, or b. It can be verified effectively that the new shading mean and fluctuation of the subsequent tile picture T are equivalent to those of B, individually. To process the first shading qualities $\{r_i, g_i, b_i\}$ ofp_i from the new ones (r_i'', g_i'', b_i'')we utilize the accompanying equation which is the reverse of (3)

$$c_i = \left(1/q_c\right)(c_i'' - \mu_c') + \mu_c \qquad (4)$$

Moreover, we need to implant into the made mosaic picture sufficient data about the new tile picture T for utilization in the later phase of recuperating the first mystery picture. For this, hypothetically we can utilize (4) to register the first pixel estimation ofp_i. In any case, the included mean and standard deviation values in the equation are every genuine number, and it is unrealistic to insert genuine numbers, each with numerous digits, in the created mosaic picture. Subsequently, we constrain the quantities of bits used to speak to important parameter values in (3) and (4). Specifically, for every shading channel we permit each of the method for T and B to have 8 bits with its quality in the scope of 0 to 255, and the standard deviation remainder qc in (3) to have 7 bits with its worth in the scope of 0.1 to 12.8. That is, every mean is changed to be the nearest esteem in the scope of 0 to 255, and each qc is changed to be the nearest esteem in the scope of 0.1 to 12.8. We don't permit q_c to be 0 on the grounds that generally the first pixel esteem can't be recuperated back by (4) for the reason that $1/q_c$in (4) is not defined when q_c=0.

3) Picking Appropriate Target Blocks and Rotating Blocks to Fit Better with Smaller RMSE Value

In changing the color characteristics for a tile picture T to be that of a relating target block B as depicted above, how to pick a proper B for every T is an issue. For this, we utilize the standard deviation of the colors in the piece as a measure to choose the most comparative B for every T. Exceptionally; we sort all the tile pictures to shape an arrangement S_{tile} and all the objective pieces to frame another, S_{target}, as per the normal estimations of the standard deviations of the three shading channels. At that point, we fit the first in S tile into the first in S_{target} fit the second in Stile into the second in S_{target} et cetera. Furthermore, after an objective piece B is decided to fit a tile picture T and after the shading normal for T is changed, we lead a further change on the shading comparability between the subsequent tile picture T and the objective square B by turning T into one of the four bearings $0^0, 90^0, 180^0$and 270^0 , which yields a pivoted rendition of T with the minimum root mean square error (RMSE) value with respect to B among the four directions for final use to fit T into B.

4) Handling Overflows/Underflows in Color Transformation

After the shading change procedure is led as depicted beforehand, some pixel values in the new tile picture T may have floods or sub-currents. To manage this issue, we change over such values to be overflow or non underflow ones and record the worth contrasts as residuals for utilization in later recuperation. In particular, we change over all the changed pixel values in T not littler than 255 to be 255, and every one of those not bigger than 0 to be 0. Next, we process the contrasts between the first pixel qualities and the changed over ones as the residuals and record them as a major aspect of the data connected with T. Appropriately, the pixel values, which are just on the bound of 255 or 0, on the other hand, can't be recognized from those with overflow/underflow qualities amid later recuperation since all the pixel values with overflows/ underflows are changed over to be 255 or 0 now. To cure this, we define the residuals of those pixel values which are on the certain to be 0 and record them too. Then again, as can be seen from (3), the scopes of conceivable lingering qualities are obscure, and this causes an issue of choosing what number of bits ought to be utilized to record a remaining. To take care of this issue, we record the remaining values in the untransformed shading space as opposed to in the changed one. That is, by utilizing the accompanying two equations, we figure first the littlest conceivable shading quality c_s (with c=r, g, circle) in T that gets to be bigger than 255, and in addition the biggest conceivable worth c_L in T that gets to be littler than 0, individually, after the shading change procedure has been conducted

$$c_s = [\left(1/q_c\right)(255 - \mu_c') + \mu_c] \qquad (5)$$

$$c_L = [\left(1/q_c\right)(0 - \mu_c') + \mu_c] \qquad (6)$$

Next, for an untransformed worth c_i which yields a flood after the shading change, we register its remaining as $|c_i$ - $c_s|$; and for ci which yields an undercurrent; we process it's leftover as $|c_L$ - $c_i|$. At that point, the conceivable estimations of the residuals of $c_i$will all lie in the scope of 0 to 255 as can be checked. Therefore, we can basically record each of them with 8 bits. Lastly, in light of the fact that the leftover qualities are brought together around zero, we utilize facilitate in this study the Huffman encoding plan to encode the residuals keeping in mind the end goal to lessen the quantity of obliged bits to speak to them.

B. Embedding Information for Secret Image Recovery

To recuperate the secret picture from the mosaic picture, we need to install pertinent recuperation data into the mosaic picture. For this, we embrace a procedure proposed by Coltuc and Chassery and apply it to the slightest huge bits of the pixels in the made mosaic picture to lead information installing. Not at all like the traditional LSB supplanting strategies which substitute LSBs with message bits straightforwardly, has the reversible complexity mapping technique applied basic whole number changes to combines of pixel qualities. In particular, the technique leads forward and in reverse whole number changes.

It is noticed that some misfortune will be brought about in the recouped mystery picture, or all the more particularly, in the shading change procedure utilizing (3), where every pixel's shading worth c_i is reproduced by the standard deviation remainderq_c, and the subsequent genuine quality $c_i$is truncated to be a whole number in the scope of 0 through 255. Be that as it may, on the grounds that each truncated part is littler than the estimation of 1, the recuperated estimation of c_i utilizing (4) is still sufficiently exact to yield a shading about indistinguishable to its unique one. Notwithstanding when overflows/underflows happen at a few pixels in the shading change process, we record their remaining values as depicted beforehand and in the wake of utilizing (4) to recoup the pixel esteem c_i, we add the leftover values back to the figured pixel values c_i to get the first pixel information, yielding an almost losslessly recuperated mystery picture. As per the consequences of the examinations directed in this paper, each recuperated mystery picture has a little RMSE esteem as for the first secret image.

The information required to recover a tile image T which is mapped to a target block B includes: 1) The index of B; 2) The optimal rotation angle of T; 3) The truncated means of T and B and standard deviation quotients, of all color channels; and 4) The overflow/underflow residuals. These data items for recovering a tile image T are integrated as a five component bit stream of the form

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

In which the bit segments $t_1 t_2 \ldots. t_m, r_1 r_2, m_1 m_2 \ldots\ldots m_{48}, q_1 q_2 \ldots\ldots q_{21},$ and $d_1 d_2 \ldots d_k$ represent the values of the index of B, the rotation angle of T, the means of T and B, the standard deviation quotients, and residuals respectively. In detail, the number of bits required for five data components in M are discussed below: 1) The index of B needs m bit t represent, with m computed by

$$m = [\log[(W_s \times H_s)/N_T]]$$

In which W_s And H_s are respectively the width and height of the secret image S and N_TIs the size of the target image T; 2) It needs two bits to represent the rotation angle of T because there are four possible rotation directions; 3) 48 bits are required to represent a mean value in each color channel; 4) It color channel with each channel requiring 7 bits; and 5) The total number of k required bits for representing all the residuals depends on the number of overflows or underflows inT'. Then, the above defined bit streams of all the tile images are concatenated in order further into a total bit stream M_t for the entire secret image. Moreover, in order to protect M_t from being attacked, we encrypt it with a secret key to obtain an encrypted bit streams M_t' , which is finally embedded into the pixel pair in mosaic image using the method of very fast watermarking by reversible contrast mapping, it requires more than one iteration in the encoding process since the length of may be larger than the number of pixel pairs available in an iteration. A plot of the statics of the number of required bits for secret image recovery is shown in figure 4.9.

In addition to, we have to embed as well as some related information about the mosaic image generation process into the mosaic image for use in the secret image recovery process. Such information, described as a bit stream I like M mentioned previously, includes the following data items: 1. The number of iterations conducted in the process dor embedding the bit streamM_t'; 2. The total number of pixel pairs used in the last iteration for embeddingM_t'

a) Algorithms of implemented method:

Based on theory of The implemented method, here I have given detailed Algorithms for Both Mosaic image creation and secret image recovery.

C. Reversible Contrast Mapping Technique

Reversible contrast mapping (RCM) is a simple integer transform that applies to pairs of pixels. For some pairs of pixels, RCM is invertible, even if the least significant bits (LSBs) of the transformed pixels are lost. The data space occupied by the LSBs is suitable for data hiding. The embedded information bit-rates of the proposed spatial domain reversible water marking scheme are close to the highest bit-rates reported so far. The scheme does not need additional data compression, and, in terms of mathematical complexity, it appears to be the lowest complexity one proposed up to now. A very fast lookup table implementation is proposed. Robustness against cropping can be ensured as well.

Most of the reversible watermarking approaches proposed so far incorporate a lossless data compression stage. The use of an elaborate data compression stage increases the mathematical complexity of the water marking. There are some watermarking schemes that do not rely on additional data compression, as for instance, the circular histogram interpretation schemes, but they have the drawback of a low embedding capacity. In this letter, we discuss a spatial domain reversible watermarking scheme that achieves high-capacity data embedding without any additional data compression stage. The scheme is based on the reversible contrast mapping (RCM), a simple integer transform defined on pairs of pixels. RCM is perfectly invertible, even if the least significant bits (LSBs) of the transformed pixels are lost. The data space occupied by the LSBs is suitable for data hiding. The basic RCM watermarking scheme was introduced in. Here, a modified version that allows robustness against cropping is proposed. The control of distortions introduced by the watermarking is investigated as well. The mathematical complexity of the RCM watermarking is further analyzed, and a very low cost implementation is proposed. Finally, the RCM scheme is compared with Tian's difference expansion scheme with respect to the bit-rate hiding capacity and to the mathematical complexity. It is shown that the RCM scheme provides almost similar embedding bit-rates when compared to the difference expansion approach, but it has a considerably lower mathematical complexity

- These techniques apply simple integer transformation to pairs of pixel value.
- These method conducts forward and backward integer transformation, in which (x , y) are a pair of pixel value and are transformed one

$$x' = 2x - y \ldots 9$$

$$y' = 2y - x\ldots. 10$$

$$x = \left[\frac{2}{3}x' + \frac{1}{3}y'\right] \quad \ldots 11$$

$$y = \left[\tfrac{1}{3}x' + \tfrac{2}{3}y'\right] .. 12$$

If x' and y' are not changed, (9) exactly inverts (7), even without the ceil functions. By watermarking, the LSBs of, are lost. Let us set to "0" the LSBs ofx' andy'. It immediately appears that if the LSB of x' was "1," the values inside the ceil functions for the computation of x and y decrease with 2/3 and 1/3, respectively. Similarly, if the LSB of $y'$was "1," the corresponding values decrease with 1/3 (for the computation of x) and 2/3 (for the computation of y). Except when both LSBs are "1," the ceil function recovers the correct results. An LSB of “1” means an odd integer number. From (7), it follows that(x', y') are both odd numbers only if (x, y) are odd numbers, too. To conclude, on without the set of odd pairs, the inverse RCM transform performs exactly, even if the LSBs of the transformed pairs of pixels are lost. The forward transform should not introduce visual artifacts. By taking the sum and the difference of (1), one gets $x' + y' = x + y$and $x' - y' = 3(x - y)$, respectively. This means that RCM preserves the gray level averages and increases the difference between the transformed pixels. Consequently, image contrast increases.

1) Reversible Watermarking

The watermark substitutes the LSBs of the transformed pairs. At detection, in order to extract the watermark and to restore the original pixels, each transformed pair should be correctly identified. The LSB of the first pixel of each pair is used to indicate if a pair was transformed or not: “1” for transformed pairs and “0” otherwise. The inverse RCM fails to recover the pairs(x, y) ∈ D composed of odd values. Such pairs can be used as well for data embedding as long as they are correctly identified at detection. This can be easily solved by setting the LSB of the first pixel to “0.” At detection, both LSBs are set to “1” and (9) are checked. If (9) are fulfilled, the pair was composed of odd pixels. In order to avoid decoding ambiguities, some odd pixel pairs should be eliminated, namely, those pairs located on the borders of. The pairs subject to ambiguity are found by solving in odd numbers the equations: 2x - y =1, 2y –x =1, 2x – y =L, and 2y – x =L. For L=255, there are only 170 such pairs. Let further be the domain of the transform without the ambiguous odd pixel pairs.

2) Marking: The marking proceeds as follows.

- Partition the entire image into pairs of pixels (for instance, on rows, on columns, or on any space filling curve).
- For each pair (x, y): a) If (x, y) ∈ D_c and if it is not composed of odd pixel values, transform the pair using the (1), set the LSB of x' to “1,” and consider the LSB of y' as available for data embedding. b) If(x, y) ∈ D_c and if it is composed of odd pixel values, set the LSB of x to “0,” and consider the LSB of y as available for data embedding. c) If (x, y)∉ D_c, set the LSB of x to “0,” and save the true value.
- Mark the image by simple overwriting the bits identified in 2a and 2b with the bits of the watermark.

A different marking procedure is proposed in simple reversible watermarking schemes. A map of transformed pairs and the sequence of LSBs for all non-transformed pairs are first collected. Then, the entire image LSB plane is overwritten by the payload and by the collected bit sequences. The slightly modified procedure proposed in this letter provides robustness against cropping. The location map of the entire image is replaced by the LSB of the first pixel of each pair showing if the pair was transformed or not. Let us further consider that the saved LSB of a non-transformed pair is embedded into the available LSB of the closest transformed pair. Thus, all the information needed to recover any original pixel pair is embedded into the pair itself or very close to it.

In the case of cropping, except for the borders where some errors may appear, the original pixels of the cropped image are exactly recovered together with the embedded payload. For pixel pairing on row or column direction, there are no problems of synchronization. Some control codes should be inserted in the payload to validate watermark integrity.

III. Results & discussions

A series of experiments have been conducted to test the implemented method using many secret and target images with sizes 256 *256. To show that the created mosaic image looks like the preselected target image, the quality metric of root mean square error (RMSE) is utilized, which is defined as the square root of the mean square differences between the pixel values of the two images.

An example of the experimental results of mosaic image shown in Fig.5: Fig.5.7 shows the after embedding created mosaic image using Fig.4 as the Secret image and Fig.5 target image. The tile image size is 8*8. Fig.5.8 which looks nearly identical to the original secret image shown in Fig 4 with RMSE=13.39 with respect to secret image.

Moreover, Fig.6 shows the block processed image, Fig 7 is a color transformed target image.Fig.8-9 shows more results using different rotation angles of images. It can be seen from the figure that the created mosaic image retains more details of target image when the tile image is smaller. It can also be seen that the blackness effects is observable when the image is magnified to be large, but if the image is observed as a whole it still looks like mosaic image with its appearance similar to the target image.

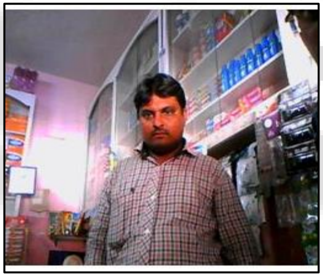

Fig. 4: Secret image

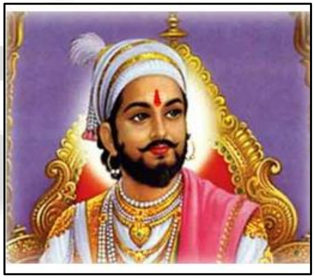

Fig. 5: Target image

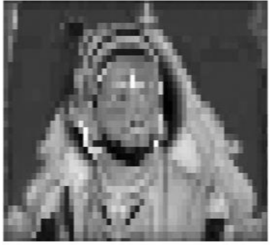

Fig. 6: Block processed image of size 8*8

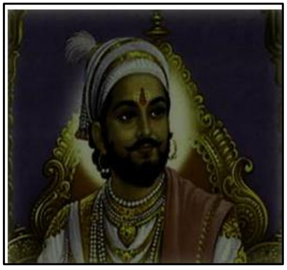

Fig. 7: Color transformed target image

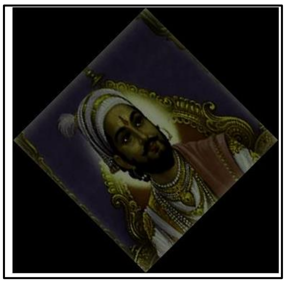

Fig. 8: Rotated target image

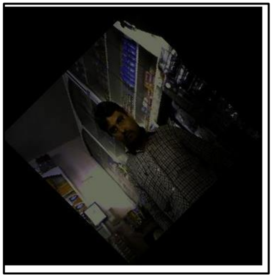

Fig. 9: Rotated secret image

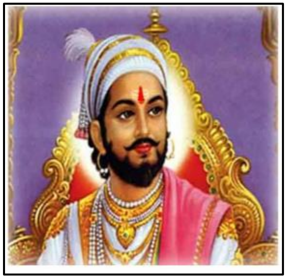

Fig. 10: created mosaic image

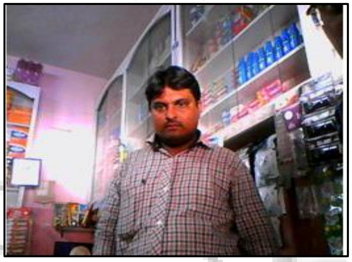

Fig. 11: Recovered secret image

Fig. 11: An example of the experimental results of mosaic image created with tile image size 8*8.

Furthermore, as shown in figure 4-11, we have drawn plots of various parameter versus different tile image sizes including those of parameters of Fig 10 RMSE value of created mosaic images with respect to target image, Fig 9 numbers of required bits embedded for recovering secret image, Fig. 5.11RMSE values of recovered secret images with respect to original image. Fig 10 MSSIM value of created mosaic images with respect to target images.

A. Graphs

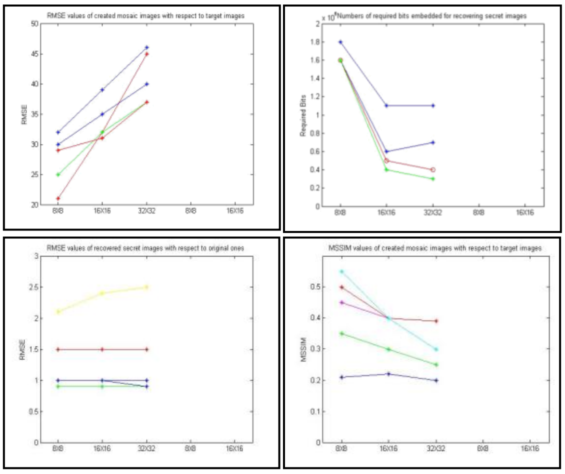

Fig. 12: RMSE values of recovered secret

Parameter	Target Image	Secret image	Mosaic image	Recover Secret Image
RMSE	30	29	50.5	26.5
MSSIM	0.45	0.2	0.1	0.01
No. bits Required	–	–	8	8

Table 1: Values of RMSE, MSSIM, No. of bits required of Target image, Secret image, Mosaic image, Recovered secret image of Existing method

Parameter	Target image	Secret image	Mosaic image	Recover Secret Image
RMSE	30	29	25	13.39
MSSIM	0.45	0.2	0.5	0.25
No. bits recquired	-	-	8	8

Table 2: Values of RMSE, MSSIM, No. of bits required of Target image, Secret image, Mosaic image, Recovered secret image of Implementation method

If the recovery key doesn't matches with the key used for hiding key then the process ends at that point, without any further process.

The above table 1 shows the fact the mosaic image created with smaller tile images has smaller RMSE value with respect to target image .On other hand tabular form 2 shows the number of required bits embedded for recovering the secret image will increased when tile image becomes smaller. Table 1 shows RMSE with respect to different tile image sizes of original secret image and recovered, as the tile size increases RMSE value increases. Table 2 shows MSSIM with respect to different tile images of target image and mosaic image as the tile size increases MSSIM value decreases, larger MSSIM indicate more similarity of mosaic image with respect to target image.

IV. Conclusion

A new secure image transmission method has been proposed, which not only can create meaningful mosaic images but also can transform a secret image into a mosaic one without any compression of secret image, without using database for selection of target image, without using LSB substitution Technique.

In the implemented method the RMSE value is reduced when compared with existing method typically 13.39 is achieved. The Mean structural similarity is nearly equal to the created mosaic image in comparison with target image typically 0.25 is achieved in implementation method.

From this analysis it is noticed that As the size of tile image increases RMSE value decreases between original secret image and recovered secret image, and structural similarity also increases between created mosaic image and target image

References

[1] Ya-Lin Lee and Wen-Hsiang Tsai, "A New Secure Image Transmission Technique via Secret-fragmentVisible Mosaic Images by Nearly Reversible Color Transformations," IEEE Transactions on Circuits and systems for video Technology, vol. 24, no. 4, April 2014

[2] J. Lai and W. H. Tsai, "Secret-fragment-visible mosaic image—A new computer art and its application to information hiding," IEEE Trans. Inf. Forens. Secur, vol. 6, no. 3, pp. 936–945, Sep. 2011.

[3] Chin chenChang, MinShian Hwang and Tung Shou Chen," A new image encryption algorithm for image

cryptosystems", the journal of system and software 58(2001).

[4] W. B. Pennebaker and J. L. Mitchell, "JPEG: Still Image Data Compression Standard", New York, NY, USA: Van Nostrand Reinhold, pp. 34–38, 1993.

[5] Zhicheng Ni, Yun-Qing Shi, Nirwan Ansari, and Wei Su," Reversible Data Hiding", IEEE transactions on circuits and system for vedio technology, vol. 16, no. 3, march 2006.

[6] C. C. Chang, C. C. Lin, C. S. Tseng, and W. L. Tai, "Reversible hiding in DCT-based compressed images," Inf. Sci., vol. 177, no. 13, pp. 2768–2786, 2007.

[7] E. Reinhard, M. Ashikhmin, B. Gooch, and P. Shirley, "Color transfer between images," IEEE Comput. Graph. Appl., vol. 21, no. 5, pp. 34–41, Sep.–Oct. 2001

[8] J. Fridrich, "Symmetric ciphers based on two-dimensional chaotic maps," Int. J. Bifurcat. Chaos, vol. 8, no. 6, pp. 1259–1284, 1998.

[9] G. Chen,Y. Mao, and C. K. Chui, "A symmetric image encryption scheme based on 3D chaotic cat maps," Chaos Solit. Fract., vol. 21, no. 3, pp. 749–761, 2004.

[10] L. H. Zhang, X. F. Liao, and X. B. Wang, "An image encryption approach based on chaotic maps," Chaos Solit. Fract., vol. 24, no. 3, pp. 759–765, 2005.

[11] H. S. Kwok and W. K. S. Tang, "A fast image encryption system based onchaotic maps with finite precision representation," Chaos Solit. Fract., vol. 32, no. 4, pp. 1518–1529, 2007.

[12] S. Behnia, A. Akhshani, H. Mahmodi, and A. Akhavan, "A novel algorithm for image encryption based on mixture of chaotic maps," Chaos Solit. Fract., vol. 35, no. 2, pp. 408–419, 2008.

[13] D. Xiao, X. Liao, and P. Wei, "Analysis and improvement of a chaosbased image encryption algorithm," Chaos Solit. Fract., vol. 40, no. 5, pp. 2191–2199, 2009.

[14] V. Patidar, N. K. Pareek, G. Purohit, and K. K. Sud, "A robust and secure chaotic standard map based pseudorandom permutation substitution scheme for image encryption," Opt. Commun., vol. 284, no. 19, pp. 4331–4339, 2011.

[15] C. K. Chan and L. M. Cheng, "Hiding data in images by simple LSB substitution," Pattern Recognit.., vol. 37, pp. 469–474, Mar. 2004.

[16] J. Tian, "Reversible data embedding using a difference expansion," IEEE Trans. Circuits Syst. Video Technol., vol. 13, no. 8, pp. 890–896, Aug. 2003.

[17] Y. Hu, H.-K. Lee, K. Chen, and J. Li, "Difference expansion based reversible data hiding using two embedding directions," IEEE Trans. Multimedia, vol. 10, no. 8, pp. 1500–1512, Dec. 2008.

[18] V. Sachnev, H. J. Kim, J. Nam, S. Suresh, and Y.-Q. Shi, "Reversible watermarking algorithm using sorting and prediction," IEEE Trans. Circuits Syst. Video Technol., vol. 19, no. 7, pp. 989–999, Jul. 2009.

[19] X. Li, B. Yang, and T. Zeng, "Efficient reversible watermarking based on adaptive prediction-error expansion and pixel selection," IEEE Trans. Image Process., vol. 20, no. 12, pp. 3524–3533, Dec. 2011.

[20] W. Zhang, X. Hu, X. Li, and N. Yu, "Recursive histogram modification: Establishing equivalency between reversible data hiding and lossless data compression," IEEE Trans. Image Process., vol. 22, no. 7, pp. 2775–2785, Jul. 2013.

[21] J. Fridrich, M. Goljan, and R. Du, "Invertible authentication," Proc. SPIE, vol. 3971, 2001, pp. 197–208.