ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

A Novel Method for Secret Data Transmission Technique via Fragment-Visible Mosaic Images by RGB Image Transformation Technique



Bandi Veera Swamy
PG Scholar (DECE),
Department of Electronics & Communication Engineering,
Tudi Narasimha Reddy Institute of Technology & Sciences,
Hydearabad.

Mr.Sathish Parvatham
Associate Professor,
Department of Electronics & Communication Engineering,
Tudi Narasimha Reddy Institute of Technology & Sciences,
Hydearabad.

Dr.Samalla Krishna
Professor,
Department of Electronics & Communication Engineering,
Tudi Narasimha Reddy Institute of Technology & Sciences,
Hydearabad.

ABSTRACT:

A novel approach to transmit images in a secure manner is proposed, in which the secret image is transformed into a same sized meaningful mosaic image. The obtained mosaic image, which is identical to the cover image and used as disguise of secret image, is obtained by segmenting the secret image into tiles and their color characteristics are transformed to that of the cover image blocks. Noise may affect the mosaic image while transmitting it to receiver in free space. In this article, we propose a skillful approach where the external noise is suppressed using various effective transformation techniques. The secret image recovery is based on the information embedded in the transmitted mosaic image using different data hiding approaches. The proposed algorithm achieves effective de-noising and de-mosaicing in terms of peak signal to noise ratio (PSNR), root mean square error (RMSE) and visual quality at low computational cost.

INTRODUCTION:

Recent years, with the evolution of computer and Internet technology, images are widely used to convey information. The wide usage of images in various applications includes medical systems, confidential military archives, enterprises and storage systems.

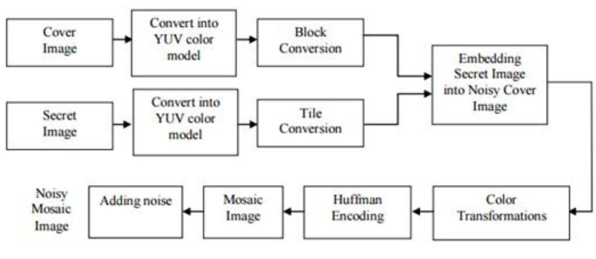
Security is the major issue while transmitting images through internet where hacking of confidential data may take place. Transfer of images from one place to another may contaminate the image information, so new methodology is derived to eliminate noise and to recover the secret image nearly losslessly. Recently, many approaches came into existence for secure image transmission [1] where noise factor is not taken into account and applied only on RGB images. So, a new algorithm is designed to reduce the amount of noise content in the mosaic image and extended to another color model which is named as YUV. In this approach, various noises are added to the mosaic image at the channel such as salt & pepper noise, speckle noise and additive white Gaussian noise(AWGN) where real time images are mostly affected by AWGN. Different transformation techniques are implemented to reduce the noise effects which include discrete wavelet transform (DWT), discrete curvelet transform (DCT) and Stockwell transform (S-Transform). The proposed technique takes RGB images as input and converts them into YUV color model, on which the whole operation is performed. The secret image, which is to be transmitted to the receiver, and cover images are segmented into tiles and blocks respectively of same size.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

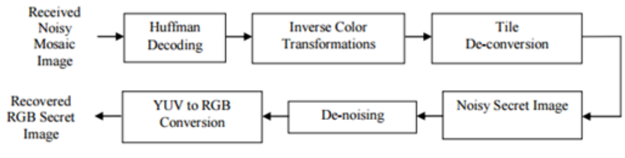
The secret tiles are fitted into cover blocks and color transformations are applied on tile images such that they look similar to the cover blocks. The color transformed values are Huffman encoded and stored in Huffman table which is inserted into the resultant image to form a mosaic image. It looks same as the cover image there by reducing the hackers attention during transmission. While transmission, the mosaic image may be corrupted with noise and the noisy mosaic image is transferred as the input to the receiver. The color transformed values are Huffman decoded and tiles are extracted to recover noisy secret image from the noisy mosaic image. The amount of noise which is present in noisy secret image is reduced by using various transforms like wavelet, curvelet and S-Transforms to retrieve the YUV secret image, which in turn converted into RGB color model.

DESIGN METHODOLOGY:

The proposed technique involves three phases which includes 1) Generation of mosaic image 2) Noisy mosaic image creation and 3) Retrieval of secret image. The flow diagram of transmission and reception of mosaic image is shown in the Fig. 1. The mosaic image is yielded as output in the first phase, which involves color transformed secret image tiles based on similarity criterion of the cover image blocks. It consists of five stages: 1) Transforming secret and cover images into YUV color model 2) Fragmentation of secret and cover images into tiles and blocks respectively 3) Converting the each tile in secret image to be that of the respective block in cover image through color transformations 4) Fitting the tile image into cover blocks 5) Performing Huffman encoding on the information needed for the secret image retrieval and is embedded to form a mosaic image.



(a)



(b)

Flow diagram of proposed technique: (a) Transmission of mosaic image. (b) Retrieval of secret image.

The second phase includes addition of various noises to the mosaic image resulting in noisy mosaic image. In the third phase, five stages are included: 1) Obtaining the tile information from the noisy mosaic image and performing Huffman decoding 2) Extracting the secret tiles by applying inverse color transformations to form noisy secret image 3) De-noising the noisy secret image using different transform techniques such as wavelets, curvelets and S-Transform and 4) Conversion of YUV to RGB color model. A. Mosaic image generation.

In the first phase of this novel technique, initially we convert both the secret and cover images into YUV color model [2], taking RGB images as reference in this context of same size. The secret and cover images are divided into tiles and blocks of equal size and each tile is color transformed to the corresponding cover block [3]. The Huffman encoding, an optimized compression technique, is used to store the color transformed values in Huffman table, which is used for recovery of secret tiles. Every tile of the secret image is embedded into respective target block along with the Huffman table to form mosaic image using least significant bit (LSB) substitution data-hiding.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

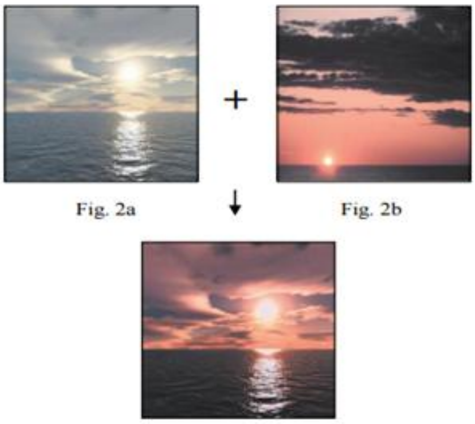


Fig. 2a Fig. 2b Fig. 2c

Color processed image

Approach [4]. Fig. 2 and Fig. 3 show an example of how color transfer scheme is applied on images and the mosaic image creation respectively.

(a) Cover Image (b) Secret Image (c) Mosaic Image

Mosaic image creation:

Information that is transmitted from sender to receiver may be corrupted with noise present in the channel. So, noise is taken as the major aspect in this article. The obtained mosaic image thus transmitted is contaminated with various noises, which include salt & pepper noise [5]-[7] speckle noise [8]-[11] and AWGN resulting in a noisy mosaic image. C. Retrieval of secret image The first step in the retrieval of secret image is to obtain secret tile information from the noisy mosaic image which involves restoring the color transformed values using reversible contrast mapping and that are stored in Huffman table at the transmitter end. The noisy secret image is built by combining the secret tiles. To suppress the noises like salt & pepper noise, speckle noise and AWGN, which is added at the medium, we follow the de-noising process.

Numerous transform techniques are used for noise reduction which includes DWT [12]-[14], DCT [15]-[16] and S-Transform [17]-[19] to obtain the de-noised secret image. Real time images are mostly available in RGB color model; therefore we convert the obtained YUV secret image into RGB model.

ALGORITHM

Algorithm: Secure image transmission using various transforms Input: a secret image SI, a cover image CI Output: recovered secret image RSI. Steps: Translate the SI and CI into YUV color model and are• denoted as SIy and CI . Checking whether the CIy• size is greater than that of SIy, if notresize theCI . Partitioning the SIy• into k tiles { $ST1$, $ST2$, … . . , STk } and CIy into k blocks{ $CB1$, $CB2$, … . . , CBk }. Mapping of each tile in SIy = { $T1$• , $ST2$, … . . , STk } to the each block in CIy = {$CB1$, $CB2$, … . . , CBk } in a sequence

$$a' = 2a - b$$
$$b' = 2b - a$$

Mosaic image MIy is created by embedding Huffman encoded color transformed values which are stored in Huffman table. Various noises are added to mosaic image in the medium• resulting in noisy mosaic image NMI . Restore the color transformed values from the $NMIy$• using Huffman decoding. The original pixel values are obtained from the transformed pixel values using (2).

$$a = \frac{2}{3}a' + \frac{1}{3}b'$$
$$b = \frac{1}{3}a' + \frac{2}{3}b'$$

The tile images are retrieved in a raster scan order to form the noisy secret image NSI . Perform noise reduction to $NSIy$ using several transform• techniques to create a de-noised secret image SI . Transpose the $DSIy$• into RGB color model to obtain the desired secret image SI as output.

DESIGN FLOW:

The design flow diagrams for transmission of mosaic image and retrieval of secret image are shown in Fig. 4. and Fig. 5.

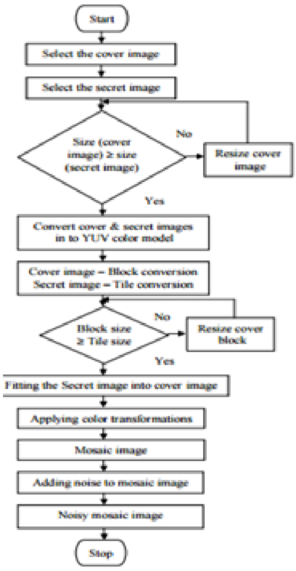
ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

The transmission process starts with a selection of cover image, which is duplicate image used for transmission of secret image and the secret image is the original image i.e. to be transmitted to the receiver. Size constraints are the major aspect in both images. Both the images are converted into YUV color model and are split into secret tiles and cover blocks. Inserting each secret tile into every block of cover image, color transformations are performed on tiles to form the mosaic image.

The mosaic image, which looks similar to that of cover image, is corrupted with noise in free space. The noises may be of salt & pepper, speckle and AWGN resulting in noisy mosaic image. The receiver receives the noisy mosaic image as input, where the inverse color transformations are applied and tile images are differentiated from the mosaic image. The tiles are merged together to form the noisy mosaic image. The amount of noise which is present in noisy secret image is suppressed by using numerous transforms. The performance of the technique is estimated by using metrics and these are

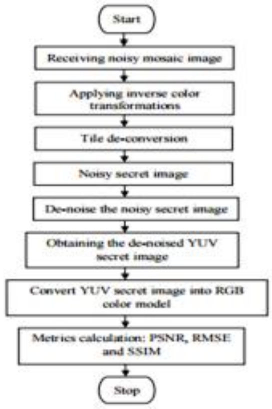
COMPARED FOR VARIOUS NOISES USING DIFFERENT TRANSFORMS

Transmitter



Design flow for transmission of mosaic image

Receiver



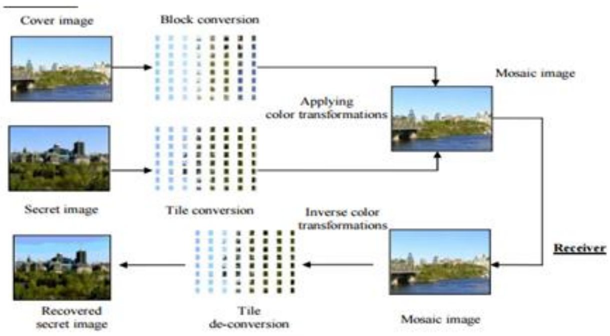
Design flow for recovery of secret image

RESULTS SUMMARY

In this section, the performance of the proposed technique is estimated. The secret image is recovered in a very secure manner by using proposed method and compared with existing technique i.e. secure image transmission without considering noise factor. To measure the efficiency of our technique, RMSE, PSNR and SSIM are calculated. We choose a set of images to check the performance of the proposed method. In Table I, the RMSE, PSNR and SSIM [20]-[22] values for various noises using different transforms are shown for a set of images.

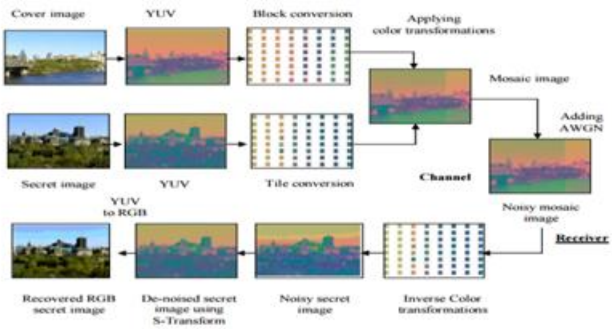
The best value of each metric for AWGN is italicized, which is resulted by using S-Transforms. The proposed technique is always better choice for the secure image transmission which shows the feasibility of the algorithm. We have shown the simulated results for a set of images compared with the secure image transmission technique without noise concern in Fig. 6 and Fig. 7. We can visualize from our results that noise is attenuated and secret image is recovered effectively. The main program is executed in a fraction of 2 min on a 1.8 GHz Intel ® Core ™ i5 processor based minicomputer even for large sized images Transmitter

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal



Secure image transmission for set of images without introducing noise factor

Transmitter



Secure image transmission for set of images considering AWGN and S-Transform for de-noising

TABLE I: Comparison of metrics for set of images for various noises using different transforms

Metric	Secure image transmission	Secure image transmission through Wavelet transform			Secure image transmission through Curvelet transform			Secure image transmission through S-Transform		
		N_{sp}	N_s	N_g	N_{sp}	N_s	N_g	N_{sp}	N_s	N_g
RMSE	6.00	2.80	3.56	3.44	2.75	3.33	3.16	0.64	3.06	2.68
PSNR(dB)	32.58	39.16	37.10	37.40	39.75	37.71	38.29	51.94	38.42	39.57
SSIM	0.78	0.66	0.64	0.61	0.68	0.72	0.62	0.71	0.75	0.88

CONCLUSION:

The proposed technique is a novel approach of secure image transmission for creation of mosaic image in a meaningful manner and the confidential information can be transmitted in a secure way. The proper usage of pixel based color transformations provides mosaic image which is alike to the selected cover image without the need of cover image data base. The amount of noise, which is added at the medium, is suppressed to the maximum extent by using various transform techniques effectively.

Various metrics are calculated and compared with numerous noises and several transforms. We can deduce that S-Transform gives better experimental results for various noises among other transforms. This work can be extended to other color models using various noises and advanced transform techniques.

REFERENCES:

[1] Ya-Lin Lee, Student Member, IEEE, and Wen-Hsiang Tsai, Senior Member, IEEE "A New Secure Image Transmission Technique via Secret-Fragment-Visible Mosaic Images by Nearly Reversible Color Transformations", IEEE Transactions On Circuits Ad Systems For Video Technology, Vol. 24, no. 4, Apr. 2014.

[2] Che-Yen Wen and Chun-Ming Chou, "Color Image Models and its Applications to Document Examination", Forensic Science Journal, Jan. 03,2004.

[3] E. Reinhard, M. Ashikhmm, B. Gooch and P. Shirley, "Color transform between images", IEEE Comput. Graph. Appl., Vol. 21, no. 5,pp. 34-41, Sep-Oct. 2001.

[4] R. Z. Wang, C. F. Lin, "Image Hiding by optimal LSB substitution and genetic algorithm", Pattern Recog., Vol. 34, no. 3, pp. 671-683, 2001.

[5] Nisha and Dr. Ravinder khanna, Dean R&D, Professor, "A Review of Image Restoration Techniques for Salt-and-Pepper noise with Test Results", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Vol. 4, Issue 2, Feb. 2015.

[6] Madhu S. Nair, K. Revathi and Rao Tatavarti, " Removal of Salt-and Pepper Noise in Images: A New Decision-Based Algorithm

[7] Raymond H. Chan, Chung-Wa Ho and Mila Nikolova, " Salt-andPepper Noise Removal by Median-Type Noise Detectors and DetailPreserving

Regularization", IEEE Transctions on Image Processing, Vol. 14, no. 10, Oct. 2005.

[8] K. Bala Prakash, R. Venu Babu and B. Venu Gopal, "Image Independent Filter for Removal of Speckle Noise", International Journal of Computer Science Issues (IJCSI), Vol. 8, Issue 5, no. 3, Sep. 2011.

[9] Arpit Singhal and Mandeep Singh, " Speckle Noise Removal and Edge Detection Using Mathematical Morphology", International Journal of Soft Computing and Engineering (IJSCE), ISSN: 2231-2307, Vol. 1, Issue 5, Nov. 2011.