

# Secure Data Transfer in Double Image Using Reversible Data Hiding Technique

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## ABSTRACT

Steganography is method of covered writing or secret writing. This concept is used to hide data in a cover medium for secret communication. Images are used as the cover medium for hiding data. In this paper, double image fusing concept is used to transform secret data using chaos algorithm and least significant bit (LSB) replacement method with color images. DWT algorithm is used for the color images to enhance the performance for perfect security. Chaos used to encrypt the data before embedding data into the cover image. This method is used for secure encryption of the data. Encryption key is used for secure encryption of the data. The given images are fused and then the encrypted data is embedded in the fused image pixels using LSB replacement algorithm. In the data extraction, the secret data is extracted using the decryption key and the color image. In this proposed security scheme, transformed secret sequence and reversible data hiding in an encrypted double image were employed to enhance the severe of the security problems. The MSE and PSNR for various images in 512\*512 and 256\*256 have been estimated using MATLAB and compared with the available literature.

**KEY WORDS:** Stenography, DWT fusion, Chaos algorithm, LSB, Reversible data hiding, color plane process, RHD.

## 1. INTRODUCTION

Image processing is the technique of performing operations in the visual appearance of images to the human and preparing images for the measurement of the features and structures present. Scientific images generally produce images to communicate results to the operator, rather than producing an audible tone. In this domain the recent development is storing large amount of data in the image and at the same time it should provide high security. In this proposed system, we are going to see the combination of cryptography and stenography. Cryptography is the art and science of transforming messages to make them secure and immune to attack. Steganography means cover or secret drawing. By using these two techniques we are going to securely transform the information to the target place. In our proposed system, double image encryption technique has been considered to carry secret data using LSB and chaos algorithm. In this proposed security scheme, reversible data hiding in an encrypted double image is employed to enhance the sternness of the security barrier. Reversible data hiding scheme unlike steganography provides reconstruction of the cover and embedded secret data. Reversible data hiding was introduced and implemented by Ni in 2006 (Hilal Almara'beh, 2016) to embed secret data in image by Improving the PSNR and reducing the MSE. Kaoliang Chung (Abhinav Thakur, 2015), Steg analysis is done to identify the cover and embedded data. Steganalysis scheme is to identify the hidden data and cover image based on histogram feature coding approach that detects the presence of steganographic data.

Reversible data hiding for encrypted images was carried out to improve security and authentication. An algorithm which includes compression, encryption and embedding and make use of reversible data hiding concept and improves the PSNR value. In the proposed system, the two RGB images are combined using DWT technique after that data is hidden in the image by converting the plain text to the binary values these values are stored in last two bit of least significant bit. By storing the data in the last two bit of LSB improves the security which is in increase of PSNR value. Reversible data hiding is the recent technique to hide data in the image. In this proposed system, the need is to send the data securely and decryption of data is possible only by the receiver. The hackers cannot identify the original image so that they cannot retrieve the data.

This proposed system can be used in Multimedia Security, Defense Field, and Data Communication and in biomedical field. An 8-bit RGB image matrix consisting  $m \times n$  pixels and a secret message consisting of  $k$  bits. The first bit of message is extracted from the LSB of the first high frequency coefficients and the second some bits of message is extracted from the second reserves coefficients and so on. This process is repeated up to all secret message bits are retrieved and these bits are grouped into 8bits to form a character values. The extraction of desired payload number of bits will be performed by using logical bitwise operators called 'bit and' and 'bit or'. Finally all extracted message characters are applied to chaos decryption module to decrypt the data with private keys. Chaos algorithm is used to compare the value of secret data and threshold value to achieve best performance in the color image.

The important techniques are explained in detail. Here DWT, LSB Replacement technique, RDH, chaos algorithm are given.

Discrete Wavelet Transform (DWT) is the replacement of Discrete Cosine Transform (DCT) in the DCT only the horizontal and vertical dimension can hide the data. In the DWT the sub bands are taken that LL, HH, LH, HL to get the clear fused image. By using this concept the fusing technique is essential in our proposed system.

LSB replacement technique is used in the existing system but in our proposed system this technique is used along with DWT fusing concept. Reversible Data Hiding technique is used because in the image in a single pixel 8-bits are present in that 4 MSB bit and 4 LSB bit. Here the MSB bit is responsible for color of the system LSB is responsible for storage of data, so that in the reverse order the data is stored in the image.

Chaos encryption and decryption algorithm is used to encrypt the secret data into the image and decrypt in the same way. It is a less time consuming process as compared to the other process which has the value for secret data and threshold is compared using the XOR technique. PSNR is the peak to noise ratio, Here by using the fusing technique the noise ratio is increased as compared to the existing system. MSE is the mean square error the MSE is reduced by using the fusing technique as compared to existing system.

## 2. RELATED WORK

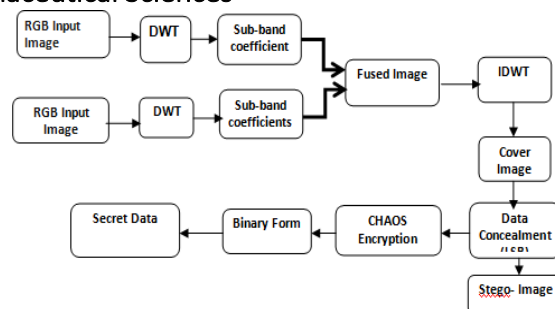
For the past few years, a rapid growth in the field of steganography results in many applications, by using this result, we observed many reference paper and its details are given here (Abhinav Thakur, 2015). A DCT based video steganography is introduced. By using this technique only the horizontal and vertical position of the image can be found. Experimental results show that the stego video looks unaltered and have PSNR value is less. The concept used here is video steganography based on DCT. The various combinations of wavelets like Discrete Cosine Transform (DCT) and Integer Cosine Transform (IDWT) are used in this system. (Ajit Singh, 2013). Combination of cryptography and steganography are used, which makes it hard to detect the presence of encrypted message. But in some cases if the eavesdropper has attacked the carrier of message then he will not be able to get the initial message as all the data here is in hidden form. For cryptography Blowfish algorithm is used which is much better than AES and DES and it is faster algorithm when compared to other algorithm. In order to break blowfish algorithm he has to spend a lot of time and effort for trying several attacks and getting the original message that is the hidden message as observed from this paper (Anitha Raj, 2014). When we consider the reference pixels, the PDE-based in painting algorithm using the Fast Numerical model can produce the forecast image. Use of this strategy for choosing the in painting predictor and reference pixels. The efficiency of the prediction result was high, and larger numbers of embedded pixels are acquired. The embedded hidden data can be retrieved from the image but it is highly time consuming process (Ashitosh Thorat, 2015). There are different methods available for hiding information in different cover media. To launch or navigate missile a system contain so many important data and this data is saved from unauthorized access use steganographic techniques. Steganography can be used for hidden communication. By referring the enhancement of the image steganographic system using least significant bit approach to provide a means of protected communication but as per our observation using this LSB technique data can be attacked by hacker easily. In the system, a key is applied during enclosement of the message into the cover-image. The message bits are enclosed randomly into the cover-image pixels instead of sequential method. Finally, steganography that uses a key has more secure communication than non-key steganography but it is a confusing process (Balasubramani, 2016). In this work, thread based implementation assists concurrent search to suit real time architectures and improve the retrieval information rapidly. In this work, at two level image security scheme consists of steganography and encryption technique is proposed and implemented. It is enhanced by deploying thread based concept using effective mining techniques and more suited for multi core processors with the increase in speed. The method is implemented using parallel threads, which are more effective and offer improved performance using multithreading scheduler. Here the images are sliced for the parallel processing, so the retrieval of the original image is difficult. We have identified that an asymmetric watermarking technique, involving a secret key for enclosing a public key is put together with an encryption method in that way the whole system is commutative, it involves both the encrypted data and cipher watermarked data by using the just one single detector, that technique is applied to the DCT of the original image, the watermarked part is based on linear algebra tools (Boukhatem Mohammed Belkaid, 2015). In this RSA and AES algorithm has been observed. The result of this project indicates that the meteosat image is even and common. By the thorough study of strength and benefits of confusion and diffusion properties, security issues against some known attacks can be found. But here the many rounds of encryption and decryption take place (Esam Hagra, 2011). A Partial Encryption Algorithm and new commutative Watermarking based on mixed single level 2D transform domain and multi dimension map orbit hopping chaotic system is introduced and with PEW technique is based on one level two dimension DWT and Multi-map Orbit Hopping Chaotic system. From this observation the commutative Watermarking gives less clarity of the picture when compared to others (Haeleen Kour, 2015). Sharing information over the communication network has become the essential part of technology. So it is important to share information on the network with the security. For this many cryptographic methods are in practice. In this reference paper, we have observed the importance of Multiple Least Significant Bit technique with the help of Digital Signature Algorithm. But the problem is DSA algorithm is similar to Blowfish algorithm. (Hilal Almara'beh, 2016) This paper is the combination of audio and video steganography. To achieve the better security and efficiency of the data the

effective steganography parameters are PSNR, MSE, SNR and MC. And many techniques are LSB, phase coding, echo hiding and DCT are used. (Jigar Makwana, 2016). A state of the art combination work of two famous data security approaches, namely cryptography and steganography. However both of techniques provide security for secret information but separately one can't guarantee for absolute security of data. Therefore to provide more security to the data at the time of transaction over unsecured channel a novel advance technique for data security is needed. From our observation in this paper future work can be done in way to combining the concepts of hybrid cryptography and audio steganography, to provide more security to the secret message. It explains about the data hiding with histogram modification technique is made by considering the multiple difference rather than single pixels. Here the issue is communicating the multiple peak and zero points in this a reversible steganographic algorithm with the help of texture synthesis. Given the original source that the scheme is to produce a large stego synthesis texture for concealing secret messages. To increase the embedding capabilities the combination of steganography approaches is used. If the receiver has only the key, can extract the additional data without the help of image content. If the receiver has both the keys like data hiding key and encrypted key the user can extract the additional information and image with an error but it is a time consuming process (Padmapriya, 2017). Bit planes of the double images have been given, and then difference image was computed based on histogram approach from the double images. Then secret logo image was hidden in the difference image to improve the hiding capacity in spatial domain. This embedding provides compression, authentication and security as compared with the historical embedding schemes (Parwinder Singh, 2015). This technique hides data using the motion vector technique. By embedding the data in moving objects the robustness of the algorithm is increased. The PSNR value is calculated to show that results are acceptable and data is transmitted completely but the error rate will be high (MSE) value (Shilpy Mukherjee, 2014). Image data hiding concept plays a vital role in every aspects of system such as social networking, Google image search, video news, video entertainment, medical image. Several of the method proposed has been designed to implement the reversible data hiding techniques. The new technique is implemented which can separate the image and data from the encrypted image. This is also a new technique for providing watermark to the image. Here the watermark technique gives less clarity to the image (Yingqiang Qiu, 2016). From this observation, the extended GIT technique is used to enhance the security in the various application and the recovery of original image is made with the GIT algorithm.

**Proposed System:** In our proposed system, this concept is used to hide data in a cover medium for secret communication. Images are used as the cover medium for hiding data. In this paper, double image fusing concept means the two RGB plane images are taken these two images are fused to get single image in the gray scale by using the IDWT the gray scale image is converted into RGB image to hide data in it. Here is used to transform secret data using chaos algorithm and least significant bit (LSB) replacement method is used with color images. DWT algorithm is used for the color images to enhance the performance for perfect security. Chaos used to encrypt the data before embedding data into the cover image. This method is used for secure encryption of the data. Encryption key is used for secure encryption of the data. The given images are fused and then the encrypted data is embedded in the fused image pixels using LSB replacement algorithm. In the data extraction, the secret data is extracted using the decryption key and the color image. In this proposed security scheme, transformed secret sequence and reversible data hiding in an encrypted double image were employed to enhance the severe of the security problems. The MSE and PSNR for various images in 512\*512 and 256\*256 have been estimated using MATLAB and compared with the available literature.

#### **System Model:**

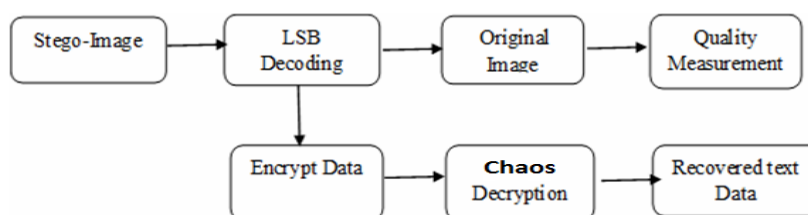
**Embedding diagram:** In our paper, the main aim is to enhance the security by minimizing the MSE value and maximizing the PSNR value. We take two RGB images as input and these images are fused as single image using DWT Technique. In the diagram (a) the RGB image are taken, the DWT is applied for the RGB plane images, Discrete Wavelet Transform is a local transformation from time and frequency domain and it will easily generates a variety of different resolution images. It divides the image into different sub band images, as LL, LH, HL, and HH. A High-frequency sub band in the image contains the edge information of input image and Low frequency sub band in the image contains the clear information about the image. It enhances the appearance of the image with help of this sub bands information for fusion process to obtain as a single image. During fusion process the image is converted into three planes as Red plane, green plane and blue plane. The two images RGB planes are fused into a single image. During This fusion process helps us to improve the security of data and to retrieve the exact image at the decryption stage.



**Figure 1. Embedding process for encryption of data into image**

Huge amount of data can be hidden in the small image. Decrypting the text is not possible by intercepting the image or data file separately. So, it is more secure. RDH algorithm is also used for embedding the data in the cover medium, where the bits of text are embedded in reverse order. Reversible data hiding is a type of data hiding techniques whereby the cover image can be recovered exactly. As it is lossless makes this technique suitable for medical and military applications. Difference expansion (DE) is one of the most important techniques which are used for reversible data hiding. finally a encrypted stego RGB image is obtained which is sent to the receiver.

#### Extracting process:



**Figure.2. Extracting process, the decryption of original image**

The stegano image is decrypted in two parts: first the data is decrypted from the cover medium and the cover medium is obtained. The reverse process is performed to obtain the data. LSB decoding technique is used to decrypt the encrypted data and the cover medium. Where the data obtain will be exactly the same as the original data and covered image is also obtained same as the original RGB image.

### 3. CONCLUSION

In this paper, data hiding in double image has been performed, and then various algorithms are used for data hiding and fusing of images. DWT algorithm is used to fuse the two color images into a single image and Chaos algorithm used to encrypt the data. LSB replacement algorithm is used to hide the data. This concept is used enhance the security for secure communication using images. The proposed methodology employees color images and implemented using MATLAB version 12B.

### 4. ACKNOWLEDGEMENT

The author wish to thank Vel Shree Dr. R. Rangarajan, Chancellor, Vel Tech High Tech Dr. RR and Dr. SR Engineering College, for the support and facilities provided for the preparation of this paper.

**Financial disclosure:** No financial support was received for this implementation.

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