Survey on Several Data Hiding Scheme for Encrypted Image by Reserving Space

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Abstract

Nowadays, due to explosive growth in the usage of internet the security of sensitive data becomes one of the prime concerns. For this purpose, various data hiding techniques are in used. So Reversible Data Hiding (RDH) in encrypted image is in used due to its excellent property which is original cover can be recovered with no loss after extraction of the embedded data. It provides image content's confidentiality, security and authentication. Formerly all the methods use vacate room after the encryption (VRAE) method but the difficult with that is sometimes faults are occurred at the time of retrieval of original image. So we use reversible data hiding by reserving room before the encryption. Basically this paper describes the overview of previously used techniques for space allocation of encrypted data inside an image can be done before or after the image encryption.

Keywords: Reversible Data hiding, vacate room after the encryption

I. INTRODUCTION

Digital communication has become an essential part, as a lot of applications are internet-based and it is significant that communication will be made secret. So for the security aspect of information passed over an open channel has become a fundamental issue and hence, the confidentiality are required to protect against unauthorized access and use. Hence data security is more important for transferring more data from one end to another through internet. There are various methods available for data security.

Data hiding is defined as the process of implanting the message signal into the cover of image to get the composite signal. Following are the 3 main requirements of data hiding system,

1) Perceptual Transparency
2) Robustness
3) Capacity

Mainly data hiding techniques are classified into two methods:

1) Reversible data hiding (RDH) technique:
   In this method, the message signal as well as the novel cover can be with no loss recovered in chorus.
2) Irreversible data hiding technique:
   In this method, the message signal can be convalesced with no loss but the original cover can be lost.

So now a day's reversible data hiding (RDH) techniques can be used. Since several years, multimedia data protection is becoming very important. The host signal is distorted in order to insert the additional information into it using the data embedding techniques. This embedding distortion is small but irreversible i.e. original cover cannot be recovered as it is. In many applications, the loss of cover data is not acceptable. The protection of this multimedia data can be done by encryption or data hiding algorithms. Data compression is necessary to data transmission. A new technique is trying to combine encryption, compression and data hiding in a single step. Now days, new challenge consists embedding of data in encrypted images. In number of domains where distortion to the cover image is admissible but permanent loss of cover image is not acceptable. This problem boosts the need for reversible data encryption techniques.

Method of reversible data hiding for encryption image are reserving room before encryption and vacating room after encryption.

A. Vacating Room Before the Encryption:

In the first framework, vacate room after encryption (VRAE), a content owner initial encrypts the original image using a standard cipher with an encryption key.

After producing the encrypted image, the owner hands over it to an information hider (e.g., a database manager) and the information hider can embed some additional data into the encrypted image by losslessly vacating some room according to a data

hiding key. Then a receiver, maybe the owner himself or a third party can extract the embedded data with the data hiding key and further convalesce the original image from the encrypted version according to the encryption key.

B. Reserving Room Before the Encryption:

In this the sufficient space is reserved before the encryption of the original process. After this the encryption and then data hiding as we done in above method. There are four main steps in this process: 1. Encryption of image 2. Data hiding 3. Data extraction 4. Image recovery

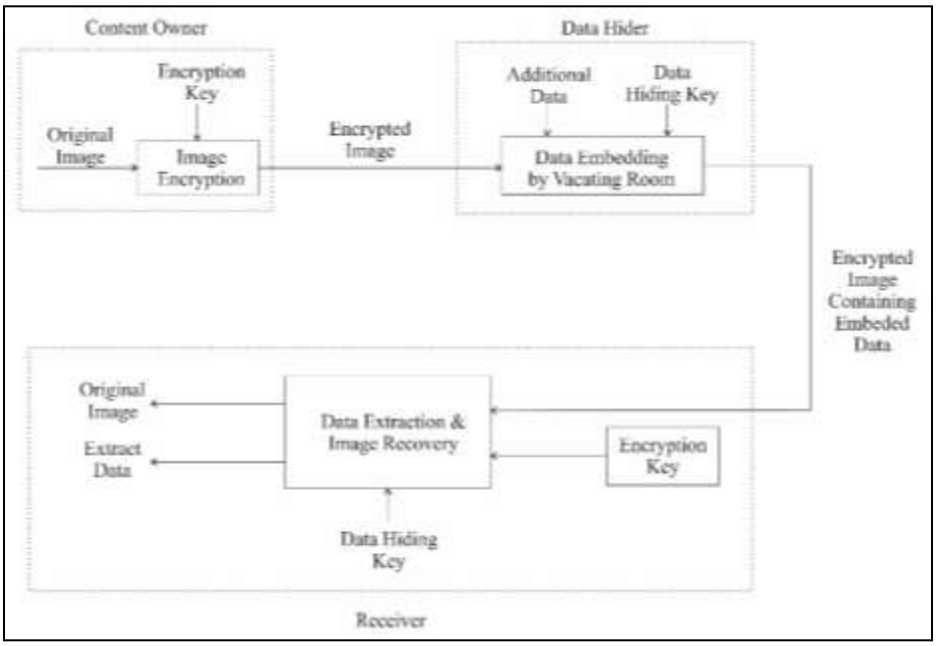

Fig. 1: Vacating room after Encryption (VRAE)

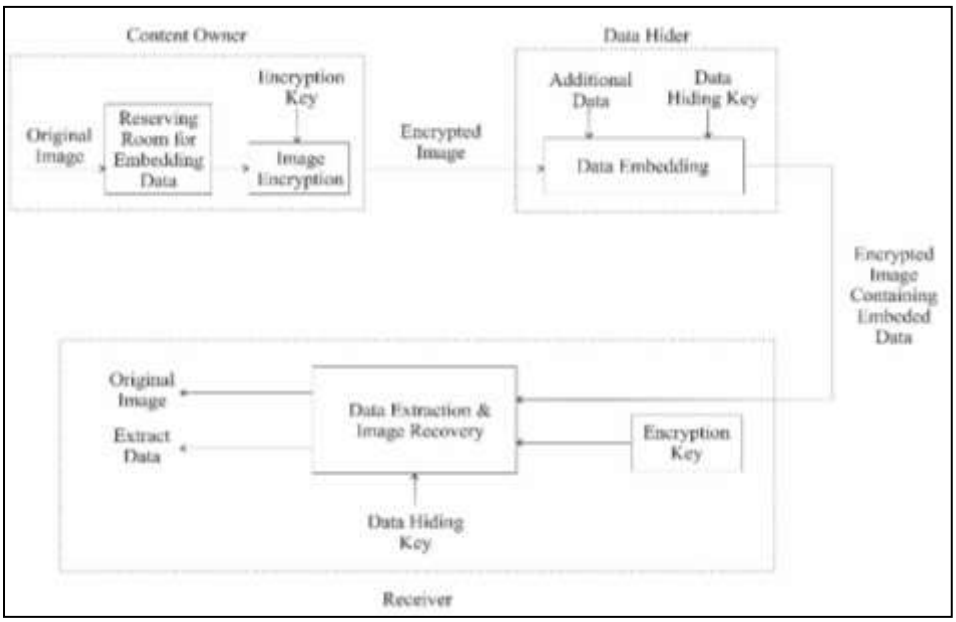

Fig. 2: Reserving Room before Encryption (RRBE)

II. LITERATURE REVIEW

Data hiding process involve two sets of data, a set of the embedded data & A set of the cover media data. As when information is embedded into the image then the quality of image gets distressed. So it is expected that after the data extraction the image quality should be preserved just like the unique image. With regard of distortion in image, Kalker and Willems [1] established a copy of rate-distortion for reversible data hiding. Reversible data hiding in images is a method, due to which the original cover can be recovered without any loss after the embedded message is extracted. This important method is usually used in medical

images, military images and law forensics, where no distortion of the original cover is allowed which can be done using reversible data hiding.

Kalker and Willems [1], defines the reversible data hiding in encrypted images by using spare space as reserving room before encryption. More attention is given on the RDH technique which is responsible for the reversibility i.e. original cover can be losslessly recovered. It provides confidentiality and security to user. The room reservation is performed before encryption. The advantages of this proposed system is it maintains extra space for embedding data in data hider module. The system achieves excellent performance without any loss of data [1].

In difference expansion method[2], the differences between two adjacent pixels is expanded i.e. multiple of 2, thus to generate a new Least Significant Bit of difference are all zero and thus can be used for the accommodation of additional data. The performance of the system by using reversible data embedding is measured through various factors such as the payload capacity bound visual quality and complexity. The benefit of the system is it prevents the loss of data while execute compression and decompression. This method is useful for the audio and video data. The system gives error because of division by 2 and due to degradation of visual quality by bit replacement [2].

One of the promising strategies for the RDH is explained by Z. Ni. et.al. [3]. Data hider can perform reversible data hiding using histogram shift mechanism. It utilizes zero and peak points of the histogram of an image and slightly modifies pixel gray values so that the space is reserved for data embedding inside the image [3].

In W. Zhang‘s proposed system [4], decompression algorithm is used for embedding the data. Recursive code construction for binary cover is performed to improve the system. Author proved that this construction can achieve rate- distortion model till the compression model reaches the entropy. The system checks the equivalence between data compression and RDH for binary bounds. The system has the benefit of reducing the distortion [4].

Fridrich et.al.[5], constructed a general framework for reversible data hiding. He first extracted the compressible features of the original cover and then compresses them losslessly , the spare space can be saved to embed the auxiliary data [5].

L. Luo, et.al [6]., have used an interpolation technique for reversible image watermarking. Reversible image watermarking restores the original image without any falsification after the extraction of hidden data. In this system we can embed large amount of covert data for imperceptible alteration. Digital watermarking is the form of data hiding that are used to embed the covert data into digital signal. This method based on adaptive interpolation-error expansion, which provides very low distortion rate and larger capacity. It also improves the image quality [6].

X. L. Li,et.al[7]., have used a hybrid algorithm. It basically uses three algorithms Predictive –Error Expansion (PEE), adaptive embedding, and Pixel selection. PEE is important for data embedding and used for reversible watermarking. It provides integrity and authentication to the user. It also improves the payload with low distortion. We use the concept of watermarking where distortion free data is required. PEE is an improvement of the Difference Expansion (DE). The proposed system describes the threshold rate for pixel of image and it divides the image pixels into two parts. Afterward select the pixel on the basis of capacity factor and threshold. Pixel selection and adaptive embedding performed simultaneously. The system reduces the embedding impact by reducing the modification and improving the visual quality [7].

Wien Hong et.al.[8], proposed method employs better prediction techniques and offers a mechanism to add or remove reference pixels based on local image characteristics, i.e., it reduces the number of reference pixels in smooth regions to increase the payload and thus the number of reference pixels in complex regions to prevent excessive image degradation is increased [8].

Tung-Shou Chen,et.al.[9],proposed an improved version of Zhang‘s reversible data hiding method in encrypted images. Zhang‘s earlier work did not fully exploit the pixels in calculating the smoothness of each block and did not consider the pixel correlations in the boundary of neighbouring blocks. These two issues could reduce the correctness of data extraction. Author adopted a better scheme to measure the smoothness of blocks, and uses the side-match scheme to further decrease the error rate of extracted-bits. The proposed method improved data extraction and image recovery strategies based on Zhang‘s work. A new algorithm to better estimate the smoothness of image blocks is used. The extraction and recovery of blocks are executed according to the descending order of the absolute smoothness difference between two candidate blocks. The side match method is employed to further reduce the error rate [9].

Zhicheng Ni, et.al.[10], proposed a novel reversible data hiding algorithm. It can recover the original image without any loss from the marked image after the hidden data have been extracted. Author proposed an algorithm which used the zero or the least points of the histogram of an image and slightly modified the pixel grayscale values to embed data into the image. This algorithm can be useful to virtually all types of images. It is expected that this reversible data hiding technique will be used for a wide range of applications in the areas such as secure medical image data systems, and image authentication in the medical and law enforcement, and the other fields where the rendering of the original images is required [10].

III. SUMMARY TABLE

Paper	*Technique used*	*Highlights*
Reversible data hiding in encrypted images by reserving room before encryption	*AES algorithm*	*In this proposed system, the room reservation is performed before encryption. The advantage is it maintains extra space for embedding data in data hider module.*
Reversible data embedding using a difference expansion	*Difference expansion method*	*Difference expansion method is explained by the author. Benefit of the system is it prevents the loss of data while performing compression and*

		decompression. This system is useful for the audio and video data.
Reversible Data hiding	*Histogram shift mechanism*	*Data hider can perform reversible data hiding using Histogram shift mechanism. It utilizes zero and peak points of the histogram of an image and slightly modifies pixel gray values so that the space is reserved for data embedding inside the image*
Improving various reversible data hiding schemes via optimal codes for binary covers	*Decompression algorithm & recursive code construction*	*The system checks equivalence between data compression and RDH for binary bounds. It has the benefit of reducing the distortion.*
Lossless data embedding for all image formats	*General framework for RDH*	*Authors constructed a general framework for reversible data hiding. He first extracted the compressible features of the original cover and then compress them losslessly, the spare space can be saved to embed the auxiliary data*
Reversible data embedding for high quality images using interpolation and reference pixel distribution mechanism	*Prediction techniques*	*The proposed method employs better prediction techniques and offers a mechanism to add or remove reference pixels based on local image characteristics.*

IV. CONCLUSION

Reversible data hiding in encrypted images is a novel area drawing attention because of the privacy preserving requirements from cloud data management. We have studied various reversible data hiding techniques to recover the original image by reserving space. It is not possible to reconstruct the original cover image without any loss. Also earlier methods implement RDH in encoded images by vacating room after encryption, as opposed to which reserving room before encryption method. In this paper, information hider can benefit by the extra space released out in past stage to make data hiding strategy simple. It can accomplish real reversibility, that is, information extraction and image recovery are free of any error.

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