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REVERSIBLE IMAGE DATA HIDING: A SURVEY

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Abstract — *Information security is necessary to shield secret information from non-legitimate access and information integrity loss. In this paper different reversible image information hiding techniques are reviewed. The reversible image information hiding theme may be used in scenarios wherever information security plays a significant role for instance military, medical science, banks etc. Secure digital communication may be achieved by hiding crucial data inside a cover image. For security reasons the encryption of cover image is preferred before hiding information. Reversible image information hiding permits embedding the information within a cover image. At the decoder side the stuffed information is extracted and cover image is retrieved back by using decryption. In these techniques, lossless recovery of a cover image and embedded information is ensured.*

Keywords: *Encryption, decryption, reversible image data hiding, data extraction, image watermarking.*

I. INTRODUCTION

Now a day's information is transmitted firmly over un-trusted public network by hiding it within a cover media. This can be called image information hiding. The information hiding technique, reversible image data hiding, RIDH assures that, upon extraction of embedded message, a cover image is going to be reconstructed absolutely. This methodology is employed in areas like military, remote sensing, cloud computing, forensic department, medical image sharing, and copyright authentication as in these areas fidelity of reconstructed images is extremely expected.

In existing RIDH algorithms message bits are embedded into original, unencrypted image. As original information bits are being embedded into a cover image, the most objective of this system is to extend range of bits to be stuffed for increasing embedding capability of the cover image. Early work shows lossless compression algorithm [1],[2] was used to compress image options and make space to stuff additional information bits. But this methodology offered less embedding capability and severe distortion was observed on watermarked pictures. Later Ni et al.[3] designed histogram shifting methodology that obtained higher embedding capability.[4],[5]. Distinction enlargement and prediction error enlargement strategies provided state of the humanities embedding capability [6]-[10].

In recent days, signal processing over information encrypted domain has become common. In several undergoing circumstances like cloud computing, secure remote sensing, two parties that are processing image information are un-trusted. To confirm security, all the images are encrypted before forwarding to an un-trusted party. For example, in secure remote sensing on board camera capture satellite images. These images are encrypted and so sent to base station. Once base station receives encrypted image it embeds confidential information in this image, currently this encrypted image that is full of information is going to be transmitted over public network towards information centre wherever it will be kept for further analysis. Finally, at information center embedded message within an image is extracted and using encryption key K, original image is obtained. The secret encryption key is pre-negotiated between satellite and information centre to that a base station has no access. Maintaining the key encryption key 'K' introduces the necessity for maintaining a key management system, KMS, that is to blame for activity all key connected tasks like key generation, key expiration, key maintenance etc. It is very expensive to implement a reliable key management system. Hence there should be some mechanism that achieves secure information hiding, without using a further information hiding key. Conjointly it's desired that, and embedding algorithm ought to be easy enough so that it saves the advanced computation at base station.

II. LITERATURE SURVEY

Mahmet U Celik, Gaurav Sharma, A. Murat Tekalp, Eli Saber [2] presented a lossless data hiding technique which allows precise recuperation of original image signal past extracting embedded information. To perform data embedding in an image, least significant bit (LSB) amendment method is used which adds additional operating points on capacity distortion curve. To get novel image a signal is compressed, these compressed fractions are transmitted as a part of concealed data. The primary objective behind this is to recuperate original image with preserved data integrity and to evade misrepresentation of the image from an original one. The compression effectiveness is enhanced with the help of prediction based conditional entropy coder by using inert portions of host side information. In this technique the lowest level of host signal is modified to make space for stuffing maximum amount of data as possible. Original image is revival is done by compressing, transmitting and recovering signal features.

Z. Ni, Y. Shi, N. Ansari, S. Wei [3] proposed reversible image data hiding using histogram shifting method. In this method the objective was to embed more and more data inside an image .To produce extra space for embedding data bits,

bits of grayscale values are shifted. In histogram shifting method peak and zero points of the image histogram are shuffled. Number of pixels at the peak point gives the embedding capacity of an image. The peak signal to noise ratio (SNR) of marked image is supplementary than further reversible data hiding techniques. This scheme can be applied to majority types of images. This method is simple and has low PSNR ratio. It provides elevated embedding capacity; also the distortion of image at decoder side is squat. The disadvantage of this technique is that, it takes more time to search an image for several numbers of iterations.

Zhenfei Zhou, Hou Lou, Zhe Ming Lu, Jeng Shyang Pan [11] presented a reversible image data hiding based on multilevel histogram modification and sequential recovery. They presented reversible image data hiding of natural images. Here an congregation of histogram is based on difference between adjacent pixels. At the time of embedding data a multilevel histogram alteration is achieved. Additional peak points are used to hide secret information and therefore more data embedding propensity is obtained. There is improvement in difference which are intent at zero, regulating distortions in the watermarked image. All the pixels are recovered in chronological conduct where current pixel is obtained by previously obtained adjoining pixel. The fundamental reason is to amend the histogram built based on neighboring pixel instead of host image histogram as mentioned in [3] by Z. Ni, Y. Shi, N. Ansari.

J. Tian [7] presented a high capacity, high visual quality reversible image data hiding for digital images. The difference between neighboring pixel values is calculated. Some difference values will be selected for performing difference expansion (DE). These difference values will now be used to stuff important information inside an image. In this technique the least significant bits (LSB) of the difference are made zero and secret, information is embedded. Difference expansion method offers better payload embedding capacity, better visual quality of an image and it gives low computational complexity. The benefits of the system are, there is no data loss when compression and decompression is performed. To achieve reversibility, redundancy in the original content is searched. This system works best for both audio and video signals. The main disadvantage of this system is the visual quality of an image is degraded because of replacement of bits.

Diljith M. Thodi, Jeffery J. Roudriguez [12] proposed the histogram shifting method. J. Tian [7] introduced difference expansion method which offered high embedding capacity of stuffing the crucial data however; this method had many drawbacks as embedding capacity was not up to the mark. There was severe distortion in received image and there was necessity of an embedding location map. Diljith M. Thodi, Jeffery J. Poudriguez's histogram shifting method gave alternative way for embedding a location map inside the cover image. This scheme had improved distortion performance at high data embedding capacity and takes control over capacity control problem. They also proposed a prediction error expansion (PEE) method which properly make use of correlation between adjacent pixels as compared to difference expansion (DE) method. Prediction error proves that it gives double embedding capacity than that of the difference expansion method.

Xialong Li, Bin Yang, Tieyon Zeng [9] presented efficient reversible watermarking based on adaptive prediction error expansion and pixel selection. They presented efficient reversible watermarking based on adaptive prediction error expansion (PEE) and pixel selection, which allows stuffing crucial information inside a cover image without ant data loss. This work presents improved version of conventional prediction error expansion (PEE) methods achieved by introducing two new schemes as 1) Adaptive data embedding 2) Pixel selection. Avoiding hiding the information uniformly, here one or two bits are stuffed inside expandable pixels. According to regional complexity this system obtains more embedding capacity i.e. 1.8 bits pixel (b.p.p) compared to conventional systems which offer embedding capacity of 1b.p.p. Here smooth pixels from an image are only selected and rough pixels are avoided. Also, extension to smooth pixels is given where rough pixels are kept undisturbed. In this scheme we obtain more clearly distributed histogram and larger amount of prediction error in histogram are expanded to carry embedded information. This reduces amount of bigger pixels, hence it can provide a better image superiority.

X. Zhang [13] presented separable reversible image data hiding where he proposed a method for separable data embedding in encrypted cover image. Here original uncompressed cover image is encrypted at sender using a secret encryption key, image's least significant bits are compressed to make spare space for hiding more and more bits. At decoder side, if data hiding key is provided receiver can extract the hidden data using the key, also a cover image can be decrypted to find an original one. X.Zhang's this scheme was an example of separable reversible data hiding as data extraction and image decryption were two separate activities at the decoder side.

Kede Ma, Weiming Zhang, Xianfeng Zhao, Nenghai Yu, Fenghua Li [14] proposed," Reversible data hiding in encrypted images by reserving room before encryption". Reversible image data hiding is gaining more and more popularity, as it allows embedding of secret data in cover image and lossless recovery of cover image and hidden data. All previous method embeds data by reversibly vacating room from encrypted image, which can lead to some errors, while extracting hidden data and decrypting the image. In proposed scheme, instead of vacating room, reservation of room is done before encrypting with conventional reversible image data hiding methods. It will be much easier to stuff the data inside an image; proposed scheme allows getting the hidden data and image without an error. Experimental results show that

embedding capacity of such methods is 10 times more than previous methods. As vacating room from encrypted image is neither easy, nor efficient, hence in proposed method first reservation is done followed by image encryption.

III. ANALYSIS OF EXISTING SYSTEM

The early works principally used the lossless compression formula to compress certain image options, so as to vacate area for message embedding. However, the embedding capability of this type of technique is quite restricted and also the incurred distortion on the watermarked image is severe.

Though existing systems offered higher embedding capability and correct reconstruction of cover image when information extraction, they additionally suffered from multiple drawbacks. The embedding capability wasn't up to the mark. Also, there's rigorous distortion in retrieved image. Of these strategies used encryption techniques to embed the key information within an image that introduced the requirement of maintaining a secret encryption key. This was attainable as long as there's a robust KMS, which can handle all key connected tasks. Unfortunately maintaining such KMS was very expensive. These existing systems provide less security and are at risk of totally different attacks. to beat these drawbacks Jiantao Zhou et al. presented “Secure reversible image information activity over encrypted domain via public key modulation”,[15] wherever secret information is embedded within a cover image by getting a public key and easily X-Oaring this public key with encrypted image blocks. This technique is more secure than all previous schemes and saves the value and overhead of maintaining a KMS. The projected theme offers far more embedding capability than existing schemes. The powerful 2 category SVM classifier at the decoder facet ensures actual recovery of cover image and allows us to perform coding of original message, ensuring information integrity and recovery original image with none distortion . There is easy X-OR operations needed for information stuffing and this can be the explanation why this theme uses easy calculations and avoids complexity. The appliance areas of this technique involve forensic departments, military applications, remote sensing, cloud computing etc.

SYSTEM ARCHITECTURE

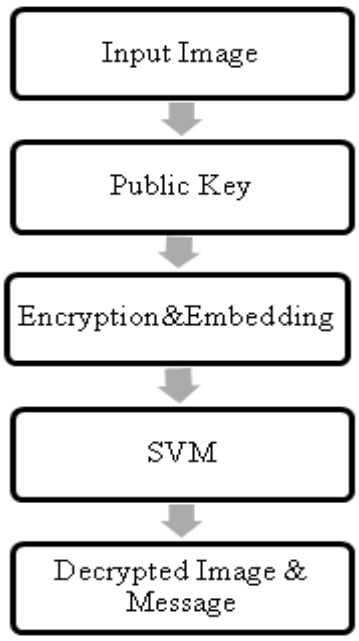

Fig. (a)

IV. CONCLUSION

Typical techniques of RIDH concerned multiple inefficiencies like less information stuffing capability, distortion in retrieved image, complicated computations and high price. Among all RIDH ways the secure reversible image information hiding over encrypted domain via public key modulation technique proposed by Jiantao Zhou et al. [15] outperforms. This theme is an example of non dissociable reversible image information concealing wherever extraction of information and recovery of cover image is completed along. Compared to all or any existing schemes, the theme conferred by Jiantao Zhou et.al.[15] provides more embedding capability and precise recovery of cover image without distortion. As there's no need of a secret encoding key and eventually a KMS, the proposed theme is price effective and offers high security.

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