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An Overview on Reversible Data Hiding in Encrypted JPEG Bitstream

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Abstract – *This correspondence propose a framework of reversible data hiding (RDH) in an encrypted IMAGE bit stream. unlike accessible RDH technique for encrypted spatial-domain images, the propose technique aims at encrypting a IMAGE bit stream into a appropriately prepared structure, and embed a secret message into the encrypted bit stream by slightly modifying the IMAGE stream. we have a tendency to identify usable bits suitable for data hiding so that the encrypted bit stream carrying secret data can be right decoded. the secret message bits area unit encoded with error correction codes to achieve a perfect data extraction and image improvement. The encryption and embedding area unit controlled by encryption and embedding keys severally. If a receiver has each keys, the key bits can be extract by analyze the blocking artifacts of the neighboring blocks, and the original bit stream fully recovered. in case the receiver only has the encryption key, he/she can still translate the bit stream to get the image with good quality without extract the hidden data.*

Keywords: *Signal Processing Method, Precise Estimation of* L_{eq} *, Roughly Observed Data,*

I. Introduction

Reversible data hiding (RDH) is methods that embed secret information into a cover image in a reversible manner. On the receiving aspect, the hidden message is extracted and therefore the original image perfectly remodeled. this technique is very useful in applications such as medical and military imaging where the original image must not be altered once the embedded data are extracted [1], [2]. different robust watermarking, RDH emphasizes perfect image reconstruction and data extraction, however not the robustness against malicious attacks [1], [3], [4]. this is often useful, for example, in cloud storage. when a file manager try to label the files using RDH methods, no transmission is involved, therefore no errors and attacks either. One common approach is the difference expansion (DE) technique in which differences of picture element groups are calculated and expanded to accommodate further bits [5]. Another is the histogram shifting (HS) that hide secret bit by shifting the histogram of picture element values [6]. other RDH methods are proposed to improve embedding efficiency, e.g., the schemes making use of recent prediction or error expansion algorithms [7]–[9], or generate RDH codes according to the theoretical terms of RDH [10], [11]. Generally, these RDH method are helpful for embedding data into images that are release to

the data-hider. In some applications, however, the image vendor may be unwilling to release the image contents to the data-hider. for example, the patient's personal data must not be disclosed to the one that embeds data into the medical image, while the original image must be perfectly recovered and therefore the embedded data fully extract on the receiver end. in this case, the channel provider must append further messages such as image data, notation and authentication data to the encrypted version of the original images. RDH in encrypted images is also proper for the buyer-seller system [12]–[14]. the seller of digital multimedia system content encrypts the original data and embeds an encrypted fingerprint provided by the customer. in this case, the vendor cannot obtain the customer's fingerprint, and therefore the buyer cannot access the original version unless he/she makes the payment to finish the dealings. to evaluate the performance of a RDH algorithm, the hiding rate and the clear image quality are essential metrics. There exists a trade-off between them because increasing the hiding rate usually causes additional distortion in image content. to calculate the distortion, the peak signal-to-noise ratio (PSNR) value of the marked image is commonly calculated. generally speaking, direct modification of image histogram [2] provide less embedding capability. In contrast, the further algorithms (e.g. [5]–[8]) manipulate the additional centrally spread prediction errors by exploit the correlations between neighboring pixels so that less distortion is cause by information hiding.

Although the PSNR of a clear picture generated with a prediction error based algorithm is reserved high, the visual quality can hardly be enhanced because additional or less distortion has been introduced by the embedding operation. For the images acquire with poor illumination, improving the visual quality is additional vital than keeping the PSNR value high. Moreover, difference improvement of medical or satellite images is desired to show the main points for visual inspection. although the PSNR value of the enhanced image is commonly low, the visibility of image details has been enhanced. To our best information, there is no existing RDH algorithm that performs the task of contrast improvement therefore as to improve the visual quality of host images. therefore in this study, we have a tendency to aim at inventing a new RDH algorithm to get the property of contrast improvement instead of just keeping the PSNR value high.

II. Literature Review

Hao-Tian Wu "Reversible Image Data Hiding with Contrast Enhancement" in this paper reversible data hiding algorithmic rule has been planned with the property of contrast improvement. Basically, the 2 peaks (i.e. the best 2 bins) within the histogram are selected for data embedding so histogram equalisation can be simultaneously performed by repetition the process. The experimental results have shown that the image contrast can be enhanced by rending variety of histogram peaks pair by pair. Compared with the special MATLAB functions, the visual quality of the contrast-enhanced pictures generated by our algorithmic rule is better preserved. Moreover, the original image will be exactly recovered without any further info. hence the planned algorithmic rule has made the image contrast improvement reversible. improving the algorithmic rule strength, and applying it to the medical and satellite pictures for the better visibility, will be our future work.

Xinpeng Zhang "Reversible Data Hiding in Encrypted Image" In this work, a completely unique reversible data hiding scheme for encrypted image with a low computation quality is planned, that consists of image encoding, data embedding and data extraction/ image-recovery phases. the data of original image are completely encrypted by a stream secret message. although a data-hider does not recognize the initial content, he can embed further data into the encrypted image by modify a part of encrypted data. With an encrypted image containing embedded data, a receiver may firstly decipher it exploitation the encoding key, and the decrypted version is similar to the unique image. according to the data-hiding key, with the help of spacial correlation in natural image, the embedded data can be properly extracted while the unique image may be perfectly recovered. although someone with the data of encoding key can obtain a decrypted image and detect the presence of hidden data exploitation LSB-steganalytic ways, if he does not recognize the data-hiding key, it is still impossible to extract the additional data and recover the original image. For ensuring the proper data-extraction and the perfect image recovery, we have a tendency to may let the block facet length be a big value, such as 32, or introduce error correction mechanism before data hiding to protect the additional data with a value of payload reduction.

Wei-Liang Tai "Reversible Data Hiding Based on Histogram Modification of Pixel Differences" In this author presented an efficient extension of the histogram modification technique by considering the differences between adjacent pixels relatively than simple pixel value. One common drawback of virtually all histogram modification technique is that they must provide a side communication channel for pairs of peak and minimum points. To solve this difficulty, we introduced binary trees that predetermine the multiple peak points used to embed messages; thus, the only information the dispatcher and receiver must share is the tree level L. In addition, since neighbor pixels are often highly related and have spcial redundancy, the differences have a Laplacian-like distribution. This enables us to achieve large hiding capability while keeping embedding distortion low.

Mehmet U. Celik et. al. "Reversible DATA Hiding" in this reversible data embedding (hiding) technique is presented. The technique provides high embedding capacities, allow complete recovery of the unique host signal, and introduces only a small distortion between the host and image behavior the embedded data. The capacity of the method depends on the statistics of the host image. For typical images, the method offers sufficient capacity to address most applications. In applications requiring high capacities, the method can be modified to adjust the embed level to meet the capacity requirements, thus trading off intermediate distortion for better capacity. In such scenarios, the generalized LSB embedding proposed in the current paper is significantly privileged over conventional LSB embedding technique because it offers finer granularity along the capacity distortion curve.

Chia-Chen Lina "Multilevel reversible data hiding based on histogram modification of difference images" in this combining the peak point of a difference image concept with a multilevel hiding strategy, our proposed hiding method not only hides a huge quantity of embedded messages but also achieves reversibility. Certainly, it is hard to preserve a stability between hiding capacity and image distortion in marked images. Through a joint imperceptibility and hiding capability calculate, our experimental results confirm that our proposed multilevel reversible data hiding scheme can provide advanced hiding capacity while keep distortion low.

Even when our proposed hiding algorithm is performed for 9 rounds, the standard PSNR is still high than 30 dB and the average hiding capacity still can reach 1.3 bpp. Performance comparison with obtainable reversible scheme further demonstrates the effectiveness of the proposed scheme. In the future, we will discover the possibility of providing higher hiding capacity with lower distortion and extend our method to transform domains such as DCT and the wave domain to improve the transmission quantity of images.

Zhenxing Qian et. al. "Reversible Data Hiding in Encrypted JPEG Bit stream",in this propose an RDH framework for encrypted JPEG bit stream. The original JPEG bit stream is properly encrypted to hide the image content with the bit stream structure preserved. The secret message bits are encoded with ECC and embedded into the encrypted bit stream by modify the append bits corresponding to the AC coefficients. By using the encryption and embedding key, the receiver can extract the embedded data and perfectly restore the original image. When the embedding key is not present, the unique image can be approximately recovered with satisfactory quality with no extracting the concealed data. In this recommend to encode the plain data bits with ECC such that precise data extraction and image restoration can be achieved. In the experiments,use the LDPC codes as an example. Other ECC algorithms may also be used. The proposed framework is also applicable to JPEG-LS and JPEG 2000 with slight modification of the encryption and embedding schemes according to the respective coding-decoding algorithms. Future work aims at extending this scheme to robust watermarking schemes for encrypted and compressed images.

III. Method

The general framework of the planned method is sketched in Fig. 1. Consider the three parties in the entire workflow of encryption-embedding-extraction-restoration: content owner, data hider, and receiver, whose roles are described as follows.

Content owner: Parse the original IMAGE bitstream and encrypt the bitstream to conceal the principal content of the original image. An encryption key is chosen by the content owner. The encrypted bitstream must have the same structure as the original so that it can be decoded correctly to give an undistorted image.

Data hider: Embed the secret message into the encrypted IMAGE bitstream. Suitable positions for data hiding are chosen, and the achievable embedding capacity calculated. Encode plain bits into secret bits with error correction codes (ECC). The word plain is associated with the original message to be transmitted, and secret corresponds to the ECC-encoded and encrypted secret bits. An embedding key is used by the data-hider for security.

Receiver: Extract the secret message and recover the IMAGE bitstream. With both the encryption key and embedding key, the secret bits are extracted and decoded into plain bits, and the original IMAGE bitstream is perfectly restored. If the receiver only has the encryption key, an image with good quality can still be obtained approximately.

Security is main concern now days. Today all is digital that by need some trick to project our data, so through this system proposed efficient data hiding technique. In this paper proposed reversible image data hiding technique with best quality of image for security.

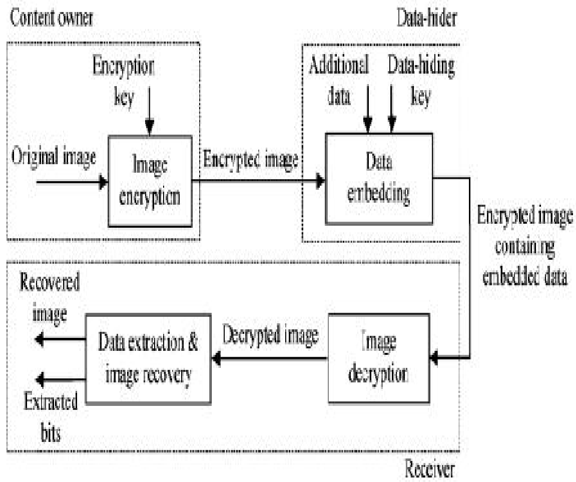

Fig 1: Sketch of the proposed framework.

IV. Conclusion

In this paper propose an RDH framework for encrypted IMAGE bit stream. The original IMAGE bit stream is properly encrypted to hide the image content with the bit stream structure preserved. The secret message bits are encoded with ECC and embedded into the encrypted bit stream by modify the append bits corresponding to the AC coefficients. By using the encryption and embedding key, the receiver can extract the embedded data and perfectly restore the original image. When the embedding key is not present, the unique image can be approximately recovered with satisfactory quality without extracting the hidden data. We propose to encode the plain data bits with ECC such that precise data extraction and image restoration can be achieved. In the experiments, we use the LDPC codes as an example. Other ECC algorithms may also be used.

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