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Research Article

AN EFFICIENT REVERSIBLE DATA HIDING SCHEME BASED ON TWO DIMENSIONAL DIFFERENCE HISTOGRAM MODIFICATION OF PIXEL DIFFERENCES

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ABSTRACT

In this paper, based on two-dimensional difference histogram modification, a novel reversible data hiding (RDH)scheme is proposed by using binary space partition technique. The existing method data hiding is done by using difference pair-mapping and the data hiding aims to embed secret message into cover image. It is a natural extension of expansion embedding and shifting techniques used in current histogram-based RDH methods. By the proposed approach, compared with the conventional one-dimensional difference-histogram and one-dimensional prediction-error-histogram-based RDH methods, Here the data hiding schemes are to hide low number of data only. In this case the space also considered as a character. Since low data are only able to hide in an image. The proposed system maximums of 4,000 characters are able to embed in an image and a different frame work for hiding and extracting are provided at both nodes. A simple lossless data hiding method based on the layered base algorithm by embedding bits in all four layers is proposed. Even though four layers are processed, the parallel processing produces less time consumption.

Keywords: Binary space partition, Difference-pair-mapping (DPM), histogram modification, reversible data hiding (RDH), two-dimensional difference-histogram.

INTRODUCTION

Recent years data hiding plays a vital role to provide secured data transmission. Its aims to embed secret message into cover image by slightly modifying its pixel values. In previous histogram-based RDH method is proposed by one dimensional histogram modification. This method uses maximum and minimum points of pixel intensity-histogram to embed data. It changes each pixel value at most by 1, and thus a good marked image quality can be obtained. In the same time its EC is quite low and this method does not work well if the cover image has a flat histogram. The two-dimensional pixel-intensity-histogram according to a pixel-pair mapping (PPM) which is an injective mapping defined on pixel-pairs. Afterwards it's introduced a method by modifying the histogram of prediction-error. Like difference-histogram, the prediction-error-histogram is also Laplacian-like and sharply distributed which produces an excellent embedding performance. Instead of only using the correlation of two adjacent pixels in Lee et al.'s method[1-3].

Proposed method partitions the cover image into four sublayer. The center pixel of each block is selected as the basic pixel for referencing, and these pixels will not be modified in the embedding stage. To conceal data, the partitioned blocks are visited and the differences between the center pixel and other pixels in the same block are calculated. Data are embedded in the difference value domain by using the histogram-shifting technique. A reversible data hiding method using the difference expansion technique. However, the difference expansion based reversible data hiding methods have to double the differences between pixels; therefore, a larger distortion occurs and may not be suitable for applications where high quality images are demanded[4-6].

EXISTING SYSTEM

In the recent years data hiding plays a vital role to provide secured data transmission. The existing method data hiding is done by using difference-pair-mapping (DPM).First, by considering each pixel-pair and its context, a sequence consisting of pairs of difference values is computed. Then, a two-dimensional difference-histogram is generated by counting the frequency of the resulting difference-pairs[7,8].

Data embedding is implemented according to a specifically designed DPM. Here, the DPM is an injective mapping defined on difference-pairs. It is a natural extension of expansion embedding and shifting techniques used in current histogram-based RDH methods. the data hiding aims to embed secret message into cover image. Here the data hiding schemes are to hide low number of data only. In this case the space also considered as a character. Since low data are only able to hide in an image[9]. Reversible data hiding (RDH) aims to embed secret message into a cover image by slightly modifying its pixel values, and, unlike conventional data hiding, the embedded message as well as the cover image should be completely recovered from the marked content. RDH is a special type of information hiding and its feasibility

SIMULATED RESULTS OF INPUT IMAGE

Figure 1 shows the input image in that going to embed the secret message and to be encoded[10].

Figure 1: Input Image

SIMULATED RESULTS OF OUTPUT IMAGE

Figure 2 shows the output image by using histogram technique the data's are embedded into the cover image without degrading the image quality[11].

Figure 2: Output Image

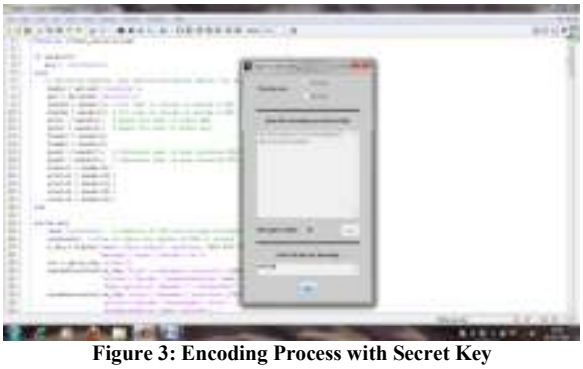

Figure 3: Encoding Process with Secret Key

Figure 3 shows the encoding process done with the image processing tool. The secret key is used to protect the embedded data which is given by the user. The secret data in q-ary representation is then embedded into the quantized coefficients and coded by using the combination of run-length and Huffman encoding[12].

Figure 4: Decoded Process With Secret Key

Figure 4 shows the decoded process in that Image and secret data extraction is done similarly to the embedding process. Before performing the data extraction, the predicted pixel, and the maximum absolute deviation are restored. The extraction of the hidden data is conducted according to proposition 2 or 4 depending on the embedding scheme. The original image is losslessly resumed as soon as the embedded secret message is completely extracted[13].

RELATEDWORKS

Binary Space Partitioning

Binary space partitioning (BSP) is a method for recursively subdividing a space into convex sets by hyper planes. This subdivision gives rise to a representation of objects within the space by means of a tree data structure known as a BSP tree.

Binary space partitioning was developed in the context of 3D computer graphics, where the structure of a BSP tree allows spatial information about the objects in a scene that is useful in rendering, such as their ordering from front-to-back with respect to a viewer at a given location, to be accessed rapidly. Other applications include performing geometrical operations with shapes (constructive solid geometry) in robotics and 3-D video games, ray tracing and other computer applications that involve handling of complex spatial scene.

Binary space partitioning arose from the computer graphics need to rapidly draw three dimensional scenes composed of polygons[14].

Histogram-Based Methods

Histogram-based methods are very efficient when compared to other image segmentation methods because they typically require only one pass through the pixels. The histogram can be done in multiple fashions when multiple frames are considered. The same approach that is taken with one frame can be applied to multiple, and after the results are merged, peaks and valleys that were previously difficult to identify are more likely to be distinguishable. The histogram can also be applied on a per pixel basis where the information result are

used to determine the most frequent color for the pixel location[15].

Geometric Wavelet Transform

Wavelet transformation is widely used nowadays in image compression. Image pixels are transformed into coefficients which are real values. Most energy of the image compacted into a few coefficients. The image is first divided into four regions where the upper left one is the low resolution sub band in which the energy of the image is concentrated. Then it is used in the other detail sub band to reconstruct the original image. Wavelet transform decompose the signal into set of basic functions, these functions are called wavelet.

The proposed work depends on transforming the hyper spectral image into discrete wavelet transform and decomposes the tensor within the coefficient resulted from the transform, and then taking inverse transform to get the image. The main advantage of wavelet is that they allow both spatial and frequency resolution and it is a part of upcoming compression standards.

Data Hiding Main Terms and Notion

Among the lossless techniques of data embedding there are two common domains of operation: spatial and frequency. Spatial techniques are characterized by the embedding of messages into the least significant bits (LSBs) of image pixels, while in frequency methods the message is embedded

In order to obtain a deeper insight of the data hiding process in images, it is necessary to summarize the definitions of the following terms and notion

Reversibility: ability to extract both the original image and the watermark.

Perceptibility: perceptual similarity between the original and the stego images

Payload: number of encoded bits of a watermark without including the redundant information.

Robustness: ability to detect the watermark after the common signal processing operations.

PROPOSED METHOD

The proposed system maximum of 4,000 characters are able to embed in an image and a different frame work for hiding and extracting are provided at both nodes A simple lossless data hiding method based on the layered base algorithm by embedding bits in all four layers is proposed. Even though four layers are processed, the parallel processing produces less time consumption. image can be partition by using binary space partition technique. We show that this difference-histogram- based method can be implemented by modifying the two-dimensional pixel-intensity-histogram according to a PPM which is an injective mapping defined on pixel-pairs.

The proposed data embedding procedure contains several basic steps. First, divide the cover image into non overlapping pixel-pairs. Then, embed the secret message into a part of cover image. Next, record the least significant bits (LSB) of some pixels of to get a binary sequence, and embed this sequence into the rest.

Nowadays with the growth in the information technology, there has opened new opportunities in scientific and commercial applications. However, this progress has caused a lot of serious problems including hacking, duplications and malevolent usage of digital information. Steganography which refers to the secret communication tries to address these growing concerns. A secret message is embedded into a host or cover signal (original audio, image or video data) by slightly modifying its content that results in a watermarked or stego signal. The reverse operation is called extraction. Note that stegano graphic applications have no value for the host signal, which plays the role of a decoy to conceal the very presence of communication. In that case, non-reversible schemes are used, in which only the secret message is extracted. However, there is a number of other applications, which require both the cover image and the secret message at the output and are based on computationally heavy reversible or lossless data hiding techniques[16].

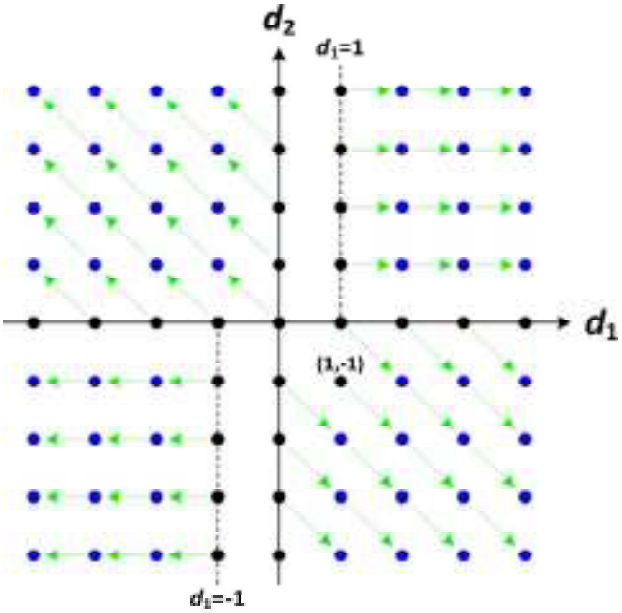

Figure 5: DPM For Illustrting The Proposed Data Embedding Procedure

Extracting Process

When the receiver has the stego image and the key, the embedded secret data can be extracted and the stego image can be restored to its original state.

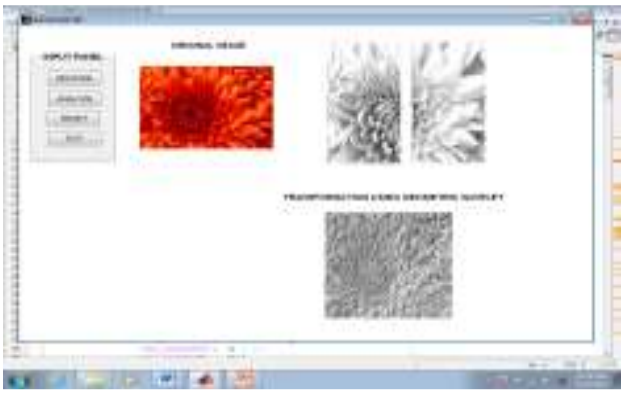

Figure 6: Partitioned image

Original image are partioned into four sublayer by using image partition technique. Embedding capacity is increased and time complexity is reduced.

Cover Image

A secret message is embedded into a host or cover image by slightly modifying its content that results in a watermarked or stego key.

Embedding Process

The data embedding procedure.It is performed over the cover image pixels at a time. First, we embed the secret message by using the improvement EMD method, and then use the following functions f1 and f2 to embed the random seeds into the stego-image.

Extracting Process

When the receiver has the stego image and the key, the embedded secret data can be extracted and the stego image can be restored to its original state.

PPM for RDH

We point out that, in an equivalent way, Lee et al.'s embedding procedure can be demonstrated by a PPM shown in which a subset of is divided into two disjointed parts as black points and blue points, each black point is mapped to a blue one (indicated by a green arrow) and each blue point is mapped to another blue point. Here, each point represents the value of a pixel-pair, and the black points are used for expansion embedding while the blue ones for shifting. According to this PPM, for a cover pixel-pair , its marked value can be determined.

PERFORMENCE EVALUATION

Evaluation for DPM

The histogram-based RDH, if the maximum modification to pixel values is 1 in data embedding, the expected value of the modification (in -norm) to cover image is $N_{\exp}/2 + N_{\text{shift}}$, where $N_{\exp}$ and N_{shift} are numbers of expanded and shifted pixels, respectively. thus the ratio of expanded pixels is a measurement of the embedding performance. the larger the ratio is, the less modification to cover image and better performance.

$$\frac{N_{\exp}}{N_{\exp} + N_{\text{shift}}}$$

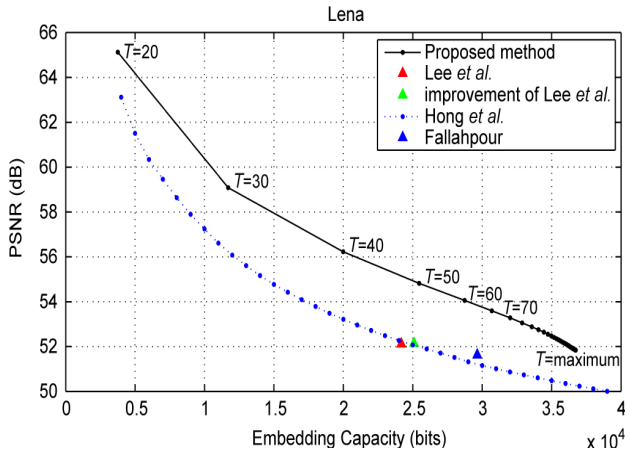

Figure 7: Performance comparisons between the existing methods

CONCLUSION

In this paper a novel RDH scheme by using a two-dimensional difference-histogram according to a specifically designed DPM. In addition, a pixel-pair-selection strategy is also proposed to further enhance the embedding performance. The proposed method uses the data hiding scheme based on difference histogram modification technique and to provide the secured data transmission over the communication media. In that the image can be partition into four layer by using the binary space partition method also using geometric wavelet transform.

In future the data's can be embedded in to an image and the decoded process will going to done by using the secret key in both nodes.in this we can embed large number of data's and the time complexity is reduced.

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