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Reversible Data Hiding With Optimal Value Transfer of Data

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ABSTRACT: In reversible data hiding techniques, the values of host data are modified according to some particular rules and the original host content can be perfectly restored after extraction of the hidden data on receiver side. In this paper, the optimal rule of value modification under a payload -distortion criterion is found by using an iterative procedure, and a practical reversible data hiding scheme is proposed. The secret data, as well as the auxiliary information used for content recovery, are carried by the differences between the original pixel-values and the corresponding values estimated from the neighbours. Here, the estimation errors are modified according to the optimal value transfer rule. Also, the host image is divided into a number of pixel subsets and the auxiliary information of a subset is always embedded into the estimation errors in the next subset. A receiver can successfully extract the embedded secret data and recover the original content in the subsets with an inverse order. This way, a good reversible data hiding performance is achieved.

KEYWORDS: Reversible Data Hiding, Optimal Value, Transfer of Data.

EXISTING SYSTEM:

A number of reversible data hiding techniques have been proposed, and they can be roughly classified into three types: lossless compression based methods, difference expansion (DE) methods, and histogram modification (HM) methods. The lossless compression based methods make use of statistical redundancy of the host media by performing lossless compression in order to create a spare space to accommodate additional secret data. In the RS method [1], for example, a regular-singular status is defined for each group of pixels according to a flipping operation and a discrimination function. The entirety of RS status is then losslessly compressed to provide a space for data hiding. Alternatively, the least significant digits of pixel values in an -ary system [2] or the least significant bits (LSB) of quantized DCT coefficients in a JPEG image [3] can also be used to provide the required data space. In these reversible data hiding methods, a spare place can always be made available to accommodate secret data as long as the chosen item is compressible, but the capacities are not very high.

DISADVANTAGES:

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Payload of this method is low since each block can only carry one bit.

PROPOSED SYSTEM:

In this proposed system, we will find the optimal rule of value modification under a payload-distortion criterion. By maximizing a target function using iterative algorithm, an optimal value transfer matrix can be obtained. Furthermore, we design a practical reversible data hiding scheme, in which the estimation errors of host pixels are used to accommodate the secret data and their values are modified according to the optimal value transfer matrix. This way, a good payload-distortion performance can be achieved.

ADVANTAGES OF PROPOSED SYSTEM:

A smarter prediction method is exploited to make the estimation errors closer to zero, a better performance can be achieved, but the computation complexity due to the prediction will be higher. The payload-distortion performance of the proposed scheme is excellent. The host image is divided into a number of subsets and the auxiliary information of a subset is always embedded into the estimation errors in the next subset. This way, one can successfully extract the embedded secret data and recover the original content in the subsets with an inverse order.

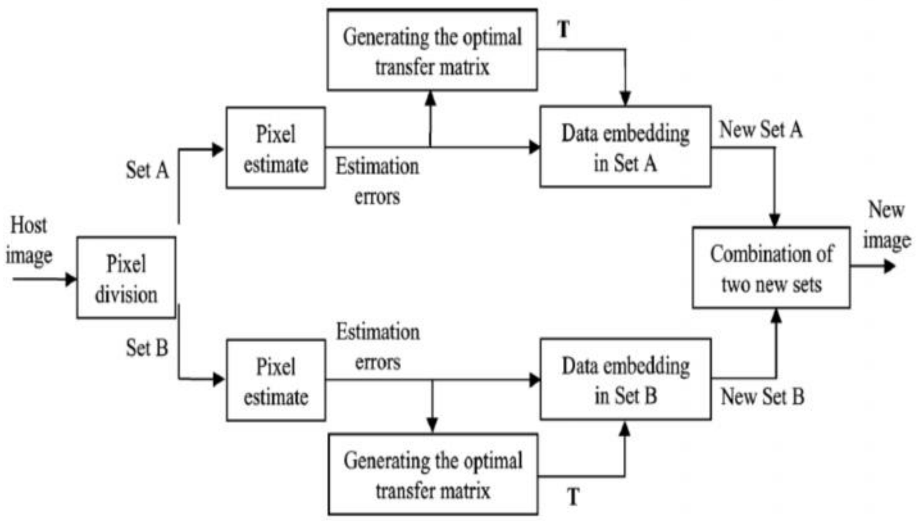
MODULES DESCRIPTION

There are five different types of modules in this project, that are listed in the following,

- Data Embedding
- Coding Module
- Recursive Construction
- Data Extraction
- Content Recovery

DATA EMBEDDING

Denote the host pixels as where and are indices of row and column, and divide all pixels into two sets: Set A containing pixels with even and Set B containing other pixels with odd. Clearly, the four neighbors of a pixel must belong to the different set. For each pixel, we may use four neighbors to estimate its value.



CODING MODEL

We denote matrices and vectors by boldface fonts and use the same notation for the random variable and its realization, for simplicity. To do RDH, a compressible feature sequence should be first extracted from the original cover. For Type-I schemes, the features can be usually represented by a binary sequence.

Therefore, we directly take the binary feature sequence as the cover to discuss the coding method and follow the notation established.

RECURSIVE CONSTRUCTION

This recursive construction performs better than the simple method because of two key points: 1) The data is embedded by an efficient nonreversible embedding code, and 2) the cover block is compressed under the condition of the marked block. However, the above recursive construction cannot approach the upper bound

DATA EXTRACTION

When having an image containing embedded data, the receiver firstly divides the image into Sets A and B, and divides Sets A and B into a number of subsets using the same manner. Then, extract and AI from the LSB of the last subset in Set B, and decompose as the weight values, the histogram difference of the first subsets and the number of iterations. With the weight values, the receiver can obtain the estimation error of each pixel in the first subsets, and with the histogram difference and the iteration number, he can use the histogram difference to retrieve the original scaled histogram and implement the iterative procedure to retrieve the optimal transfer matrix used for data-embedding in the first subsets.

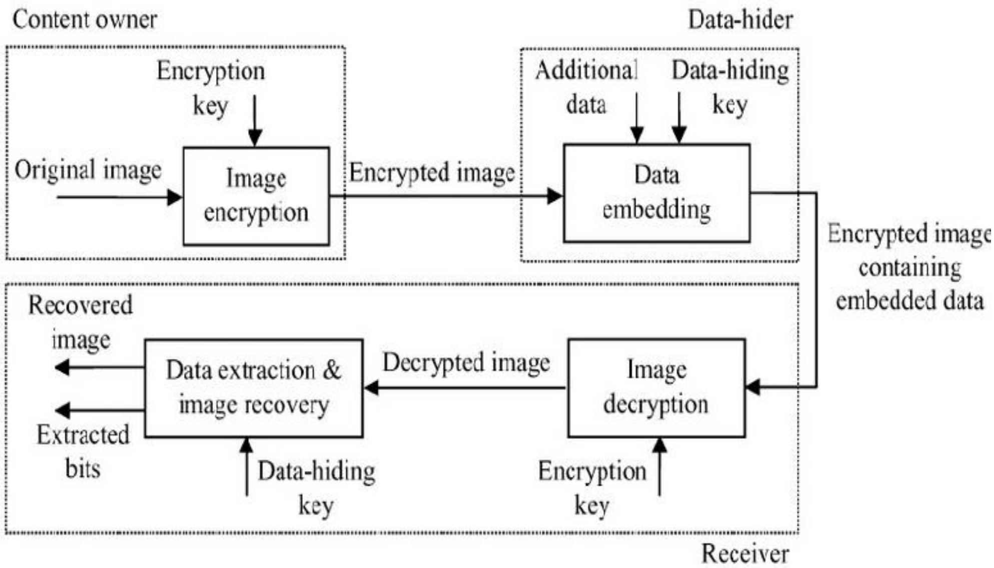
CONTENT RECOVERY

The auxiliary information extracted from a subset is used to recover the original content of the previous subset, and then the embedded data in the previous subset are extracted by using the recovered original estimation error.

That means the original content and the hidden data in the subsets of Set B, except the last one, can be recovered and extracted with an inverse order. Then, the receiver can decompose the payload hidden in the subsets into AI of Set A, LSB of Subset of Set B, and the embedded secret data.

While the LSB of Subset of Set B is used to recover the original content of the subset, is used to retrieve the optimal transfer matrix and the estimation error of each pixel in Set A. Similarly, the original content and the hidden data in the subsets of Set A can be also recovered and extracted with an inverse order. At last, by concatenating the secret data hidden in Sets A and B, the receiver reconstructs the entire secret data

There are different types of application, such as Windows-based applications and Web-based applications.



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Then, the receiver recovers the original content and extracts the hidden data in Subset of Set B. Since the f first part of image contains the labels of saturated pixels and the original values of the first type of saturated pixels, the first type of saturated pixels in Subset it l can be localized and their original values can be recovered. For the second types of sat-rated pixels and the unsaturated pixels, after calculating the probability, the receiver can convert the second part of image l into a sequence of original estimation error by arithmetic decoding. Thus, the original pixel values are recovered.

Conclusion

In order to achieve a good payload-distortion performance of reversible data hiding, this work first finds the optimal value transfer matrix by maximizing a target function of pure payload with an iterative procedure, and then proposes a practical reversible data hiding scheme.

The differences between the original pixel-values and the corresponding values estimated from the neighbours are used to carry the payload that is made up of the actual secret data to be embedded and the auxiliary information for original content recovery. According to the optimal value transfer matrix, the auxiliary information is generated and the estimation errors are modified.

Also, the host image is divided into a number of subsets and the auxiliary information of a subset is always embedded into the estimation errors in the next subset. This way, one can successfully extract the embedded secret data and recover the original content in the subsets with an inverse order.

The payload-distortion performance of the proposed scheme is excellent. For the smooth host images, the proposed scheme significantly outperforms the previous reversible data hiding methods. The optimal transfer mechanism proposed in this work is independent from the generation of available cover values. In other words, the optimal transfer mechanism gives a new rule of value modification and can be used on various cover values.

If a smarter prediction method is exploited to make the estimation errors closer to zero, a better performance can be achieved, but the computation complexity due to the prediction will be higher. The combination of the optimal transfer mechanism and other kinds of available cover data deserves further investigation.

Future Enhancement

We propose a new reversible watermarking scheme. One first contribution is a histogram shifting modulation which adaptively takes care of the local specificities of the image content. By applying it to the image prediction-errors and by considering their immediate neighbourhood, the scheme we propose inserts data in textured areas where other methods fail to do so.

Furthermore, our scheme makes use of a classification process for identifying parts of the image that can be watermarked with the most suited reversible modulation. This classification is based on a reference image derived from the image itself, a prediction of it, which has the property of being invariant to the watermark insertion. In that way, the watermark embedded and extractor remain synchronized for message extraction and image reconstruction.

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