Reversible Data Hiding under Inconsistent Distortion Metrics

N RamaDevi (PG student DECS), Department of ECE, QIS College of Engineering & Technology (Autonomous), Ongole, A.P.India. nalabolu.ramadevi12@gmail.com
Mr.M.Koteswararao, Associate Professor, Department of ECE, QIS College Of Engineering &Technology(Autonomous),Ongole,A.P.India. koteshproject@gmail.com

Abstract - This paper presents a method Recursive code construction (RCC), based on the l transition probability matrix , approaching threat-distortion bound of reversible data hiding (RDH) has been proposed. Using the existing methods, OTPM can be effectively estimated only for a consistent distortion metric, i.e., if the host elements at different positions share the same distortion metric. However, in many applications, the distortion metrics are position dependent and should thus be inconsistent. Inconsistent distortion metrics can usually be quantified as a multi-distortion metric.In this paper, we first formulate the rate-distortion problem ofRDH under a multi-distortion metric and subsequently propose general framework to estimate the corresponding ,with which RCC is extended to approach the rate-distortion bound of RDH under the multi-distortion metric. We apply the proposed framework to two examples of inconsistent distortion metrics: RDH in colour image and reversible steganography.The experimental results show that the proposed method can efficiently improve upon the existing techniques.

***Keywords*:-**Rate-distortion, inconsistent distortion metrics, multi-distortion metric, reversible steganography, reversible data hiding.

I. INTRODUCTION

Reversible data hiding (RDH) is a special type of data hiding, whereby both the host signal and the embedded data can be restored from the marked signal without loss. This important technique is widely used in medical image image military image and law forensics, where the original signal is so precious that it cannot be damaged. Moreover, it has been found that RDH can be quite helpful in video error-concealment coding, reversible image processing nearly all RDH algorithms consist of two steps. The fisted involves generating a host sequence with a small entropies. a sharp histogram, that can usually be achieved using Recombined with the sorting technique or a pixel selection strategy . Subsequently, in the second step, users reversibly

For an independent and identically distributed host sequence, this problem has been solved by Kalker and Willems, who formulated RDH as a special rate-distortion obtained the rate-distortion function, the upper bound on the embedding rate under a given distortion constraint Δ, as follows

Several design such of algorithms inconsistent distortion metrics for RDH, which endow pixels from regions of complex texture or complex structure with lower costs. In general, such algorithms select image pixels with lower costs to carry messages, but their embedding methods are difference expansion or histogram shift without considering the optimal modification. It is usually hard to estimate the rate-distortion bound of RDH under inconsistent distortion metrics directly. However, in practical applications, inconsistent distortionmetrics can be quantified as several distortion levels, i.e., amulti-distortion metric. That is to say we can well approximate inconsistent distortion metrics with a multi-distortion metric. Thus, an interesting problem concerns the estimation of therate-distortion bound of RDH under a multi-distortion metric and solving the corresponding OTPM. When a multi-distortion metric is considered, the host sequence is classified into severalsubsequences according to the distortion metrics. So instead of a single histogram, multiple histograms are generated. Although RDH on multiple histograms has been studied by Hu et al. and Li et al., the researchers' distortion metrics are both consistent. In this paper, we first formulate therate-distortion problem of RDH under a multi-distortion metric

$$\rho_{rev}(\Delta) = \text{maximize}\{H(Y)\} - H(X),$$

II. PROPOSED SYSTEM

Proposed method in approaching the rate distortion bound. By improving the recursive code construction.RCC will approach the rate-distortion bound as long as the adopted entropy coder reaches entropy. Acoding methodtwo applications, RDHincolorimageandreversiblesteganography, are presented to demonstrate the power of the proposed framework. Finally, this paper is concluded with the discussion in Section

Reversible Data Hiding Method:

Reversible Data hiding (RDH) has been intensively studied in the community of signal processing, also referred as invertible or lossless datahiding.RDH is to embed a piece of information into a host signal to generate the marked one, from which the original signal can be exactly recovered after extracting the embedded data.

The technique of RDH is useful in some sensitive applications where no permanent change is allowed on the host signal. because it is computed frame-by-frame. In order to incorporate temporal information, for a region, we aggregate its region-based features over a sequence of frames, resulting in the consistent

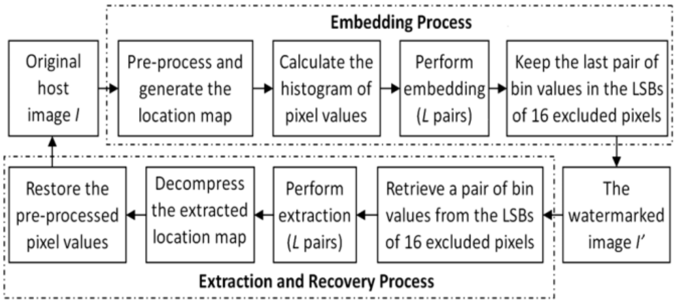


Figure: Procedure of the proposed RDH algorithm

Rate-distortion:

In the section, the rate and distortion model and the associated algorithm for fast

distortion computation are developed. Based on these, the based multiple embedding is then formulated as the rate and distortion optimization problem in terms of multi distortion

Pre-processing:

From input, image are taken and then preprocessed. In this preprocessing, all color images are converted into gray level images. For the gray level images, RDH algorithms will applied.RDH Algorithm:

1. Hiding the image so that nobody can aware of its existence

2. The LSB is the lowest significant bit in the byte value of the image pixel.

3. The LSB based image steganography embeds the secret in the least significant bits of pixel values of the cover image

Embedded process:

For a 8-bit grayscale cover image and the binary secret message w of length C, the

embedding process is described briefly as follows.

1) Initialization: With the cover image in cross and round sets as shown in Fig. 4(a), assign half of the secret message of length

1/2 × C for crosses and round sets embedding, respectively.

2) Rhombus Prediction of the Cross Set: As shown in Fig. 4(b), each pixel in the cross set is predicted by its four neighbouring pixels in round set to obtain the Pˆ X(r,s) and then the prediction error PEX(r,s) in the cross set.

3) Optimal Peak and Zero Bins Selection: Based on the histogram of prediction errors in the cross set, i.e., PEX = {PEX(r,s)}, the GA-based rate and distortion optimization is carried out to determine the nearly optimal number of peak and zero bin pairs and their corresponding values for the payload of length (1/2)C.

4) Stego-Pixels Generation in the Cross Set: With marked prediction errors, we have the stego-pixels in the cross set P X(r,s) = PE X(r,s) + Pˆ X(r,s). (19) 6) Stego-Pixels Generation in the Round Set: Utilize the generated stego-pixels in the

cross set to predict the pixels in round set as mentioned in step 2) and repeat steps 3)–5) to generate the stego-pixels P O(r,s) in the round set.

5) Stego Image Generation: Combine the stego-pixels in both cross and round sets, i.e., P X and P O to obtain the whole stego-image.

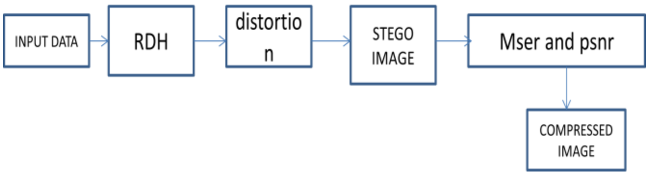
To determine the optimum opt in terms of rate and distortion performance. For a given payload, we take the same percentage χ in both cross and round sets to simplify the implementation. Besides, Lou'smethod is also employed in the embedding process to avoid the possible overflow/underflow for the generated stego image, in which, a location map is introduced to indicate the overflowed/under flowed pixels and then hidden in the carrier images as the additional side information. B. Extraction Process based on the received optimal peak and zero bins and the stego-image, we extract the secret message and recover the original image in the inverse order as embedding process, namely the marked round set is recovered and message is extracted first, which is then used to reconstruct the marked cross set and extract the corresponding hidden message

Advantages:

The visual quality of the images generated by proposed algorithm is better preserved.

- Moreover, the original image can be exactly recovered without additional information.
- Hence the proposed algorithm has made the image distortion reversible.

System Architecture:



III. CONCLUSION

Data hiding using steganography has two primary objectives firstly that steganography should provide the maximum possible payload, and the second, embedded data must be imperceptible to the observer. It should be stressed on the fact that steganography is not meat to be robust. It was found that the proposed method gives high payload in the cover image with very little error. This is of course on the expense of reducing PSNR and increasing the MSE. The high capacity is getting for the various applications using wavelet transform, high security. The Optimum Pixel adjustment process was used for reduction of error between the input image and embedded image. Steganography and its classification. The evaluation parameter of steganography is also discussed. Here steganalysis also described. In future, different steganographic techniques and steganalysis methods will be implemented and compared.

IV. RESULT

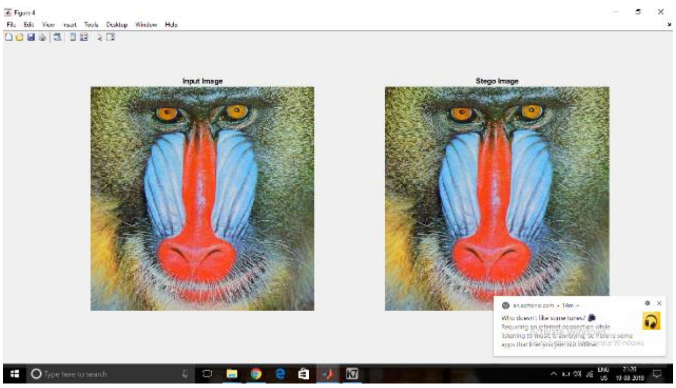


Fig1: Tested image baboon

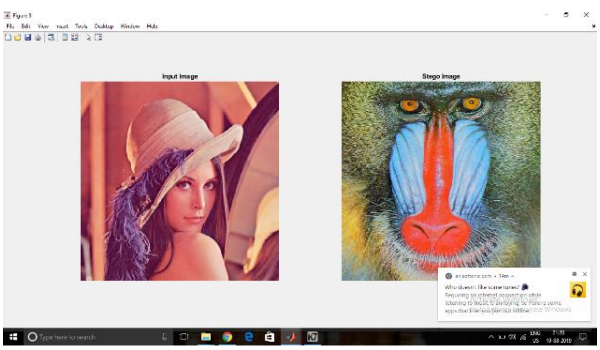


Fig2: Tested image for lena and baboon image

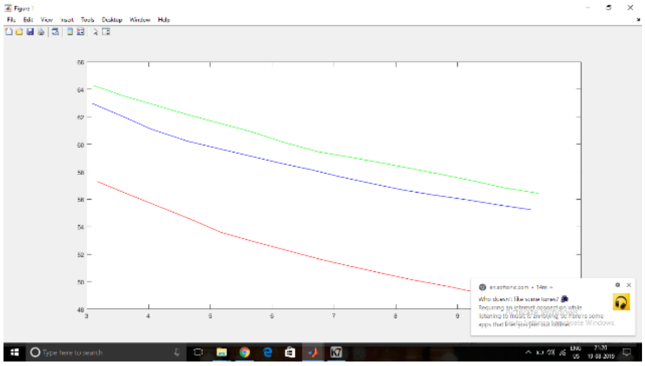


Fig3: RDH distortion Matrix

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