Enhance Image using Dynamic Histogram and Data Hiding Technique

[1]D.Bharadwaja, [2]Y.V.N.Tulasi

[1]Department of CSE, Gudlavalleru Engineering College, Email: bharadwaja599@gmail.com
[2]Department of CSE, Gudlavalleru Engineering College, tulasi.kp1@gmail.com

Abstract : The inconspicuous world of technology the task of secure data transfer stood futile. There are many ways to make data secure with the processing techniques. The data is insinuated in a host and converted using encryption methods for further transfer. The host medium is mutated using some principles of alteration rules and the genuine host medium is reclaimed back after the extraction of secret data from it. We adopt reversible data hiding approach to surge the security by hiding data in an image. We make use of color images rather than grey scale to exaggerate the capacity of hidden data. The sender can encrypt the genuine image using encryption key and dynamic histogram using SCHEME. Then the LSB are compressed for creating space to hide the data using data hiding key. The receiver makes use of both encryption and hiding keys for accurate retrieval of data. If the receiver makes use of only one key the particular functionality will respond depending on the key used.

Index Terms: Host insinuation, Reversible data hiding, Extraction of data, Dynamic Histogram

I . INTRODUCTION

The concept of data hiding projects that secret information must interposed into a carrier medium with the consideration of some host alteration principles. The distortion of encrypted images is due to the regular methodologies of data hiding. Those distortions are unacceptable in the fields like medical images and military things. There are several reversible data hiding techniques that were proposed and they fall into three major categories i.e. Lossless compression based methods, difference expansion (DE) methods, histogram modification methods.

The widely used lossless compression based methods make use of statistical redundancy of the host to accommodate space for hiding secret data. Contrast enhancement is one of the important measure taken for image processing. Histogram equalization is one of such method which we will consider to enhance the contrast of an image. A graphical representation of data is termed as histogram. An image histogram can be termed as the graphical representation of the total number of image pixels which can be represented as the function of its intensity.

We make use of histogram equalization method to stretch the image so as to increase the contrast of it. The histogram projects the graphical representation of an image depending upon its pixels and particular intensity of corresponding pixels. For an 8 bit grey scale there will be 256 different possible intensities and histogram also projects the same way.

The histogram of colour images will also project the individual representation of RGB graphs. The intensity levels are again remapped into images so s to increase the contrast of the images by using the histogram equalization technique. Histogram equalization technique transforms the histograms of genuine image into a flat uniform histogram with a mean value that is present at the centre of the colour range. The mean brightness of the retrieved image is always at the centre or close to it. For images with low and high brightness value, there must be some significant changes applied by enhancing the contrast. Several principles are applied for the improvement of histogram equalization based contrast enhancement such as bi-histogram equalization (BBHE) , equal area dualistic sub-image histogram equalization (DSIHE) and minimum mean brightness error bi-histogram equalization (MMBEBHE).

The technique of BBHE exactly portioned the image into two equivalent parts and the separation intensity is presented by the input mean brightness value, which is the average intensity of all pixels that construct the input image and there two halves are equilized. The technique of dualistic sub-image histogram equalization (DSIHE) follows the same model as followed by BBHE. while the and minimum mean brightness error bi-histogram equalization (MMBEBHE) is the extension of BBHE for further improvement of contrast.

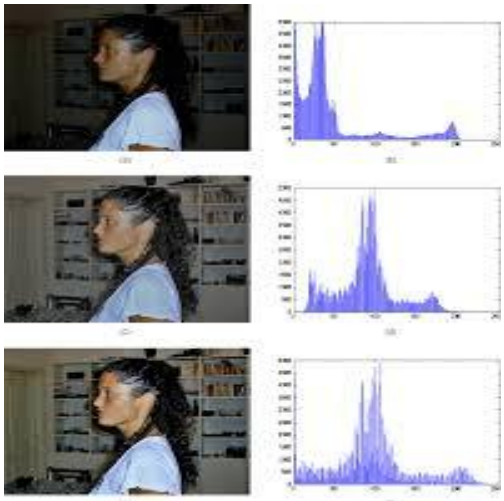


Fig1:DHS

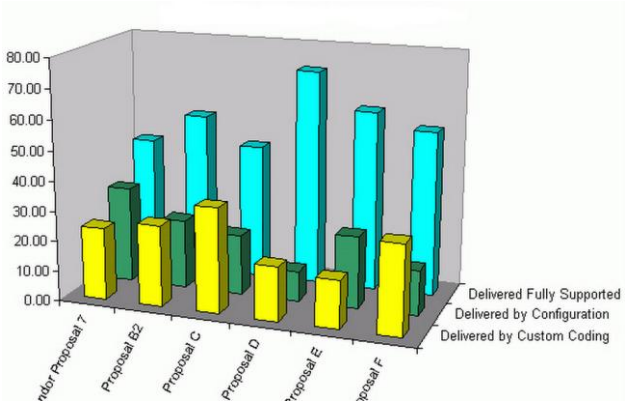


Fig1.1 3-D histogram

II RELATED WORK

When we consider the input image X, the probability density function P (Xk) can be defined as:

$$P(Xk) = nk/n$$

Where

Nk = number of times the level Xk projects in the image X

N= total number of sample images considered

K= 0, 1,……, L-1.

The value of P (Xk) represents the value associated with the histogram corresponding to the input image pixels which have a specific intensity xk corresponding the probability density function. We can define the cumulative density function as:

$$P(Xi)\ k$$

$$J=0$$

Where Xk=X for K=0,1,…⌊L-1.

Considering the definitions we have the value that C(XL-1)=1. The mapping of input images in the wide range of values which lies between (X0,XL-1) with the use of histogram equalization as a cumulative density function further as transform function.

The transform function f(x) based on the cumulative density function as

$$f(x)= X0 +(XL-1-X0)C(x)$$

Then the output image of the HE,Y={Y(i,j)}, can be expressed as

$$Y=f(X)$$

$$=\{f(X(i,j)|\ \forall X(i,j)\in X\}$$

The image contrast will be enhance by using the HE as it performs dynamic range expansion and flattens a histogram. The described rules predict that when the message has the uniform distribution property then the entropy of message source will be maximum. Therefore histogram equalization can induce dynamic changes in the image contrast.

A. Brightness Preserving Bi-Histogram Equalization (BBHE) :

BBHE is one of such method which is widely used to maintain the contrast of the image. In the BBHE process we will consider an image and project its histogram view. The image histogram will further divided into two equal parts. The brightness value is calculated as the mean of the image intensity value which is nothing but the separation intensity which constitutes the image. These two image histograms are separately equalized so as to produce a histogram which will lie in the range of input mean and grey level. When we combine these two histograms we will produce a histogram ranging from zero to L-1.when this histogram is divided depending upon intensity we will produce two histograms of range 0 and range value.

B. Dualistic Sub-Image Histogram Equalization (DSIHE):

Equal area dualistic sub image histogram equalization is another process which follows the same process as of BBHE. in the DSIHE method we will consider the image and further decompose the image into two sub images. These decomposition of image is based not on the grey scale value but we will differentiate these two sub images into light sub image and dark sub image.

When the image is decomposed the bright image produced has a value of average image level and middle grey level. In this method the DSIHE methods will sub divide the image into lighter and brighter, the brighter image will act as the perfect output for the preserving the contrast of the image.

C. Minimum Mean Brightness Error Bi-HE Method (MMBEBHE)

Minimum mean brightness error bi-histogram method is one of such method which is used to maintain the contrast of the image. The MMBEBHE also adopts the same process as the BBHE. The only difference is that when the image is sub divided into sub modules there we consider the threshold levels of the images.the ouput modules will have the levels which are in the ranging [0, lt] and I [lt +1, L −1]. MMBEBHE is formally defined by the following procedures:

(1) we have to calculate the AMBE for maximum values of threshold .

(2) Find the suitable threshold level XT , that will produce minimum AMBE.

(3) Partition the input histogram into two equivalent parts depending on XT found.

D. Recursive Mean-Separate HE Method

(RMSHE):

Recursive mean separate histogram equalization method is also one of such method which is widely used to perpetuate the image brightness. In the BBHE method we will perform the mean separation and then divide the image so as to preserve the brightness. In the case of RMSHE we will be decomposing the image into further times so that we can preserve the image brightness. HE is equivalent to RMSHE level 0 (r = 0). BBHE is equivalent to RMSHE with r = 1.The outputted image brightness is preserved and original image is obtained.

E. Classical Encryption Caesar Cipher Algorithm.

The most fundamental problem of cryptography addresses which it resolves is to ensure security of communication over insecure medium. We make use of the encryption techniques because we want need a strong encryption algorithm so that the intruder can't decrypt it and the keys must be shared in such a fashion that the sender and receiver can only decrypt the secret information.

One of the widely known substitution technique is Caesar cipher. The Caesar cipher confuses the letters of the alphabet, causing the result look like gibberish

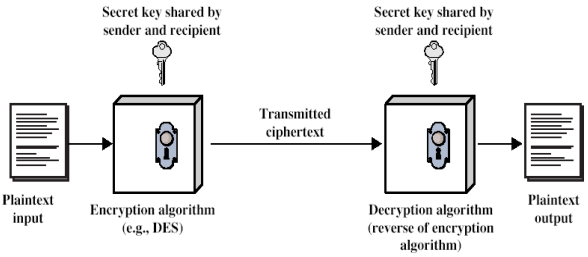


Figure 2.1 Simplified Model of Symmetric Encryption

F. Caesar Cipher Algorithms

Operation principle:

Every alphabet is placed in a alphanumeric table and depending upon the key value the data is encrypted or decrypted.

The Caesar cipher technique is the best possible technique which reduces the tasks of people for encrypting data in an unknown way of encryption and decryption.

We consider the following rules for encryption of data using Caesar cipher

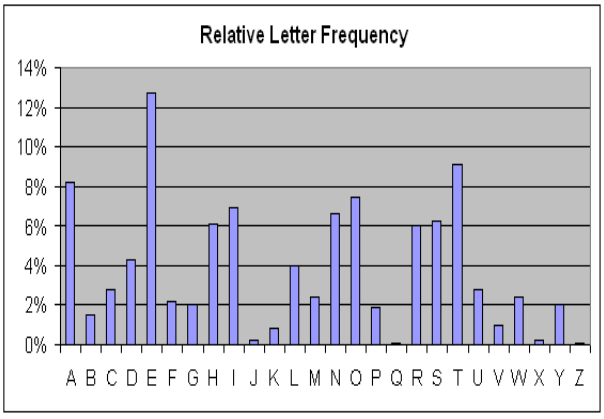
Then the Caesar cipher is expressed as:

$$C = \mathrm{E}(p) = (p + k) \bmod (26)$$

$$p = \mathrm{D}(\mathrm{C}) = (\mathrm{C} - k) \bmod (26)$$

When we consider a key K=3,
plaintext letter:
ABCDEF...UVWXYZ
cipher text letter:
DEF...UVWXYZABC

Hence "**ENCRYPTION**" is translated into" **HQFUBSWLRQ".**



III. DATA IN ENCRYPTED IMAGE USING REVERSIBLE DATA HIDING TECHNIQUE

I. REVERSIBLE DATAHIDING

The regular process or method of data hiding creates some disturbances in input image while retrieving data out of Stego image. The technique of reversible data hiding is a process where we infuse the secret data inside a image and retrieve the original cover image without any distortion..

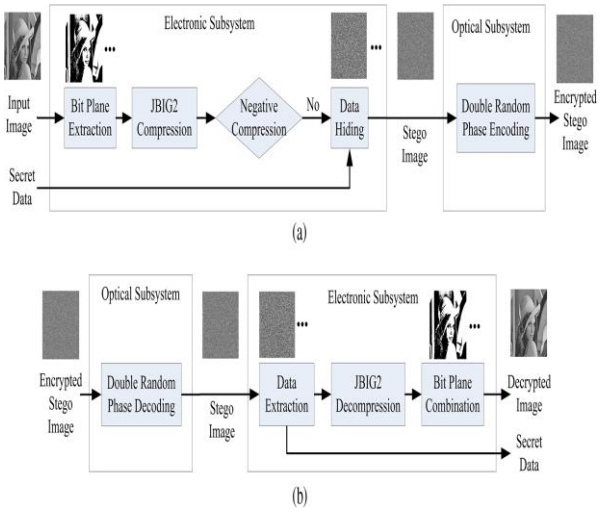


Fig.3.Data hiding in Encrypted image

In the recent years researchers had proposed many new methodologies for the reversible data hiding. In the difference expansion method we consider the two adjacent pixel value of the image and double the pixel value of them. The doubling of the image pixel will generate new LSB value. The new LSB value provides an additional space to infuse the data in the image.

The data hider technique is also one of such technique which performs reversible data hiding. In this technique we consider the peak points of the histogram and we alter the pixel values so as to embed data in it. In the further analysis there are many techniques which perform the reversible data hiding approaches to improve the performance.

2. SCHEME:

The SCHEME of reversible data hiding technique is better compared and exactly achieved by the valid use of colour images rather than the gray scale image. For more privacy protection the content owner can encrypt original image using a proper encryption key. Then using the hiding key we will compress the LSB bits so as to accommodate the data in the least significant bits. If the receiver has only one type of key either hiding or encrypted he can get only one output either hidden data or decrypted image.

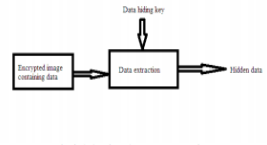


Fig.2.1 Option 1-Data extraction

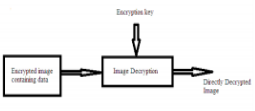


Fig. 2.2 Option 2-Image decryption

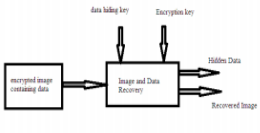


Fig. 2.3 Option 3-Data and image recovery

Fig.2. Three options in receiver side

IV EXPERIMENTAL RESULTS

We are considering four types of host images of sizes 512*512 which we named Lena, baboon, plane and cake.

Both the set A and B were dividing into 16 subsets. We have to predict that the capacity of the subset must be more than that of data. The amount of auxiliary information of the previous subset, the auxiliary information of the subset is generated after the data is embedding or embedded. We can recover the original content from this using the inverse order. The optimal transfer mechanism implemented for each and every subset except the last one is used to achieve a good payload-distortion performance. Using the LSB replacement method we will embed the auxiliary information in the last subset and recover the content in inverse order.

Fig3: orginal image

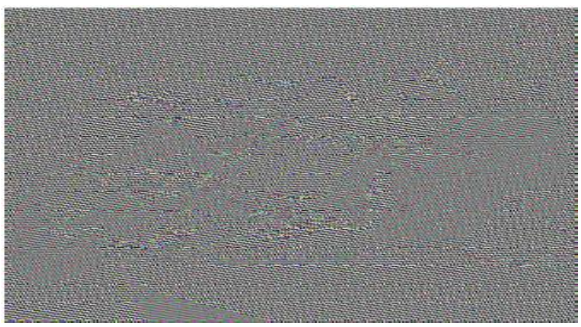


Fig4: encrypted image

Fig.5.Directly decrypted image

Fig.6.Decrypted image

V. CONCLUSION:

The analysis of histogram equalization based methods predict that there are many cases which require higher value of brightness preservation and not handled well by HE,BBHE,DSIHE and these have been properly enhanced by the RMSHE technique. The MMBEBHE is another method which is the mutation of BBHE method which will keep maximum brightness preservation in an image. All these methods are helpful for building up a good brightness preservation technique but they project some side effects depending upon various grey level distributions in the histogram.

In this paper we propose the DHE method where we would preserve the data in an image with an high secure value and which is free from other side effects. The secret data we will transform it to encrypted form for higher secure levels. If the amount of data which we are going to embed is too large we will consider a colour image for storing the data rather than a gray scale image.

We would considering the colour image rather than the gray scale image because of the factor of storing huge amount of data while considering the bit value of grey scale with RGB image. We would further enhance this technique by embedding the video bits and making use of expert encryption and decryption methodologies to provide high security.

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