Improved Reversible Data Hiding Through Image Using Different Hiding andCompression Techniques

M Jothibasu, M Karthik, E Malar, S Boopathy, M Senthil Kumar

Abstract: ***Steganography is a technique to be used for hiding communication. It embeds secret data in to unexceptional cover medium. Reversible data hiding (RDH) significantly considered as data hiding algorithm. From this, anyone can inbuilt the data into audio signal, image or video. Commonly two methods are available to hide the data on the image one is for reserving room after encryption and reserving room before encryption. This paper describes about reserving room before encryption to reduce the errors, which are possible in decryption phase. Subsequently it embed the data into gray scale image by bit plane processing algorithm and also embed data into color image by using histogram modification technique and shifting. If in the case of color image, image is splits into three channels such as red, green and blue. Then each channel image separated into three rows and three columns matrices. The matrices are individually processed in such a way that the matrix transformed to a row vector. The difference between pixel values of the particular channel establish and using histogram modification binary bits carrying secret message to embedded on the color image. Normally histogram modification is done to avoid underflow and overflow problems. Major the important issue in this process is compression employed on the image may affect the data hidden. To avoid this, the reserving room before encryption is employed and lossless compression technique is engaged on region of interest where data is hidden and lossy compression is applied to other portions in the image.***

Keywords: ***Reserving room before encryption (RRBE), Reversible data hiding (RDH), encryption, partitioning, Histogram Modification, Histogram Shifting, Least Significant Bit (LSB).***

I. INTRODUCTION

Generally, Image processing operations are classified into three major types such as, Compression, Enhancement and Restoration, and Measurement Extraction. Image compression technique reduces the memory storage space required to store a digital image. At some point in digitization process image may be flaw due to environmental conditions and it is resolved by image enhancement process. The Measurement Extraction process helps in regain useful information from the flawless corrected image. Every Image are stored and operated in 256 grey-scale system, which means each pixel in the image were assigned the values linking 0 and 255. Here, 0 indicate black pixel and 255 indicates white pixel. The values commencing 1 to 254 will be for grey images. Moreover, these operations can be extended to operate on color images.

Reversible Data Hiding (2) (RDH) techniques related to steganography is engaged to uphold the security and validation. Both steganography and visual cryptography are considered distinct topics for image security. Fundamentally, a confidential data in a secret image could be segregated into various encrypted shares. When such encrypted parts are reassembled or decrypted to redesign the genuine image it is possible to have an exposed image that still consists of confidential data. During communication, the stegonographic image may be subjected to various types of security attacks. Hidden messages can be detected using steganalysis. Steganalysis identifies whether a consignment is encoded into images or not. Then it attempts to recover the consignment, consecutively to provide better communication system with protected network bandwidth. Then the compression techniques was employed on digital content to minimize the redundancy and the quality of the decompressed version to be conserved. To minimize the possibility of the assault from interceptors and augment the accomplishment proficiency, the major purposes of data hiding and image compression techniques are to be integrated into single unit. The main benefit of this method is having advanced compression ratio with higher data hiding capability. An algorithm is developed to regain the missing and weaken parts of the image however to execute that algorithm, the correlation between neighbors blocks have to be computed. In addition to this, the processing time enlarges exponentially as the size of image increases and there is a need of indicator bit of reconstruction of image. To overcome the occurrence of multiple peak points in the receiver side, a binary tree structure is deigned. An earlier method consists of several techniques for data hiding and it is limited to Grayscale image. Based on LSB plane method for encrypted images (3), RDH is accomplished to designate reserving room previous than the encryption process. Accordingly, the data hidden method utilizes more space in the color image channels. While including reserving room prior to encryption process, time delay may arise for color images and this is to be rectified by resizing the image but compensation has to be made for higher space utilization.

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M Jothibasu,Assistant Professor, Dept of ECE, PSG Institute of Technology and Applied Research, Coimbatore, Tamilnadu, India

M Karthik,Assistant Professor (SrG), Dept of EEE, Kongu Engineering College, Erode, Tamilnadu, India

E Malar, Professor & Head, PSG Institute of Technology and Applied Research, Coimbatore, Tamilnadu, India

S Boopathy,Assistant Professor, Dept of ECE, Sri Eshwar College of Engineering,Coimbatore, Tamilnadu, India

M Senthil Kumar,Assistant Professor (SrG), Dept of Aeronautical Engineering, Kumaraguru college of Technology, Coimbatore, Tamilnadu, India

II. EXISTING MODEL

Earlier approach, the given input image is divided into different sub blocks with histogram operation. Then shifting is done on every block to enhance the data hiding capability and visual features present in the system. In that approach particular amount of information is taken into account for comparing the information present in a single image (5), (6). By using reversible data hiding technique (2) it is categorized into three main stages:1)Dividing image into two blocks 2)Processing stage and 3)Embedding stage. Initial stage involves isolating the image into two main blocks. Processing stage includes generating the histogram of each block and taking the difference of histogram after histogram modification. The proposed approach presents a binary tree structure to defeat the weakness of communicating the multiple peak points to the receiver. In addition, data embedding is done after dividing the image into blocks (5), (6).

III. PROPOSED MODEL

In the proposed model, we have used reserving room before encryption (RRBE) for data embedding. In our first model, the input image is divide into number of blocks of size with two rows and two columns, whereas bit plane processing (BPP) technique uses the least significant bit (LSB) data can be embedded as a most significant bit (MSB) data in the image. It shows how the data embedding process can be done and followed by the input gray scale image is split into matrices having four rows and four columns and localized histogram of each sub blocks are calculated. The histogram is shifted to get place for data hiding by the peak and zero points in the histogram. When the peak histogram level is switched to one position, the block will propose number of places to hide which is equal to magnitude of peak histogram level. We are going to use lossless image compression techniques (1), (4) like SPIHT, DWT etc., which will make use of run length encoding and Huffman coding forestage images. Consequently, the image is error free at decryption phase and efficient compression is employed to give better-compressed image.

A. Block Diagram OfBitplane Process:

The stages of BIT Plane Process are shown in fig1. The input image is given to region selection for data hiding. Then LSB bit plane and secret data is combined using data embedding (5), (6). Finally, the data is hidden in the image and can be viewed.

B. Block Diagram Of Shifting And Modification Process:

Histogram shifting and modification process are shown in fig 2. Prior to Encryption stage, the input image is encrypted using Reserve Room and the encrypted image (3) is then divided into 4*4 sub blocks. The obtained blocks are computed into local histogram and then the histogram of sub blocks are shifted and modified. Then using data embedding, the shifted sub blocks and secret data are incorporated. At last, the image is compressed and displayed.

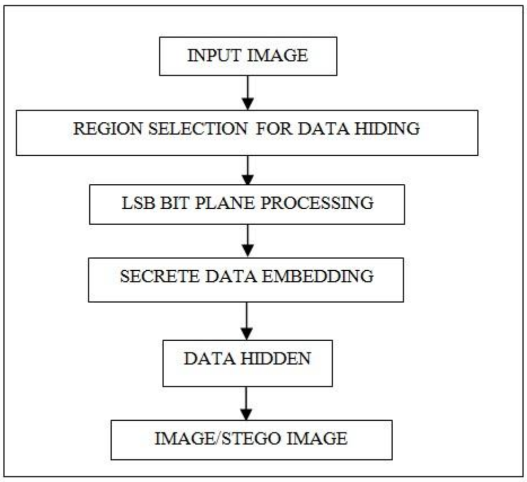

Figure 1 BIT Plane Process

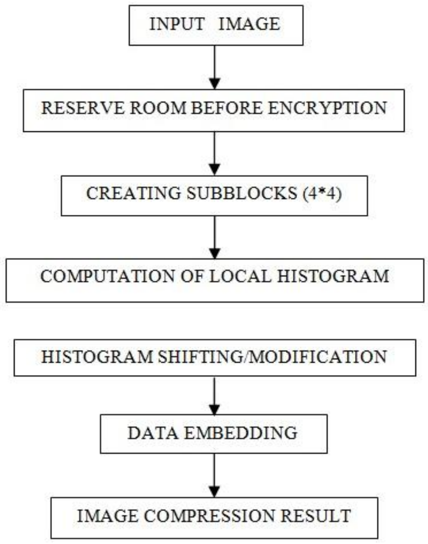

Figure 2 Shifting and Modification Process

IV. PROCESSING MODULES

The processing modules are splits into sub blocks and they are based on DWT lossless compression, LSB bit plane processing , Reserve room before encryption and Histogram modification (1), (4).

A. Image division to sub blocks

To accumulate the data, initial input image is separated into sub blocks and again it is splits into 4*4 sub blocks, so that the dimension of image or the selection area becomes multiple of four.

B. LSB Bit plane processing

Function (f – amplitude or gray/intensity level of an image) with spatial coordinates p and q is used to define a digital image. p, q, f are finite- discrete quantities. Digital images are divided into various categories such as color image or gray scale or bi-tone (monochrome). It is purely depends the intensity levels of every pixel. Representation of every pixel in any one way such that one bit or 8-bit or 24-bit. One bit plane belongs to monochrome image and 8-bit planes belongs to gray scale image finally color image have 24 bit planes (8-bits each, with respect to the three channels R, G and B). Gray scale image with 7X8 pixel bit plane shown in the figure 5. Minimum positional value (20 = 1) is at the least significant bit plane (LSB plane) whereas highest positional values i.e. 27=128 is at MSB plane (most significant bit plane).

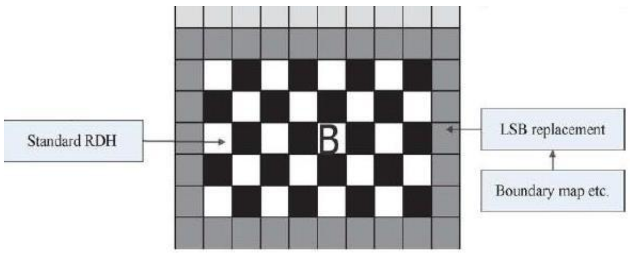

Figure 3 RRBE Reserve Room before Encryption

To make adaptation easier Reserving room before image encryption (RRBE) are at placed at user side. Reversible data hiding tasks (2) in encrypted images is shown in fig 3. First required memory space is allocated for an idle image. After this process, image will be transformed into encrypted one with help of encryption key. It is need to allocate extra space to encrypt an image during hiding of data (3) which is reversible for the data hider. The process involved feature extraction and recovery are same as Vacate room after the encryption (VRAE). Enormous data will be hidden with help of color images. Three channel color image will helps to allocate wider space. To attain better performance in data hiding algorithms during reservation of rooms, the LSB planes are used. Hence partition of an image will be carried out at smoother area. In order to accomplish it, consider an image with only one channel which contains 8 bits gray levels. It is having the size of M X N and Ci, j as pixels which varies from 0 to 255, where the variable iis between 1 to M and j is between 1 to N. So that the each and every process to be performed in the specific channel of an image. Initially the rows are extracted from an idle image. Embedded message block (1) will be helpful while determine the size of the discrete overlapping blocks [l]. n=M-m+1 equation used to compute number of blocks. Each block having m [=1/N] rows. Last block or forth coming blocks will be overlapped with other block of rows. In an image partition A denotes the high smoother area and B denotes the lesser smoother area as shown in figure 3. Histogram modification is used to find smoother area.

C. Histogram Modification

A reversible data hiding scheme (2) worked on histogram modification is shown in fig 4. The principle behind the histogram modification process based on the neighbor pixel differences instead of the host image’s histogram.

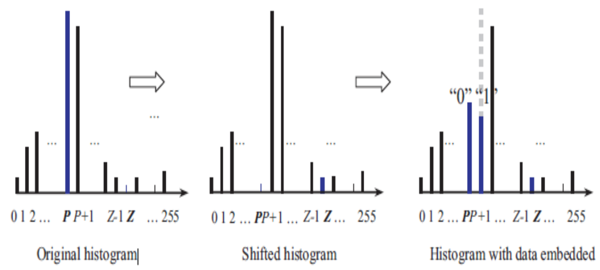

Figure 4 Histogram modification

Many peak points exist around the histogram due to the similarity of adjacent pixel values. Besides, many zero points exist in both the sides of the bin zero. Here the peak point refers to the height of histogram bin with the largest statistical value (i.e., the count falling in the corresponding bin).The histogram bin with zero value is called zero point. In our case, all the differences are classified into levels of [−255 to 255] and each level corresponds to a histogram bin. Hence, it is reasonable to modify the histogram with a multilevel mechanism for hiding data that are more secret. In decoder, the host image pixels are recovered one by one. That is, its previously recovered neighbor aids each pixel recovered. Meanwhile, the secret data is extracted from the marked adjacent pixel’sdifferences. Histogram is shifted rightward or leftward to produce redundancy for data embedding (5), (6). The peak and zero point bins of the original histogram are found and it is denoted as b (P) and b (Z), respectively. Then all the bins belonging to the b (P) and b (Z) are shifted rightward up to one level. In this way, the bin of b (P) is emptied and b (P + 1) becomes the new peak point. Next, the confidential data can be embedded by modulating the pixel values equaling P + 1. That is, if a pixel is encountered with the value equaling P + one, then one-bit confidential data can be hidden. For example, if the current processing confidential bit is “1”, we can modify the pixel value as P; whereas if the current processing confidential bit is “0”, the pixel with value P + 1 is kept unchanged.

V. RESULTS AND DISCUSSIONS

A. Bit plane process I/O

The unique values are modified to newer values due to data is hidden in it.

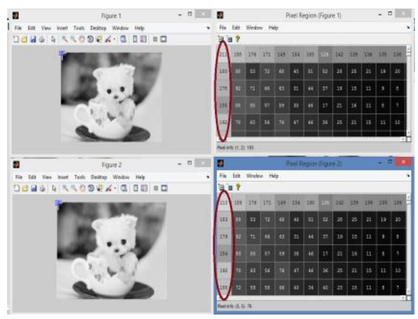

Figure 5 The data is been hided in bit plane method

B.Histogram of shifting process

Similarly, the changed histogram has the hided data.

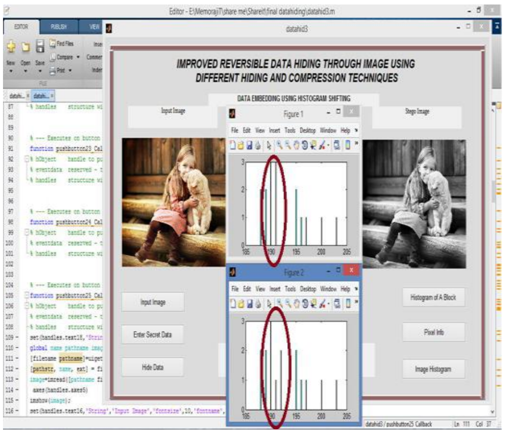

Figure 6 Shifted data's are highlighted.

C.Shifting& Modification

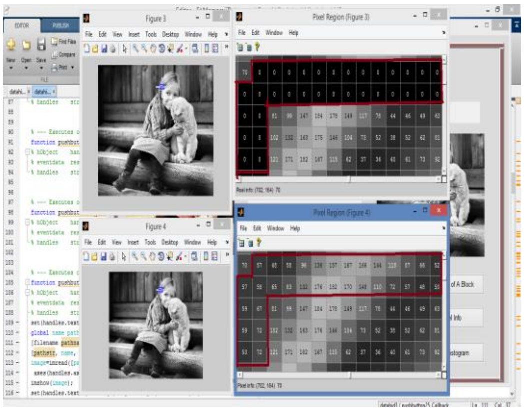

Figure 7Shifting and modification of data is done.

VI. CONCLUSION

The image is embedded efficiently on the gray scale image by means of LSB plane method and Histogram shifting. Encryption is done before reserving room by using RDH, for the purpose of encrypted images. Single channel gray images are extra space benefit for hiding the data. Previously encryption the reserving room the time delay is reduced for gray images. In addition, the extra space utilization for compensating for resizing the images for remedy out. One third of percentage information are retrieved by means of lossless compression technique and the image is produced by the DWT. The images are utilized and compressed by the ratio is improved by the space. The image is hide by secret data and the test image is taken for 'elaine.png'. The test images are attained by 1.457 lossless compressions is our algorithm.

FUTURE WORK

The smoother areas are identified by automating the selection area in future work .Enhancing capacity for storing data is more peaks of histogram levels for smoother area. The images are hidden by the information and the image is finding the smooth part to decompose by using the algorithm. The decomposing algorithm is accelerated for work and the storing capacity is improved to hide the smoother area. At the reconstruction phase, no accuracy problem is occurred then decomposing algorithm are error free.

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