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Color Image Steganographic Technique in Spatial Domain

K.S.Sadasiva rao¹, Dr A.Damodaram²

Associate Professor, Dept of Informatics, Sri Indu PG College, Hyderabad, India¹

Professor of CSE, School of Information Technology, Jawaharlal Nehru Technological University, Hyderabad, India²

ABSTRACT: Steganography is the process of embedding original message bits on some carrier file. The carrier file may be textfile, image file, audio file or video file etc. If that carrier file is an image file, then that technique is called Image steganography. If color image is used as a carrier file to embed data bits, then that type of steganographic technique is called as color image steganography. In this proposed work, embedding the original message bits in the spatial domain of the carrier color image, without much distortion in the quality of the color image is implemented. Hence this technique is called as color image steganographic technique in spatial domain.

KEYWORDS: spatial domain technique, Steganography, LSB.

I. INTRODUCTION

Image steganography is the process of embedding data bits in the image cover file without disturbing the quality of the image. The image files which are used to carry the data bits are called as a cover image or cover file. After embedding the data bits in the image cover file, the cover file is called as stego file. Image steganographic algorithm, in which the bits of the pixels of the cover image are directly replaced by original message bits, is called as spatial domain steganographic algorithms.

Most of the image steganographic algorithms will be using the LSB method as it is not affecting the quality of the cover image after embedding the data bits. Here the carrier file is a color image file, so it is called as color image steganography.

The color image is a combination of three planes Red, Green and Blue. Generally in spatial domain, RGB planes are used to stuff the data bits at least significant bit positions of the pixel. Hence three bits can be stuffed in each pixel among the three planes.

II. RELATED WORK

Steganography is a process of hiding data in other media to transfer the secured information [1]. Most of the steganographic algorithms are working on gray scale images [5], but some unauthorized user may suspect some useful information is going in gray scale image, because nobody is interested in sending gray scale images as general images [7]. Color image steganographic algorithms are actually practically required to be implemented, because these color images may not look like suspicious. Actually many steganographic techniques have been implemented either in color or gray scale images. But the color images, all the three planes RGB have been used to stuff bits. 3bits/pixel can be added with color images, but the level of distortion is high.

II. PROPOSED SYSTEM

In this work, we applied LSB algorithm for the three planes (i.e., RGB) in the color image which is a carrier file and also applied for two planes (i.e., Red and Blue only). Then compared the results of two planes LSB algorithm with the results of three plane LSB algorithm. Finally we found the best results by applying 2-bit LSB algorithm for only two planes (i.e., Red and Blue).

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Figure: Proposed System

A color image is taken as a carrier file. An image is a group of pixels. Pixel is represented with 24 bits in the color image, where as 8 bits are used to represent red plane, 8 bits to represent green plane and remaining 8 bits are to represent blue plane. Generally all algorithms in the spatial domain will be using all the three planes to embed the original data bits, where as in our proposed work, we found that if green plane is eliminated, it will not affect the quality of an image much [1] [7].

Here a color image is taken as an input carrier file. Each pixel is considered and only two planes red and blue are considered to stuff the bits. The least significant 2 – bit positions are considered to embed the data bits. Hence 4-bits are stuffed for each pixel. So we can embed many number of data bits depending on the image resolution. The same 2-bit LSB algorithm is used for all the three planes RGB, but we found a large disturbance in terms of PSNR and also with human eye, we can identify the distortion in the stego image.

Hence it is proved that 'if green plane is modified or stuffed with data bits, we found large remarkable distortion in the stego image'.

IV. PROPOSED ALGORITHM

- Read a cover image which is a color image.
- Resize that color image as two dimension matrix with the size [500,500].
- Display the cover image.
- Read the three planes RGB into three different variables, these will be converted into matrices.
- Read the original message bits from any input data file.
- Read the red and blue plane pixel values into variables.
- These values will be converted into binary.
- Stuff 2-bits of original data bits into 2 LSB positions of pixels of red and blue planes, hence we can embed 4bits/ pixel data.
- Then modified red and blue planes have to be converted back to decimal
- Now whole matrix is converted back to an image using uint8 () function.
- Find mean square error rate (MSE) for red and blue planes, hence green plane is not used as a carrier.
- Find the PSNR value for stego image with following formula

$$\text{PSNR} = 10 \log_{10} \frac{\text{max possible pixel values of an image}}{\text{MSE}}$$

- Display the cover image, stego image and also the PSNR value.
- exit

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V. RESULTS

The following are results of the color image steganographic algorithm in spatial domain with 2-bit LSB algorithm. Secured information bits are stuffed into only two planes Red & Blue (excluding Green plane). Hence the following cover image and stego image will be looking similar. Peak Signal to Noise Ratio (PSNR) = 45.8992 for the given stego image which is acceptable, because if PSNR value is more than 20, with human eye, we cannot make out the difference between cover image and stego image.



Figure 2 shows the cover image before stuffing the data bits. After stuffing the data bits to this carrier image, it is stego image which is shown in Figure 3.

Mean Square Error (MSE):

Mean square error value is calculated for the stego image and the values are as follows.

MSE=1.6717 (MSE for stego image)

MSE_Blue plane=2.5086 (MSE for blue plane of stego image)

MSE_Red plane=2.5064(MSE for red plane of stego image)

MSE_Green plane=0 (MSE for green plane of stego image is '0' because we did not stuff bits in green plane.)

VI. CONCLUSION

In our proposed system, we implemented 2-bit LSB algorithm on only two planes (red and blue planes) of color image. We found better results comparing with applying 2-bit LSB to all the three planes. Our algorithm is able to get a stego image without any distortion and also able to stuff nearly 10,00,000 data bits. The PSNR value for our proposed algorithm is 45.8992 for the given stego image which is acceptable, because if PSNR value is more than 20, cannot make out the difference between cover image and stego image with human eye.



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