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RGB Frequency Based Image Steganography

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Abstract

In this paper, we introduced a new RGB technique for image steganography. In this technique we introduced the idea of storing a different number of bits per channel (R, G or B) of a pixel based on the frequency of color values of pixel. The higher color frequency retains the maximum number of bits and lower color frequency stores the minimum number of bits.

Keywords: Steganography, RGB image, Color frequency, Information hiding.

1. Introduction

Internet is the most convenient and efficient medium for communication. Through internet, messages are often transferred through a fast and cheap way in various fields like government offices, private sector, military, and medical areas. repeatedly confidentiality of the transferred message needs to be maintained. To ensure that the message is transferred securely and safely over the network, suitable method is required. Steganography proves as a trustable method for achieving this aim. In steganography, the info is hidden in the cover media.

Steganography handles the data by hiding information in cover media without making much changes to the original image. The purpose is to hide the file that is embedded within the cover media so that the presence of the merged file can be hidden and no can see the hidden information even if the cover image is given to some stranger. There are many proposed methods of image stenography, LSB which is the one of the most common techniques for including bitmap images (RGB images) such as cover sources used for hiding information

In this paper we proposed a new technique for storing hidden information in an image using frequency of the (R-G-B) color an image. In this technique we used occurrence or percentage of color values of (R-G-B) higher percentage of (R-G-B) is first used to store information and then the lower percentage value is used to store information.

2. Review

steganography is a glowing research area in which various methods have been used. Here we will discuss a brief overview of some famous proposed methods

LSB is the most basic method for steganography. In this method secret message bits is placed by replacing the least significant bits of the pixels in an image. Through this method all the messages can be inserted in the pixels of the images. One of the drawbacks of this method is it reduces the image quality of an image which allow intruders to easily guess that the image contains some hidden information. Let's understand this method thorough an example.

Let string of message to be sent over the internet is 01010110 and value of pixels of image are as follows:

01101100 11001011 10000101 10000001 01101100

11001011 11110010 10101101

Then after inserting the hidden message the pixel value would change as follows:

01101100 11001011 10000100 10000001 01101100

11001011 11110011 10101100

Another method of steganography is the pixel indicator technique that uses the least two significant bits of one of the channels from Red, Green or Blue as an indicator for existence of data in the other two channels. The indicator channels are then chosen in sequence. This method provides high capacity insertion of data 2 bits and 4 bits of secret message can be hidden inside single pixel and it also provides high capability against decoding of message by the

intruders. Disadvantage associated with this method is that it does not provide 100% insertion of data in one channel in utilized for the indicator

3. Proposed Work

The aim of proposed method is to develop a technique which does not affect the picture quality of the image and helps to transfer the hidden information without being noticed by the intruders. In this technique we used frequencies of RGB channel in which 'higher' frequencies of the channel is changed so that it does not affect the overall look of the source image and hence more bits can be changed in the channel having higher frequency. After selection of higher frequency, we used LSB method in the selected channel to change the bits of the selects pixel to hide information

4. Proposed Algorithm

Algorithm for the proposed method are as follows:

1. Calculate the frequency of each channels of RGB color in the selected image

2. Select the channel that have higher frequency

3. Apply LSB method to higher frequency channel in the selected pixel bits to hide secret information

4. Select the lower frequency channel than the higher frequency channel if the secret message doesn't get inserted 100% in the higher frequency channel. This method allows 100% insertion of the secret message inside the image

5. To retrieve the information, we again calculate the frequency of RGB colors of the image:

   1. Select the higher frequency channel and start collecting bits from its LSB

   2. If secret message doesn't get complete the select the lower frequency to retrieve the secret message

Encoding

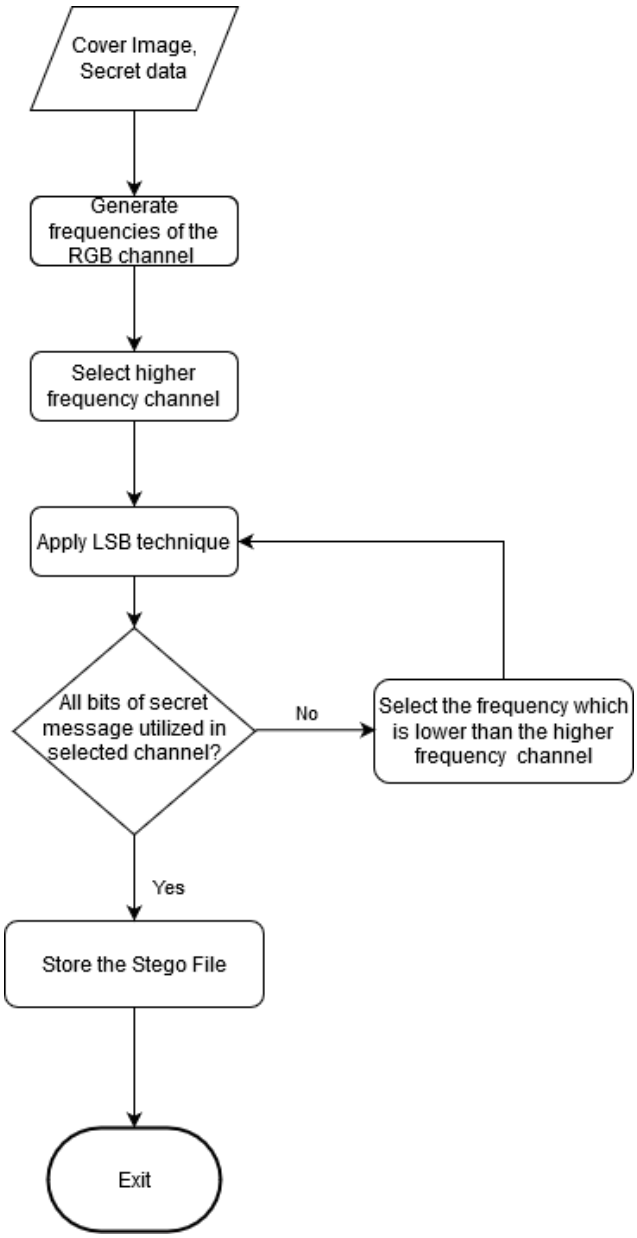

Figure 1: Flow chart of encoding of algorithm

Decoding

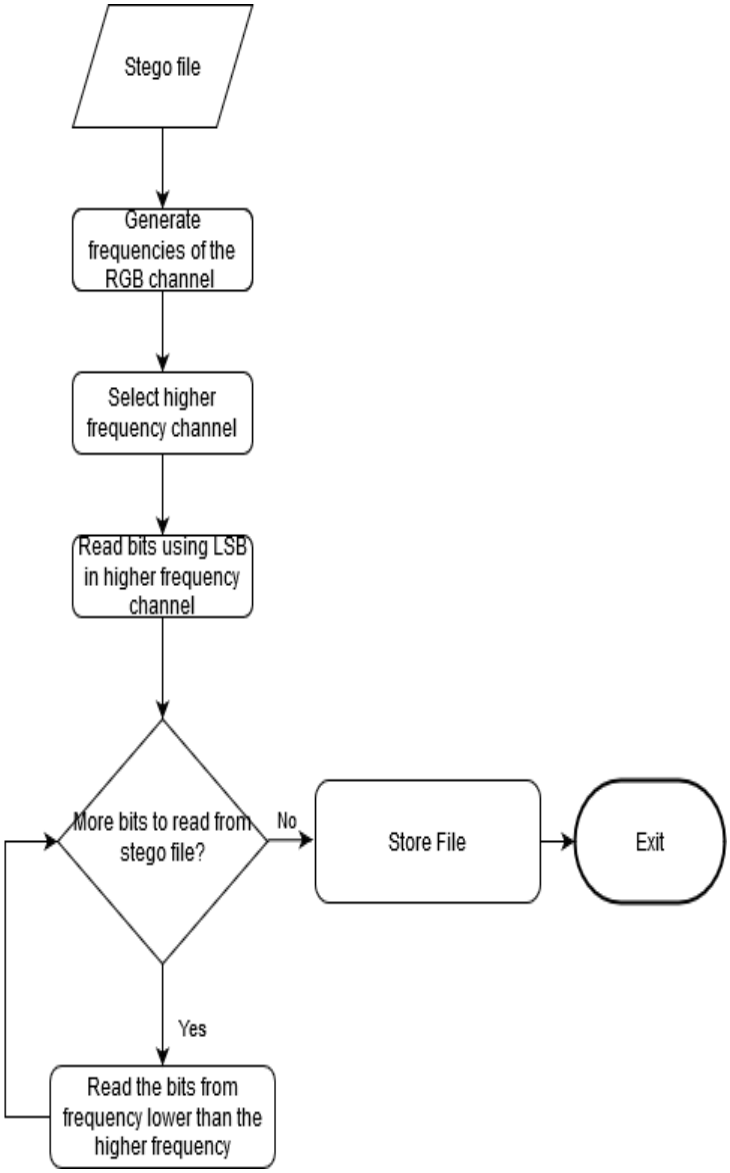

Figure 2: Flow chart of decoding of algorithm

4. Experimentations and results

We have carried out our experiments in MATLAB with different cover images exploring and experimenting with different frequencies of color and plotted 3D histogram of the image for better understanding of the frequency of the color values present in the images.

Figure 3: Original image of vegetable

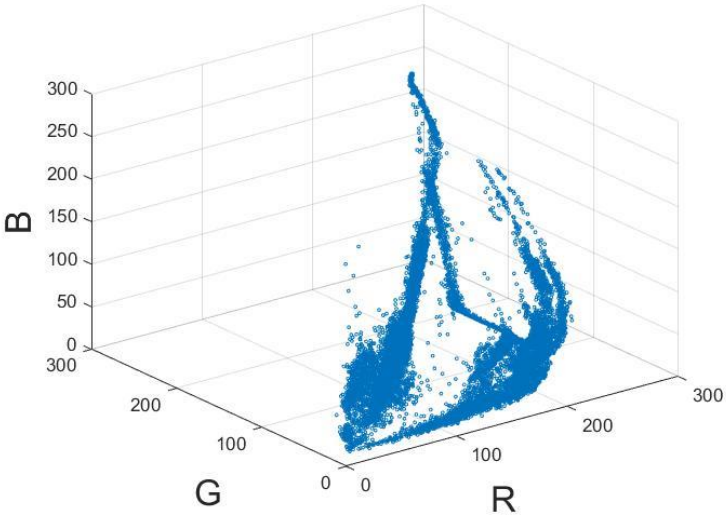

Figure 4: 3D histogram of vegetable images

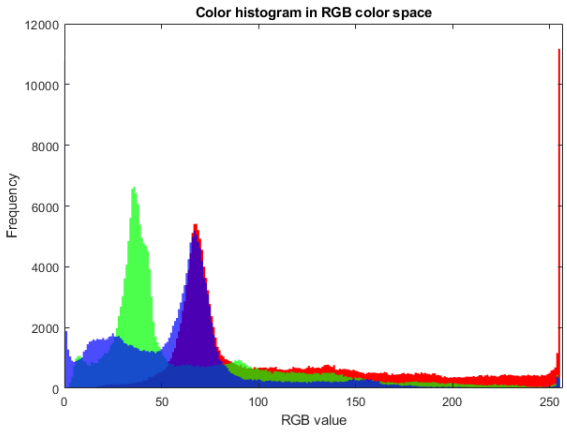

Figure 5: Color histogram of vegetable images

Percentage of RGB color present in Figure 3 are as follows:

Red: 49.33 %

Green: 27.12 %

Blue: 23.54 %

From above collected data Red color has maximum percentage and we will use this to store bits of secret data inside red color. If secret data doesn't get occupied in red color frequency then will choose green color which is 27.12 % lower than the red color percentage and we do this until all bits of secret message doesn't get occupied.

Figure 6 & 7 shows the histogram of red and green color channel image and our algorithm preserves the cover image quality without affecting too much

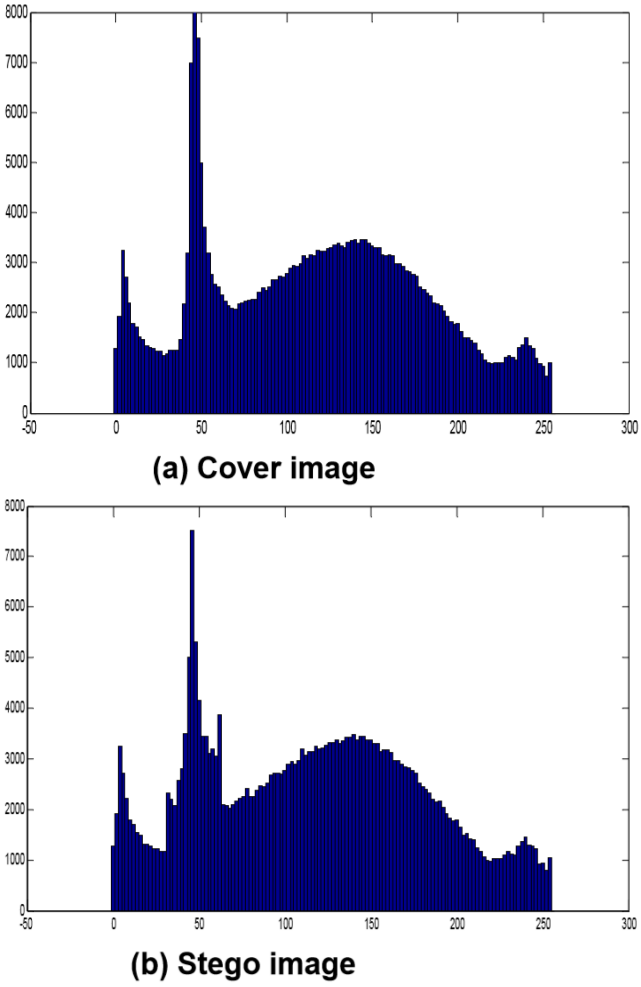

Figure 6: a & b shows the histogram of red channel

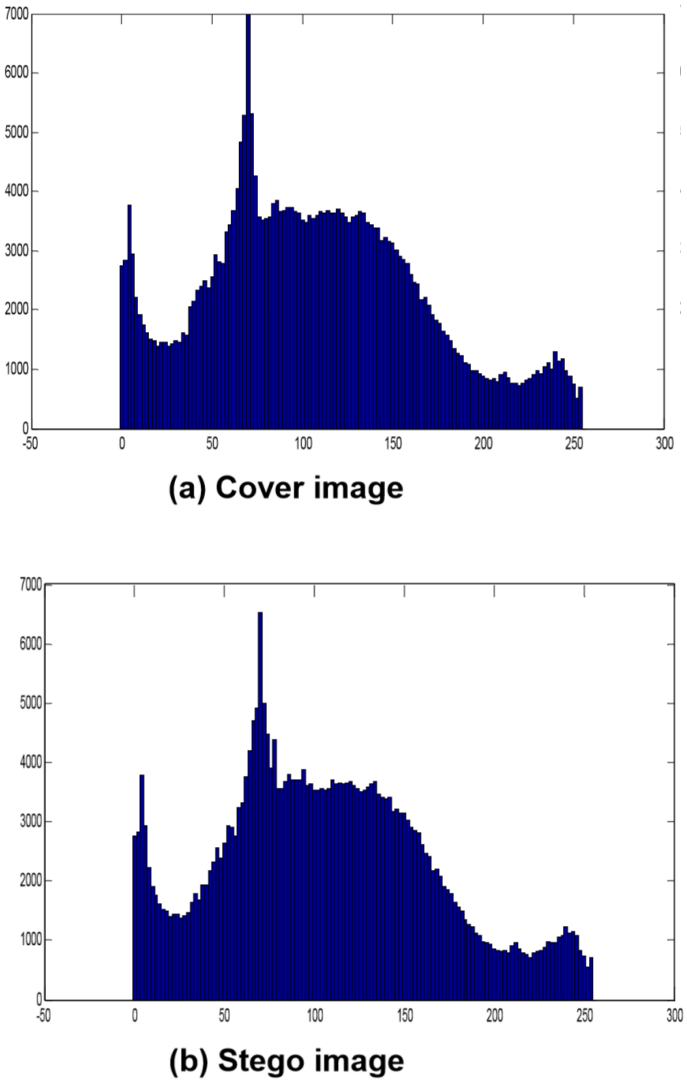

Figure 7: a & b shows the histogram of blue channel

5. Conclusion and future work

In this paper we discussed about new idea of steganography in image using frequency of different colors this method allows high capacity of data to be hidden inside the carrier image. Each channel bit stores 1 bit of message inside the pixel other methods like LSB reduces the carrier image quality and hence intruders and easily guess about the stego image. This algorithm uses higher frequency of the color to store secret information this allows carrier image to store information without affecting the picture quality of the carrier image.

There are various ways to make our algorithm more secure:

- Use cipher key to cipher the hidden message.
- Use channel indicator for fast and better decoding of the message.

6. References

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