Hiding image to video: A new approach of LSB replacement

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Abstract

Steganography has become great area of interest for researchers as need for secure transaction of information is increasing day by day. Information may be text, image, audio or video. Steganography is a technique in which required information is hided in any other information such that the second information does not change significantly and it appears the same as original. This paper presents a novel approach of hiding image in a video. The proposed algorithm is replacing one LSB of each pixel in video frames. It becomes very difficult for intruder to guess that an image is hidden in the video as individual frames are very difficult to analyze in a video running at 30 frames per second. The process of analysis has been made more difficult by hiding each row of image pixels in multiple frames of the video, so intruder cannot even try to unhide image until he get full video.

Keywords: Steganograpphy; Hiding image to Video; LSB Replacement; Image Processing.

1. Introduction

Steganography is the art of hiding the fact that communication is taking place, by hiding the information in other information. There are different kinds of steganography used in communication channel. . The following media are the candidate for digitally embedding message [3,4]: -

- Plaintext
- Still imagery
- Audio and Video
- IP datagram.

Text can be hided in an image by replacing some bites of the image according to the characters of the text[1,5]. Similarly an image can be hided in another image by replacing bits of pixels of second image (In which we are hiding first image) corresponding to the pixels of first image matrix. Some commonly used techniques[1] are:

- F 5 Algorithm
- LSB Coding
- Palettes Modification

2. Related Work

Number of techniques available for hiding text or image in images. In some methods LSBs of the target image are replaced corresponding to the text or image getting hidden[6,7]. The reason of selecting LSBs for replacement is that it makes least change in pixel values and hence the final object appears very similar as the original.For example: a 24-bit bitmap will have 8 bits, representing each of the three color values (red, green, and blue) at each pixel[8]. If we consider just the blue there will be 28 different values of blue. The difference between 11111111 and 11111110 in the value for blue intensity is likely to be undetectable by the human eye. Hence, if the terminal recipient of the data is nothing but human visual system (HVS) then the Least Significant Bit (LSB) can be used for something else other than color information [2].In audio steganography, secret message is embedded into digitized audio signal which result slight altering of binary sequence of the corresponding audio file[2].In proposed work we are hiding image into video.

3. Proposed Work

In the proposed system the pixel information of the source image is hided in the destination video frames such that each row of pixel (consisting of 8 bits Eg. 11011001) is hided in first rows of multiple frames of the target. This makes the hiding so complex, it becomes very difficult to analyze.This section is divided into two subsections. 3.1 explains the process of hiding image into video frames and section 3.2 explains the process of recovering the image from frames.

3.1 Algorithm for image hiding-

Each pixel (8 bits) is hided in 8 pixels of video frame (1 bit of source image replaces LSB if 1 pixel in target frame). If image size is m_1*n_1 and frame size if m_2*n_2. Then number of pixels in one row of one frame that can be hided are given by-

$$y = n_2/8 \text{ pixels.}$$

Number of frame that can be hided in a video are given by-

1. $x= (n_1/n_2) * 8.$
2. For i=1 to x //no of frames
3. For j= 1 to m_1 //no of rows in image
4. For k=1 to y //no of columns that can be hided in one frame Read bits of pixels

   4.1 Write bits in LSB if frame pixel (8 pixels will be needed)

5. End for
6. End for
7. End for

3.2 Algorithm for image unhiding

To unhide the image, LSB of each pixel in the frame is fetched and a bit stream is constructed to construct the image.

1. For i=1 to x //no of frames
2. For j= 1 to m_1 //no of rows in image
3. For k=1 to y

   3.1 Read pixel

   3.2 Find LSB

4. End for
4.1 Construct bit stream to be written in recovered_image
5. End for
6. End for

3.3 Description of the hiding process-

Suppose at sender side following image segment is given-

$$I = \begin{matrix} 10110010 & 10100010 \\ 10010101 & 00101010 \end{matrix}$$

I(p,q) is a pixel in given segment-

I(p,q)= 10010101

Above 8 bits will be hided in 8 pixel of a video frame in following manner-

8 pixels of a video frame-

10101001 10101001 10101001 10101001 10101001 10101001 10101001 10101001

After LSB replacement the above pixels will look like-

1010100**1** 1010100**0** 1010100**0** 1010100**1** 1010100**0** 1010100**1** 1010100**0** 1010100**1**

When all the columns of a frame are utilized next frame is selected. Next row of the image is hided in next row of the frames.

3.4 Description of the recovery process-

To recover the image each frame is selected one by one and LSB is fetched from each pixel to construct bit stream of size 8.
Suppose following 8 pixels of a video frames are given-

1010100**1** 1010100**0** 1010100**0** 1010100**1** 1010100**0** 1010100**1** 1010100**0** 1010100**1**

Following bit stream is found from above pixels(Underlined bits)-
10010101
Similarly all the pixels of image are recovered.

4. Experimental Results

Algorithms were implemented in MATLAB 7a we have got very exiting results, we have hided image given in figure 1 and hided it by using our algorithm in figure 2. Figure 3 shows the video frames containing the image in them. Figure 4 shows the recovered image

Figure 1.Image

Figure 2. Video frames to hide the image

Figure 3. Frame after hiding a portion of the given image

Figure 4. Recovered image.

5. Conclusion and future work

We have developed a system to hide image in a video stream. The developed system worked excellently and it is very useful in sending sensitive information securely. Industry demands high level research work in steganograpgy , More quick algorithms may be developed and some heuristic approaches may be developed for this purpose.

6. References

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