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Multi-Level Steganographic Algorithm for Audio Steganography using LSB Modification and Parity Encoding Technique

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Abstract: ***Steganography is a very well-known method of information security through information hiding. Here two different steganographic methods have been used instead of using one steganographic method. This has been done with a layering approach. This method is named as multi-level steganography. Multi-Level Steganography has advantage of difficult decoding and sending two secret message through a single cover object.***

Keywords: Information security, Information hiding, Steganography, Multi-level-steganography Model, Decoy object

1. INTRODUCTION

Steganography can be applied to different objects like text, picture, image, audio or video. This objects called cover object or carrier object of the steganographic method. The secret message can also be of types like text, picture, image, audio or video. These objects are called message object. After application of steganographic method the produced output file is called stego-object. These cover object, message object and stego object are very well known to the people who are working on Steganography. Dr. Al Najjar first introduced [1] another type of object which is called intermediate object or decoy object. This decoy object is output of first level steganographic method and input of second level steganographic method. Decoy object actually nullifies the requirement of two different cover objects for sending two different secret messages.

2. LITERATURE SURVEY

2.1 Least Significant Bit (LSB) Coding

One of the earliest techniques studied in the information hiding of digital audio (as well as other media types) is Least Significant Bit modification coding technique. In this technique LSB of binary sequence of each sample of digitized audio file is replaced with binary equivalent of secret message [2].

Advantage: It is the simplest way to embed information in a digital audio file. It allows large amount of data to be concealed within an audio file, use of only one LSB of the host audio sample gives a capacity equivalent to the sampling rate which could vary from 8 kbps to 44.1 kbps (all samples used) [3]. This method is more widely used as modifications to LSBs usually not create audible changes to the sounds.

Disadvantage: It has considerably low robustness against attacks.

2.2 Parity Encoding

Instead of breaking a signal down into individual samples, the parity coding method breaks a signal down into separate regions of samples and encodes each bit from the secret message in a sample region's parity bit.

If the parity bit of a selected region does not match the secret bit to be encoded, the process flips the LSB of one of the samples in the region [5].

Advantage: The sender has more of a choice in encoding the secret bit, and the signal can be changed in a more unobtrusive manner.

Disadvantage: This method like LSB coding is not robust in nature.

3. PROPOSED METHOD

3.1 Multilevel Steganography

Here two secret messages rather than one can be transmitted with a single cover file. Layering approach gives opportunity to do so. In this paper two layered approach has been presented. At the first level, cover file (C) can be embedded with the first secret message S1. Assuming the stego file as C1 which is cover file for next level where secret message can be denoted as S2. Now the final stego file created as C12. So C12 holds both S1 and S2.

Two levels of steganography can be identified as layer 1 and layer 2. At layer 1 LSB modification technique and at layer 2 parity encoding technique has been used.

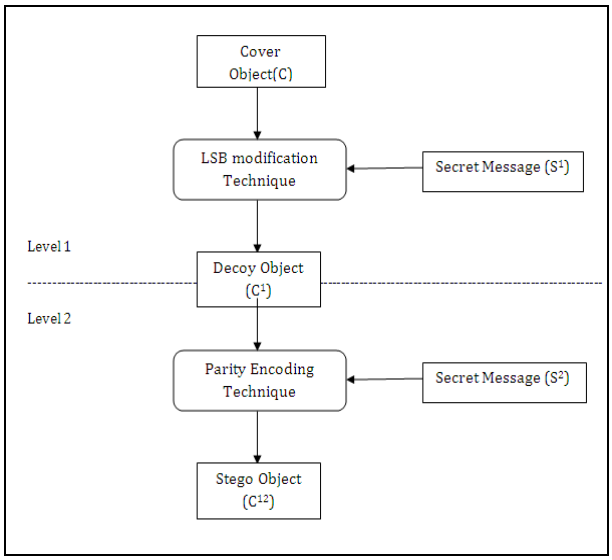


Figure 1 Flow-chart for proposed method

3.2 LSB Modification

3.2.1 Method

The LSB modification technique has been implemented with the following algorithm:

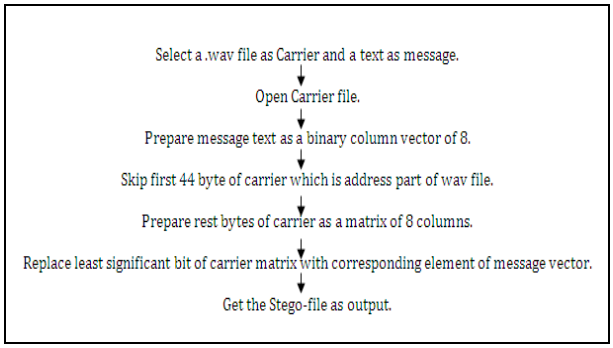
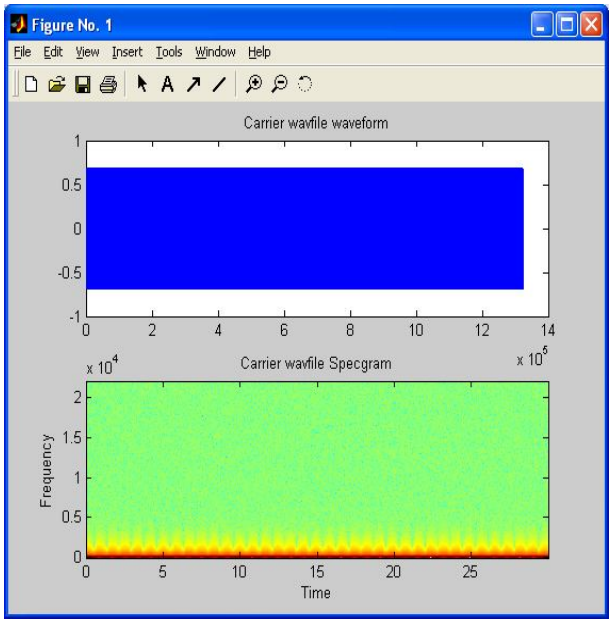


Figure 2 Flow-chart of LSB modification Technique

3.2.2 Result



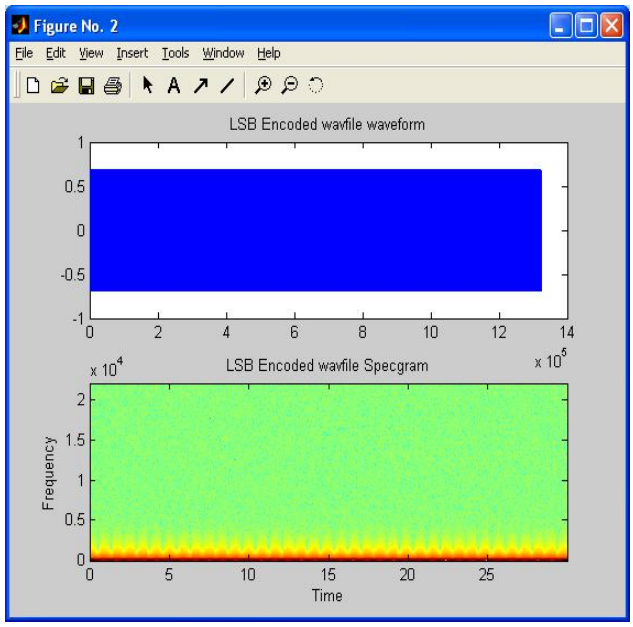


Figure 3 Result of LSB modification technique

It is observed that stego-file hasn't been audibly modified. Also the graphical representation also shows that there is reasonable no change between input carrier file and output stego file.

3.3 Parity Encoding

3.3.1 Method

The parity encoding has been implemented by breaking the data part of the wav file into number of regions. Each region includes same number elements of secret message text. Then parity flag of each region calculated. If it does not match with the message bit then we change the last bit of that region with the message bit.

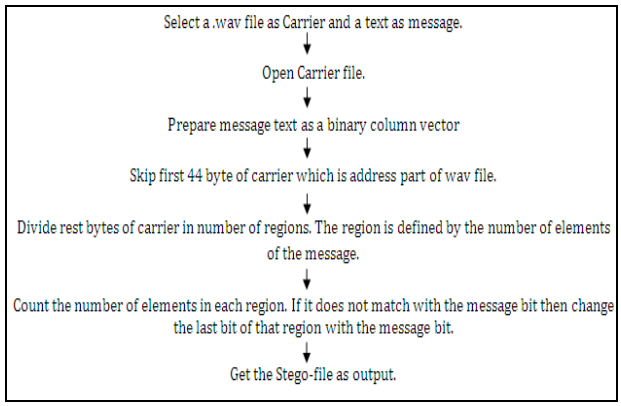


Figure 4 Flow-chart of Parity Encoding Technique

3.3.2 Result

Stego object hasn't been audibly modified. Also after decoding, secret message object can be retrieved.

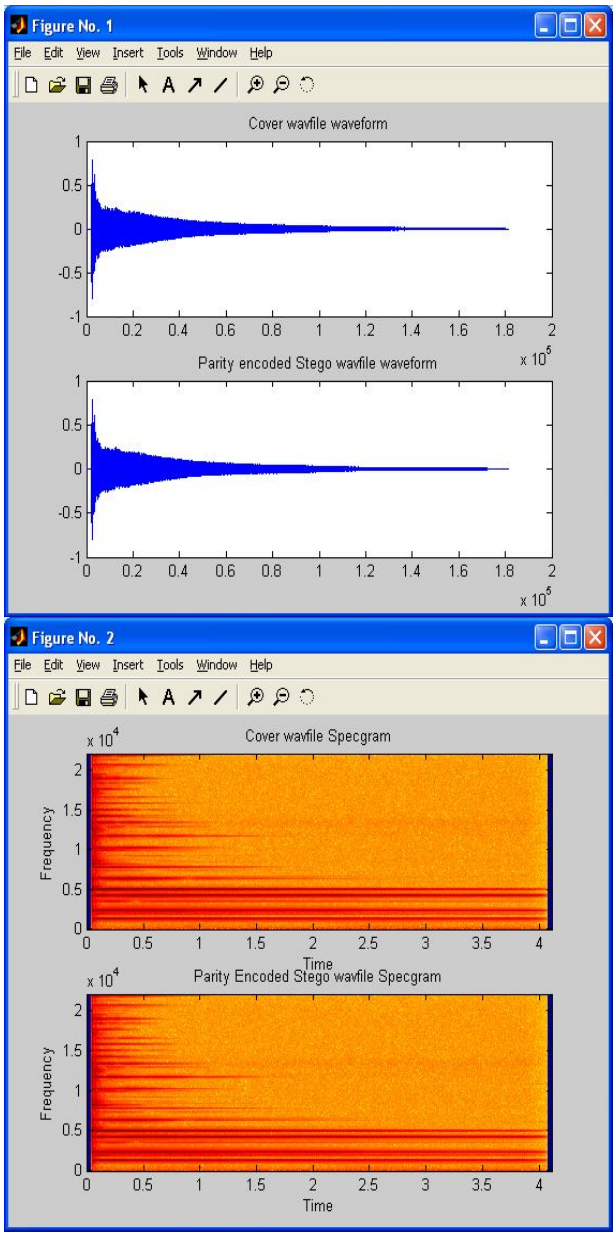


Figure 5 Result of Parity Encoding Technique

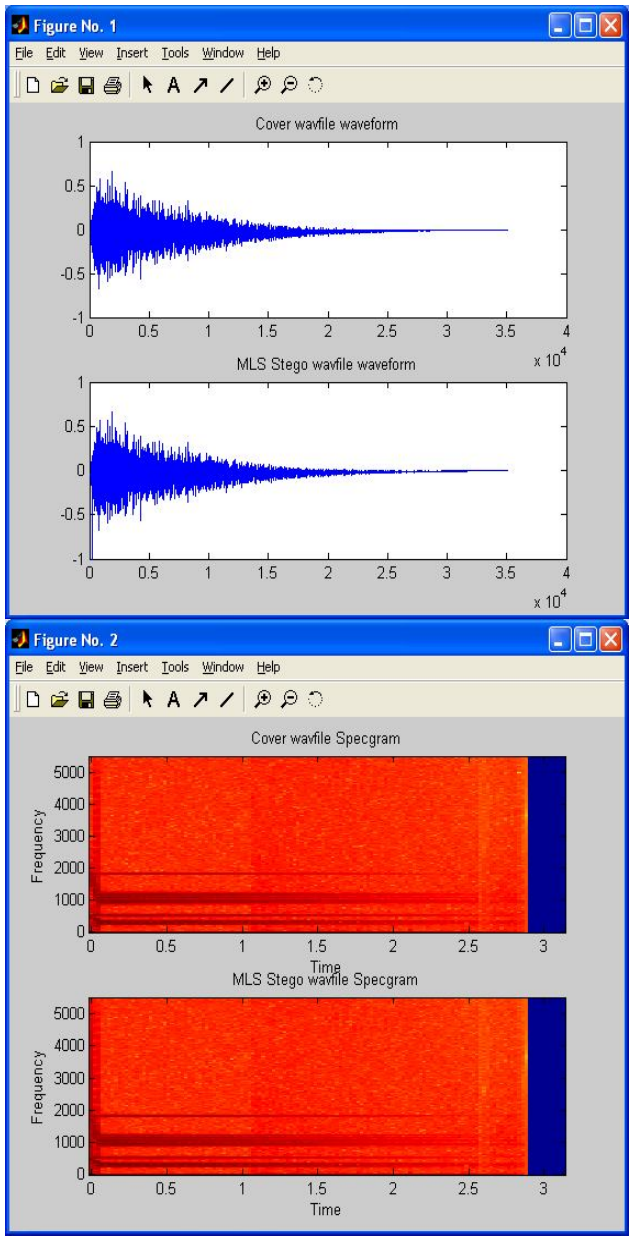


Figure 6 Result of Proposed MLS Technique

3.4 Blend of LSB modification and Parity Encoding in Multi-Level Steganography (MLS)

3.4.1 Method

At level 1 first message object hided under cover object using LSB modification technique as discussed earlier. The output of this level is an intermediate object which is called decoy object. This decoy object is input for next level. In level 2 second secret message hided under decoy object using parity encoding technique.

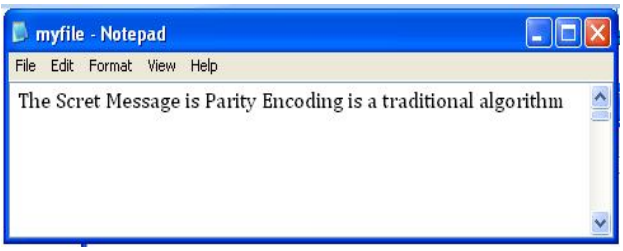
3.4.2 Result

After using MLS algorithm the audibility of the cover object hasn't been modified and secret objects are retrieved.

3.5 Decoding Result

When stego object decoded means passes through the decoding algorithm of phase encoding method the secret message of second level is retrieved.

When decoy object passes through the decoding algorithm of LSB modification method the secret message of first level is retrieved.



4. CONCLUSION

In this paper a new method of audio steganography presented where two secret messages can be hidden. Two traditional method of steganography blended in a level based approach to reach the goal. The output stego object is very difficult to decode which makes this method successful in the world of audio steganography.

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