A Review and Proposal of an Innovative Approach for Hiding Audio Secure Data in Images using Steganography

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Abstract: In previous years, existing research has been taken for hiding secret data into digital audio signal because of advantages of psycho acoustical masking phenomenon of human auditory system [HAS]. In this review paper a novel approach based on audio steganography by integrating optimal steganography and two level cryptographic methods. Improvement of imperceptibility of data hiding and increased security level for the secret data has been provided. Audio Steganography is the procedure of hiding the existence of secret information by zipping it into another medium such as audio file. In our system the innovative audio Steganography technique in a practical way in order to conceal the preferred information. The proposed system uses LSB (least significant bit) technique for embedding audio secret data into image cover data. We also try to other steganography techniques in our system.

Keywords – LSB (least significant bit) , HAS , steganography , cryptographic, embedding audio.

I. INTRODUCTION

Information hiding encompasses wide variety of the secret writing technologies that includes cryptography, steganography and watermarking. The term hiding implicates the process of making information invisible to inmates. Even though all these methods hide the message, each one differs in their own purpose and applications from one another. In cryptography, the legitimate recipient can decrypt and decode the secret message from the cipher [2]. Watermarking provide copyright protection and control by extending the cover source with some information. Steganography is an art of hiding information in a multimedia object such as image, audio and video objects. The main purpose of steganography is to draw the attention of illegal users form the Stego-file by selecting an innocuous cover media [2]. The name of the steganography method depends on the type of cover media object used for concealing secret data (such as image steganography, audio steganography and video steganography). Among these Audio steganography is more challenging compared to the image and video because human auditory system (HAS) identifies even minor changes in the audio signal compared to HVS. The human auditory system (HAS) detects sound signals ranging greater than 109:1 and frequencies ranging from 103:1.

In the past few years, many authors proposed different audio steganography approaches that hide the secret information by modifying the samples of the audio signal directly and indirectly in time domain and also transform domain by using various transformation techniques. This paper proposes novel audio steganography that extends the idea with increased security level and robustness to the secret audio data embeds in the digital image [20]. The proposed method encrypts the message prior to hiding. Audio Steganography becomes more powerful and efficient tool in combination with encryption methods which provides higher levels of security. The performance analysis of proposed audio steganography technique can be evaluated based on the objective and subjective measures.

These days, another test comprises to insert audio information in encoded pictures. Information is an arrangement of estimations of subjective or quantitative factors. Information is gathered, measured, announced and dissected, whereupon it might be imagined utilizing diagrams, pictures or different investigation apparatuses. Information are singular pieces of information. Data can exist in a collection of structures as numbers or substance on bits of paper, as bits and bytes set away in electronic memory, or as conviction set away eye to eye mind. It basically exists in two structures as:

Raw Data:
Data that has been gathered however not organized or broke down.

Structured Data:
It refers to the data organized in several manners. This includes data contained in relational database and spreadsheets.

An image is artifacts that depicts visual perception and are captured through optical devices such as camera, mirrors, lenses and telescope. Image is also basically a type of data used for the purpose of saving information and retrieving the same.

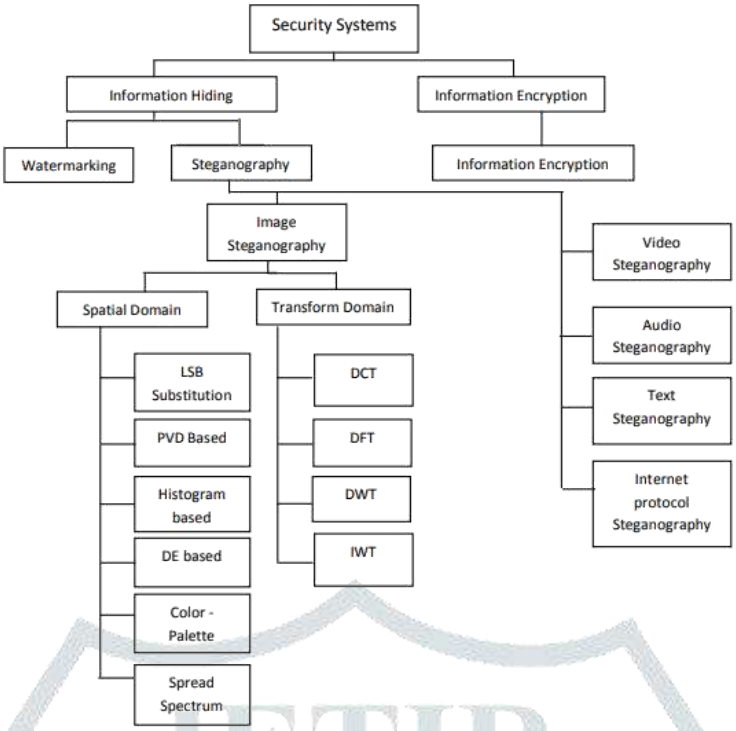

Figure 1.1: Different techniques of security system for data security

Objective

We presented a novel method to hide secret audio data into image cover data. We also works for other hiding techniques. We try to design a Matlab based GUI layout where can be hide audio data. We also work for image steganography, text data steganography.

II. LITERATURE REVIEW

Reversible audio data hiding techniques in the waveform domain are usually simple and require less computational load. Veen et al. [1] proposed an amplitude expansion method that applies a bit shift to amplitude data toward the most significant bit (MSB). This operation makes space for insertion of payload data into the least significant bit (LSB) position. To prevent amplitude overflow being introduced by the bit-shift operation and the addition of a payload bit, amplitude compression is applied prior to the bit-shift operation. Compounding errors induced in bits by amplitude compression are losslessly compressed and are embedded into the LSB position as overhead data.

Yan and Wang [2] proposed a prediction error expansion method for reversible audio data hiding using linear prediction. Between one and three previous samples of the waveform and the integer coefficients are multiplied and added to predict the current sample. The difference between the current and predicted amplitude is multiplied by two, and the payload bit is then added to the result. These processes form the so called "prediction error expansion". The expanded difference is added to the predicted amplitude to get the Stego sample. Overflow in amplitude caused by the difference expansion is avoided by having a "no expansion flag" for that sample. A location map that indicates which samples are not expanded is lossless compressed and is embedded alongside the payload data.

Techniques for reversible hiding of audio data in the frequency domain firstly convert segmented waveform signals into spectral data by using an integer conversion, such as an integer discrete cosine transform (DCT) [3]. Amplitude spectra in the high frequency region are shifted by one bit toward the MSB in order to add payload data to the LSB position. An inverse transform of the embedded spectral data generates the Stego waveform data. Amplitude overflow in the waveform domain is prevented by a non-embedding processing of the frequency regions which exhibit high amplitude. A location map that indicates which frequency regions are not processed is also embedded alongside the payload data. Reversible data hiding is considered to be useful for authentication, metadata recording, tampering detection, covert communication, and so forth. Requirements for the technology are minimal quality degradation of the Stego signals, large payload, and undetectable concealment of hidden data. One of the major problem in previous studies is the requirement of overhead data, such as the location map. These overheads shrink the payload data area, especially in cases where the audio data is short. In addition, concealment of payload data is imperfect, since the LSB data in the stego waveform [1] or in the DCT spectrum [3] always represents the payload data. Furthermore, the number of secret keys representing the prediction coefficients is small, typically there are only 64 patterns [2].

III. PROBLEM IDENTIFICATION

In LSB only the least significant bits are modified to hide the secret audio message, average no. of bits needed be changed. The difference b/w cover image and the Stego image are hardly noticeable. DCT transform technique works in frequency domain, it divides the image into two parts having their own importance. Whereas the high frequency components of the image are discarded due to compression attacks. DWT also works in frequency domain, consisting of two operations from left to right (horizontal direction) and from top to bottom (vertical direction). Pixels of image are scanned from left to right and top to bottom, addition and subtraction is performed with the neighboring pixels, the process repeats until the all the pixels has been processed. At the end, four sub-bands are obtained LL, LH, HL and HH. Whereas the image is embedded in the low frequency sub band because it looks identical to original image. Techniques that work in transform domain to hide data are complex for intruders. All these techniques are evaluated on the bases of PSNR, MSE, PC, Processing time, Robustness and Capacity. The PSNR value of LSB technique is high. Among these three techniques DCT works perfectly with least distortion in image as compared to LSB and DWT.

IV. PROPOSED ALGORITHM

The new idea has been proposed for the security of secret information and parties as well. The main goal of this method is to develop an efficient security system for the protection of confidential audio data during the transformation process. The basic idea of this system is to analyze the audio, secure the secret audio file as well as the cover files with strong algorithm. The system consist of two main phases encryption and decryption various stages of encryption are; image acquisition, preprocessing, enhancement, read and convert audio file, applying AES also compression using DCT transform, Embedding audio in image using LSB technique, Stego image is retrieved.

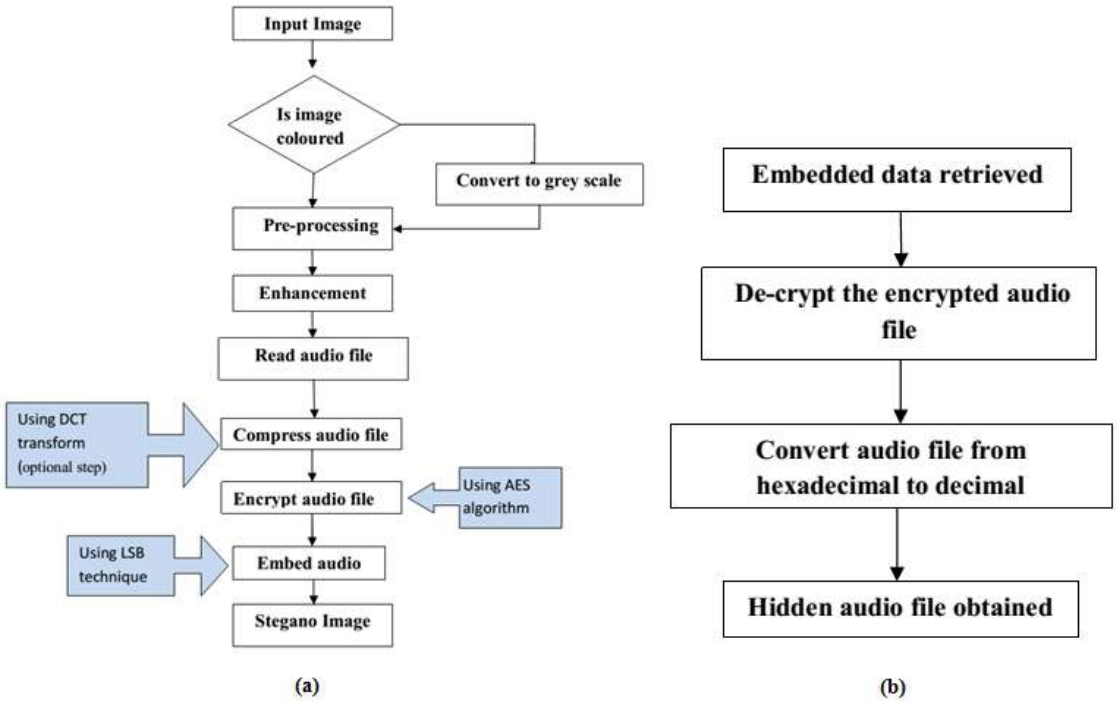

Figure 4.1 (a) Flow chart for encryption process (b) Flow chart for decryption process

A variety of techniques are used for hiding the data in images.

A. Reversible Data Hiding

Reversible information is characterized as an approach where the information is covered up in the host media that might be a cover picture. The reversibility implies inserting information as well as unique picture can be recouped. In reversible information concealing the first cover can be recuperated loss-lessly after the inserted messages are extricated. Reversible information stowing away can be considered as a type of steganography in which we shroud information inside pictures. This technique is effective in armed forces and medicinal fields. In general, a higher degree of distortion is achieved if there is a higher embedding capacity. For reversible data hiding certain requirements should be specific such as:

Marked image quality: The marked picture quality ought to be tremendous. It suggests resulting to inserting data in cover picture the adjustment in cover picture ought to be less.

So that exclusive expected beneficiary can perceive the correspondence.

Payload: Hidden bits in the picture.

Auxiliary information: Auxiliary information is a measure of information that is required to be sent at the extraction organize for perfect recuperation of picture and mystery message.

1) Least Significant Bit

A novel reversible information concealing system empowers the correct disclosure of the original picture subsequent to removing the inserted data. LSB (Least Significant Bit) adjustment is proposed as the information installing technique, which presents extra working focuses on the capacity-distortion(C-D) graph.

2) Histogram Shifting

In the fundamental histogram shifting data hiding, initially a zero point as well as highest point will be calculated.

Image Steganography utilizing cover medium as an image is called image steganography. Human eye can't identify unobtrusive changes in a picture. Any message in the form of text or an image can be stored as secret inside a cover image. Some bits of the pixels of a picture can be straightforwardly replaced or the picture can be converted.

V. CONCLUSION

This review paper implements hybrid audio steganography which hides the audio information by encrypting in multiple levels and embed into the variable LSB's of the selected samples based on polynomial expression as a function of Audio and image cover file. The proposed algorithm is simulated and results have been validated by comparing with existing methods.

VI. EXPECTED OUTCOME

On the basis of above discussion on this paper, there is a tradeoff between data capacity and security. The main issue in this field "is providing security at the same time with limited capacity, so that file of large size can be easily embedded". For this problem a strong computer based system is needed that overcome the tradeoff whereas providing better security at the same time. Tool used: Matlab is the most reliable technique for the implementation of steganography. Matlab R2016a provides a very intellectual computing environment as well as a large number of built-in functions for image and speech processing and information security.

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