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ENHANCED MODEL FOR SECURE TRANSMISSION OF TEXT USING AN AUDIO FILE

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***Abstract* – This paper describes about transmitting secure text inside an audio file to prove that the text is safe and secures within the confines of it and suites the appropriateness of information security. In this paper, the proposed method can hide the desired message in the form of plain text using the Low-bit encoding algorithm. This method proves best effort service for securing and transmitting information over the network. The exchange of messages to the intended receiver supports the feature of encryption and decryption and enhances reusability in the form of a software application.**

Keywords—**Steganography, HAS, Cover file, Stego file, Low-bit encoding, Data hiding**

I. INTRODUCTION

Steganography is the process of sending hidden data or secret messages over a public channel so that a third party cannot detect the presence of the secret messages. The goal of steganography is different from classical encryption, which seeks to conceal the content of secret messages; steganography is about hiding the very existence of the secret messages [1]. The cover file may refer to that of audio, video, or an image file. The cover file chosen here to be explained in this paper is the audio file for hiding the text.

The text is hidden inside the audio file by means of an algorithm known as the Low-bit encoding algorithm (LSB/MSB algorithm). This in turn is again implemented by building software, consisting of controls used in the GUI. This paper consists of these user interfaces along with the algorithm at its backend to facilitate the process.

The audio file chosen here is the .wav file and the text is any plain text of utf-8 format. The following topics in this paper then explain about the literature survey, proposed method, system architecture, implementation, results and conclusion.

II. LITERATURE SURVEY

Certain methods and processes are available and are to be known as to how they differ from each other and how they can be implemented as an application. This serves as a tool for devising a system conception for a method to be made.

A. Systems and processes

A survey of the existing techniques reveals that there have been several other techniques for hiding information or messages in cover files in such a manner that the hidden data should be imperceptible. Substitution system substitutes redundant parts of a cover with a secret message. The statistical method encodes information by changing several statistical properties of a cover and use hypothesis testing in the extraction process. Distortion process stores information by signal distortion and measure the deviation from the original cover in the decoding step. The cover generation method encodes information in the way a cover for secret communication is created. In case of hiding information in digital sound, some of the methods embed data by altering the phase in a predefined manner. To a certain extent, modifications of the phase of a signal cannot be perceived by the human auditory system (HAS) [1]. All these steganographic techniques deal with a few common types of steganography procedure depending on the variation of the host media. That means the cover object or the carrier object which will be used to hide the secret data. Different media like image, text, video and audio has been used as a carrier or host media in different times.

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B. Techniques available till date

Cryptography is a base method for this and there are processes involved in it. It refers to the study and implementation of techniques for secure communication. Various aspects of data security come addressed under this method, viz. Symmetry and asymmetry key, stream and block ciphers, etc.

The audio specific techniques [2, 3] are:

1. Spatial Domain Methods:

- Low-Bit Encoding: This method is also known as LSB (least significant bit) encoding. Modification can be carried out in a way that the audio bits are not compromised. The bits are replaced by coded binary string, thus encoding the data to be hidden.

- Echo hiding: This method embeds a short echo to the host signal for the data into an audio file. It embeds data into a host audio signal by introducing an echo. The data are hidden by varying three parameters of the echo.

2. Transform Domain Methods:

- Spread Spectrum: This method can use the hidden data distributed over a frequency spectrum of audio signal; can produce redundant copies of data signal. The basic spread spectrum technique is designed to encode a stream of information by spreading the encoded data across as much of the frequency spectrum as possible. This allows the signal reception, even if there is interference on some frequencies.

- Discrete Wavelet Transform: This method can hide data in transform coefficients of the audio signal; makes use of smaller waves.

- Tone Insertion: This method has low embedding capacity; the method is resistant to attacks of low pass filtering and bit truncation.

- Phase coding: This method encodes the message as phase shifts in spectrum of the digital signal. It works by substituting the phase of an initial audio segment with a reference phase that represents the data. The phase of the subsequent segments is adjusted in order to preserve the relative phase between the segments.

III. PROPOSED METHOD

There are two processes. First is encoding and another is decoding processes which based upon Low-bit encoding Algorithm [4, 5, 6, 7]. There are two steps:

a) **Data Embedding**

b) **Data Retrieval**

Steps for Data Embedding:

1. Read the cover audio signal.
2. Write the text in an in file to be embedded. Convert it into a sequence of binary bits.
3. Every message bit from step 2 is embedded into the variable and multiple LSBs of the samples of the digitized cover audio cover.
4. For embedding purpose, the MSB of the cover sample is checked. As shown in above table.
If MSB is '0' then use 6 LSBs for data embedding.
If MSB is '1' then use 7 LSBs for data embedding.
5. The modified cover audio samples are then written to the file forming the stego object.

Steps for Data Retrieval:

1. Read the stego object.
2. Retrieval of message bits is done by checking the MSB of the samples.
If MSB is '0' then use 6 LSBs for data retrieve.
If MSB is '1' then use 7 LSBs for data retrieve.
3. After every such 16 messages bits retrieved, they are converted into their decimal equivalents and finally the secret audio signal reconstructed. The Capacity by the proposed method is estimated by using, cp=p1*7+p2*6, where p1 and p2, are the probabilities of the samples with value as '1' and '0', respectively. The Percentage increase in Capacity is given by ECP= (cp/c)*100 for 4 bits per Sample.

IV. SYSTEM ARCHITECTURE

Figure 1 shows the architectural design model. It shows the sender and the receiver objects in a network, along with the rest of the components. The system consists of a sender and a receiver as the major components or objects. They are connected to each other by means of an open communication channel or simply a network that establishes a connection between the two nodes. The sub-components or the sub-systems under the sender and the receiver objects are those that facilitate the encryption and decryption processes. They interact with each other through the interfaces designed in the software and also by the above mentioned algorithms.

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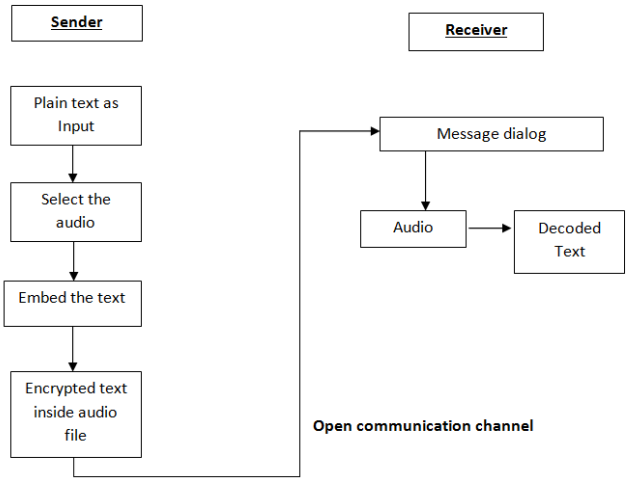

Figure 1: Architectural Design of a sender and a receiver

V. IMPLEMENTATION

The implementation stage involves careful planning, investigation of the system and its constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods.

A. Tool and Platforms used

The tool used here is the Microsoft visual studio under the .NET framework. The method described in this paper can be developed by specifying the controls like those of textboxes, buttons, etc. The NAudio framework is one of its kinds for supporting the audio formats of .wav file and its analysis.

1. *Microsoft Visual Studio*

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Microsoft windows, as well as websites, web applications and web services [8, 9].

2. *.NET Framework*

.NET framework is a software framework developed by Microsoft that runs primarily on Microsoft Windows. It includes a large class library known as framework class library (FCL) and provides language interoperability across several programming languages. Programs written for .NET framework execute in a software environment known as common language runtime (CLR), an application virtual machine that provides services such as security, memory management and exception handling. FCL and CLR together constitute a .NET framework.

3. *NAudio Framework*

NAudio is an open source .NET audio and MIDI library, containing dozens of useful audio related classes intended to speed development of audio related utilities in .NET. It has been in development since 2002 and has grown to include a wide variety of features. While some parts of the library are relatively new and incomplete, the more mature features have undergone extensive testing and can be quickly used to add audio capabilities to an existing .NET application. NAudio can be quickly added to the .NET application using NuGet.

The audio file having its textual data hidden is then transmitted through the network either by means of a LAN cable or by various other wireless methods [10]. The decoding method, unless known by the third party users at the moment of transmitting the data, is sent to the intended receiver by the above methods thus proving it to be secure.

VI. CONCLUSION

In the proposed paper, the experiments through the use of the Low-bit encoding algorithm prove that the text can be hidden inside the audio file and proves to be secure. The encrypted text can be sent to the intended receiver by means of a LAN cable or by wireless methods in a network.

The method in its existence has been verified within its programming and experimental errors. All the possibilities of encryption, decryption, sending and receiving have been analyzed through devised logics and core implementation. The method suites the appropriateness of information security, as the text hidden inside an audio file proves safe and secure enough to be sent over the network. The algorithms used such as that of Low-Bit Encoding algorithm have been devised logically and proved useful to hide the text within the confines of the audio file. The same also proves useful in decrypting the text from the audio file. The file can be sent over the network by means of the communicating medium such as a cable as well as through a wireless transmission.

The method described in this paper thus employs in doing the following works:

- Hiding the text within the confines of the audio file
- Decoding the text from the audio file
- Sending and receiving the audio file by means of the transmission methods in an open communication channel

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