A REVIEW ON DIGITAL DATA SECURITY USING AUDIO STEGANOGRAPHY

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Abstract – This paper presents a review of audio steganography and various audio steganography techniques used for digital data security.The purpose is to gain more knowledge on various audio steganography techniques.The main objective is to find out a technique, which can hide a large amount of data with more security.To fulfill the purpose, various researches and projects done before are taken into consideraton.

IndexTerms- Steganography, Audio steganography, Embedding, Extraction, Secret key, Cryptography

I.INTRODUCTION

Information is very important and maintained secured in some areas such as Business, Military, Social affairs & Network security.Everyone wants the secrecy & safety of their communicating data.Hence security during communication has become a fundamental issue. So, the attractive soultion for secured transmission of data is steganography.Steganography is a art of science to hide data in digital media (cover media) so that third party or attacker can‟t recognize that information is hidden into the cover media. Digital data security can be achieved in two ways-encryption and data hiding. Cryptography technique distorts the information in such a way that it cannot be recognized. Steganography and Digital watermarking are the popular data hiding techniques.In steganography the process of hiding information content inside any multimedia content like audio, image, video is referred as a “Embedding”. In this work, a review of audio steganography and various audio steganography techniques related to digital data media and security of the hidden data has been narrated. This review will help the future researchers to find the questions to carry out further research in the field.

II. REVIEW OF LITERATURE

From the consecutive years (2001-2005) :

M. M Amin, M. Salleh, S . Ibrahim, M.R.K atmin, and M.Z.I. Shamsuddin [1]” Information Hiding using Steganography” stated that Steganography is a technique of hiding information in digital media. Besides hiding data for confidentiality, this approach of information hiding can be extended to copyright protection for digital media: audio, video, and images.

Kaliappan Gopalan [2]” Audio steganography using bit modification” in this paper , One bit in each of the samples of a given cover is altered in accordance with the data bits and a key. The same key is used to retrieve the embedded bits at the receiver.

Nedeljko Cvejic and Tapio Seppben [3],” Increasing the capacity of LSB-based audio steganography a novel modifcation to standard LSB algorithm that is able to embed four bits per sample, thus improving the capacity of data hiding increases.

Krista Bennett [4]” Linguistic Steganography: Survey, Analysis, and Robustness Concerns for Hiding Information in Text” This paper provides a basic introduction to steganography , with a particular focus on text steganography. Text-based information hiding techniques are discussed.

Great scholar James C. Judge [5] in his work on' Steganography: Past, Present, Future‟ stated that steganography is the term applied to any number of processes that will hide a message within an object, where the hidden message will not be apparent to an observer .

Nedeljko Cvejic, Tapio Seppänen [6]” Increasing Robustness of LSB Audio Steganography Using a Novel Embedding Method” in this paper, Using the proposed two-step algorithm, watermark bits are embedded into higher LSB layers, resulting in increased robustness against noise addition or MPEG compression.

From the consecutive years (2006-2010) :

Shawn D. Dickman [7] in his project on ' An Overview of Steganography‟, stated that Steganography is a useful tool that allows covert transmission of information over an overt communications channel.

Mohammad Pooyan and Ahmad Delforouzi [8] in their project” LSB-based Audio Steganography Method Based on Lifting Wavelet Transform” stated that t maximize capacity of audio signals, we calculate hearing threshold in wavelet domain. Then according to this threshold data bits are embedded in the least significant bits of lifting wavelet.

Mazdak Zamani,Rabiah Bt Ahmad.Azizah Bt Abdul Manaf,Akram M. Zeki [9]gives a new approach of substitution of audio steganography to increase the robustness. Robustness mainly enhanced against both intentional and unintentional attacks. In proposed technique Genetic algorithm is used and the message bit is embedded into higher LSB layers.

Mazdak Zamani [10]*”* A Secure Audio Steganography Approach “described The main problem is low robustness against attacks. Two types of attacks are there. One type of attack tries to reveal the hidden message and other tries to destroy the hidden message.

R. Sridevi, Dr. A Damodaram and Dr. SVL. Narasimham [11]"Efficient Method of Audio Steganography by Modified LSB Algorithm and Strong Encryption Key With Enhanced Security", Enhanced Audio Steganography (EAS) is a combination of audio Steganography and cryptography.

Debnath Bhattacharyya1 [12]" Text Steganography: A Novel Approach" in their report proposed a combines cryptography, steganography and along with that an extra layer of security has been imposed in between them. This newly introduced extra layer of security changes the format of normal encrypted message and the security layer followed by it embeds the encrypted message behind a multimedia cover object.

Arvind Kumar Km and Pooja [13] in this paper" Steganography- A Data Hiding Technique" stated that combining secret image with the carrier image gives the hidden image. The hidden image is difficult to detect without retrieval.

Krishna Bhowal and Anindya Jyoti Pal [14]" Audio Steganography using GA" encrypted message bits are embedded into random and higher LSB layers, resulting in increased robustness against noise addition. On the other hand, GA operators are used to reduce the distortion.

Mazdak Zamani and Azizah A. Manaf [15]" A Genetic-Algorithm-Based Approach for Audio Steganography" the proposed genetic algorithm, message bits are embedded into multiple, vague and higher LSB layers, resulting in increased robustness.

Zaidoon Kh. AL-Ani, A.A.Zaidan[16]" Overview: Main Fundamentals for Steganography" to recognize the researchers for the main fundamentals of steganography. In this paper provides a general overview of the following subject areas: Steganography types, General Steganography system, Characterization of Steganography Systems and Classification of Steganography Techniques.

Pradeep Kumar Singh and R.K.Aggrawal [17]" Enhancement of LSB based Steganography for Hiding Image in Audio" the proposed scheme of image hiding in audio and its comparison with simple Least Significant Bit insertion method for data hiding in audio.

Masahiro wakiyama and Yasunobu Hidaka [18]"An audio steganography by a low bit coding method with wave files" in this paper, audio data is a wave file format and the text is embedded in wave file.

Dr. H. B. Kekre and Archana AthawaleArchana Athawale [19]" Increasing the Capacity of the Cover Audio Signal by Using Multiple LSBs for Information Hiding" The maximum number of bits that can be used for LSB audio steganography without causing noticeable perceptual distortion to the host audio signal is 4 LSBs, but in these methods, message bits are embedded into multiple and variable LSBs. These methods utilizes up to 7 LSBs for embedding data.

From the consecutive years (2011-2016) :

Muhammad Asad, Junaid Gilani, Adnan Khalid [20] proposes two methods to improve the conventional LSB technique-Bit Selection and Sample Selection. The first method is to randomize bit number of secret message used for embedding. And second method is to randomize the sample number which is used for embedding the next message bit. Both the proposed algorithms work fine against steganalysis attacks. A successful test has been performed for proposed method on the .wav file with 8000 samples per second containing 8 bits per sample.

Pooja P. Balgurgi, Prof. Sonal K. Jagtap [21]presented the implementation of two level security by combining cryptography and steganography. And proposed an algorithm in which combination of LSB technique and XORing method is used to provide a better level of security. Brief description of all the audio steganography techniques is also presented.

M.Baritha Begum and Dr.Y.Venkataramani[22]" An Efficient Text Compression for Massive Volume of Data" This algorithm is composed of two stages. In the first stage, the input strings are converted into the dictionary based compression. In the second stage, the redundancy of the dictionary based compression is reduced by Run length coding.

Mohammed Salem Atoum and Akram Zeki[23]" Exploring the Challenges of MP3 Audio Steganography" This paper presents the issues and challenges faced for steganographic techniques that uses MP3 files as the cover or carrier file. The problem of steganographic techniques for MP3 is variety of MP3 states, where it exists at higher or lower bit rates, with higher or lower resulting quality.

Anu Binny and Maddulety Koilakuntla [24]" Hiding Secret Information Using LSB Based Audio Steganography" In the proposed method each audio sample is converted into bits and then the text data
is embedded. In embedding process, first the message character is converted into its equivalent binary.

Pooja P. Balgurgi and Sonal K. Jagtap [25]" Audio Steganography Used for Secure Data Transmission" This paper presents comprehensive survey of some of the audio steganography techniques for data hiding.Least Significant Bit (LSB) technique is one of the simplest approach for secure data transfer.

Shamim Ahmed Laskar and Kattamanchi Hemachandran [26]" High Capacity data hiding using LSB Steganography and Encryption" Steganography and cryptography are two different data hiding techniques. Steganography hides messages inside some other digital media. Cryptography, on the other hand obscures the content of the message. We propose a high capacity data embedding approach by the combination of Steganography and cryptography. In the process a message is first encrypted using transposition cipher method and then the encrypted message is embedded inside an image using LSB insertion method.

Kaliappan Gopalan and Jiajun Fu [27]" An Imperceptible and Robust Audio Steganography Employing Bit Modification" Modification of bit values of samples in accordance with data to be embedded in audio steganography can have high payload at low complexity. Hiding data at a lower bit index of samples has low audibility of change with high susceptibility of being affected by intentional or other alterations to the stego.

NehaGupta and Ms. Nidhi Sharma [28]" Dwt and Lsb Based Audio Steganography" The proposed system aims to provide improved robustness, security by using the concept of DWT and LSB proposed a new method of Audio Steganography.

Jayaram P and Ranganatha H R[29]" Information hiding using audio steganography – a survey" in their report Audio steganography is the scheme of hiding the existence of secret information by concealing it into another medium such as audio file.

M.Baritha Begum[30]" LSB Based Audio Steganography Based On Text Compression" Dictionary based compression bits are hidden into the Lsb bit of audio signals and to calculate the signal to noise ratio (SNR). This audio Steganography is conducted for various compression algorithms with dictionary based compression. Audio Steganography based dictionary compression achieves better value of signal to noise ratio (SNR).

Muhammad Asad and Junaid Gilani[31]" An Enhanced Least Significant Bit Modification Technique for Audio Steganography" in their report a a proposed technique works against steganalysis and decreases the probability of secret message being extracted by an intruder. Advanced Encryption Standard (AES) with 256 bits key length is used to secure secret message .

Shamim Ahmed Laskar and Kattamanchi Hemachandran[32] in their project on' High Capacity data hiding using LSB Steganography and Encryption' proposed a high capacity data embedding approach by the combination of Steganography and cryptography. The combination of these two methods will enhance the security of the data embedded. The main objective in this work was to provide resistance against visual and statistical attacks as well as high capacity .

Kirti Gandhi, Gaurav Garg introduced a method which is a variant of well-known LSB method [33] Modified LSB Audio Steganography Approach. Due to less robustness and more vulnerability to be attacked LSB method is not preferred. Instead two bits (2nd and 3rd LSB's) are used for hiding message. This will increase the data hiding capacity also.

Bankar Priyanka R., Katariya Vrushabh R.,[34] "Audio Steganography using LSB'', presented a novel approach of submission technique of audio Steganography . Using genetic algorithm, message bits are embedded into multiple and higher LSB layer values, resulting in increased robustness.

Ashwini Mane, Gajanan Galshetwar [35]' "Data Hiding Technique: Audio Steganography using LSB Technique", presented a method known as Least Significant Bit (LSB) method . In LSB method consecutive LSB's in each sample of cover audio is replaced with secret message bit. LSB method is very easy to implement but have low robustness.

S.S. Divya, M. Ram Mohan Reddy [36]' "Hiding Text In Audio Using Multiple LSB Steganography And Provide Security Using Cryptography", The research has proposed two novel approaches of substitution technique of audio steganography that improves the capacity of cover audio for embedding additional data. Here message bits are embedded into multiple and variable LSBs. These methods utilize up to 7 LSBs for embedding data.

. Soumya Banerjee and Saikat Roy[37]" A Variable Higher Bit Approach to Audio Steganography" in their report The most commonly used form of Steganography is the LSB (Least Significant Bit) Steganography in which the Least Significant Bit of a byte is changed. Here, we propose a variable higher bit approach to Steganography with audio as our medium of choice. We present an algorithm which uses either of 2 consecutive higher order bits to hide data.

Gunjan Nehru and Puja Dhar studied [38]"a detailed look of audio steganography techniques using LSB and genetic algorithm approach" This research has study of various techniques of audio steganography using different algorithms like genetic algorithm approach and LSB approach. It has tried some approaches that help in audio steganography..

Tanmaiy G. Verma [39]" A Unique Approach for Data Hiding Using Audio Steganography" Steganography and Cryptography are considered as one of the techniques which are used to protect the important information, but both techniques have their pro's and con's. This paper aims to conquer their respective drawbacks and to achieve this we are using a double layer protection technique which is cryptography cum steganography approach.

Harish Kumar, Anuradha [40] have presented a Steganography method of hiding text data in an audio file and proposed a technique which firstly sampled the audio file and then suitable modification is done at LSB.Experimental results are also given for the proposed technique.

Seetha Rama Raju and V. Srinivasa Rao [41] in their project on "A novel lsb based audio steganography"stated that a novel steganography scheme for hiding data in an audio file for increasing the hiding capacity and robustness. In this technique, first the audio file is sampled and then an appropriate bit of each alternate sample is altered to embed the textual information.

Gowtham Prasad TVS and S Varadarajan [42] in their project on" A Novel Hybrid Audio Steganography for Imperceptible Data Hiding"stated that a novel method 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.

Mazhar Tayel, Ahmed Gamal[43]" A Proposed Implementation Method of an Audio Steganography Technique"In audio steganography; secret message is embedded in the digital sound by slightly altering the binary sequence of the sound file. Existing audio steganography software deal with WAV, AU, and even MP3 sound files.

The study of earlier developments has concluded that the existing techniques were capable of hiding amount of data with secure. So the purpose is to find a technique which will hide large amount of data and with more security.

III. CONCLUSION

In this research work we reviewed many papers on audio steganography techniques. This paper covers review of audio steganography and its various techniques of audio steganography used for digital data security .These papers are good enough and have wide future scope. By reviewing these papers we observed that most of the audio steganography work is done in the year 2011-16.In these years, LSB and Hybrid methods are most widely used techniques for audio steganography.Some researchers have also used the combination of cryptography and steganography, compression methods in their work for data security.These papers provide a lot of information to the initiator for starting their work in audio steganography.

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