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VARIOUS STEGANOGRAPHY TECHNIQUES FOR HIDING INFORMATION: A SURVEY

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ABSTRACT

Steganography is the technology to communicate the information secretly in an appropriate carrier i.e. text, image, audio and video files. Under this assumption, the objective is to conceal to the existence of the embedded data. Steganography helps to maintain the confidentiality and security of transmitted information in an unprotected transmission media. Cryptography and Steganography are techniques those are used to encrypt and hide the secret data inside other media to ensure data security. This paper discusses the comparison of available Steganography techniques. Steganography Technique is to hide in an image file using Least Significant Bit (LSB) based Steganography, Discrete Cosine Transform (DCT) based steganography, and Discrete Wavelet Transform (DWT) based steganography. The proposed paper provides a systematic survey of existing Steganography research by categorizing existing methods according to the certain features and analyzing the advantages of these features.

KEYWORDS
steganography, LSB, DCT, DWT.

I.   INTRODUCTION

teganography is the invisible communication of messages. This is done by hiding information in other information. The term Steganography has been derived from the Greek words "stegein" means "cover" and "grafein" means "to write". Hence, Steganography can be considered to be a procedure of covered writing [6]. Since last decade, this approach of information hiding has become popular in a number of application areas. Digital Steganography is the technology of securing information hiding it to other piece of information. Now a days it is easy to access any form of data i.e text, image, audio and video which are very weak and attacked by many threats. Therefore, there is necessary of hiding secret identification inside in different digital data. In Cryptography which secures that by encrypting the data in unreadable format but Steganography makes data invisible by embedding them in another piece of information [13]. The Secret information can be embedded in covers like text, audio, video and images which resulted as stego-text, stego-audio, stego-video and stego-image respectively. Now a days for more confidentiality both Steganography and Cryptography has been taken together [16].

TABLE 1: COMPARISON BETWEEN SECRET COMMUNICATION TECHNIQUES

TECHNIQUES	Confidentiality	Imperceptibility	Integrity	Roboustness
Cryptography	Yes	Yes	No	Yes
Steganography	Yes/No	Yes	Yes/No	Yes/No

The below Figure 1 shows the block diagram how the secret message can hide inside in another information.

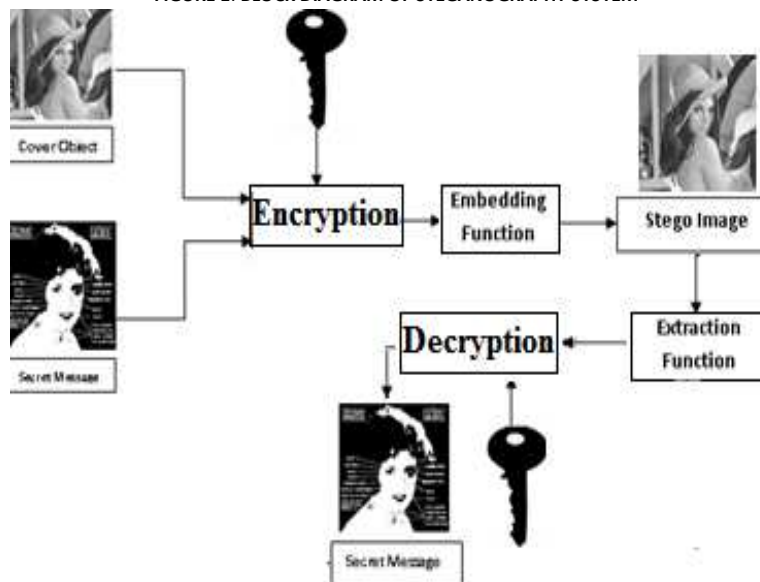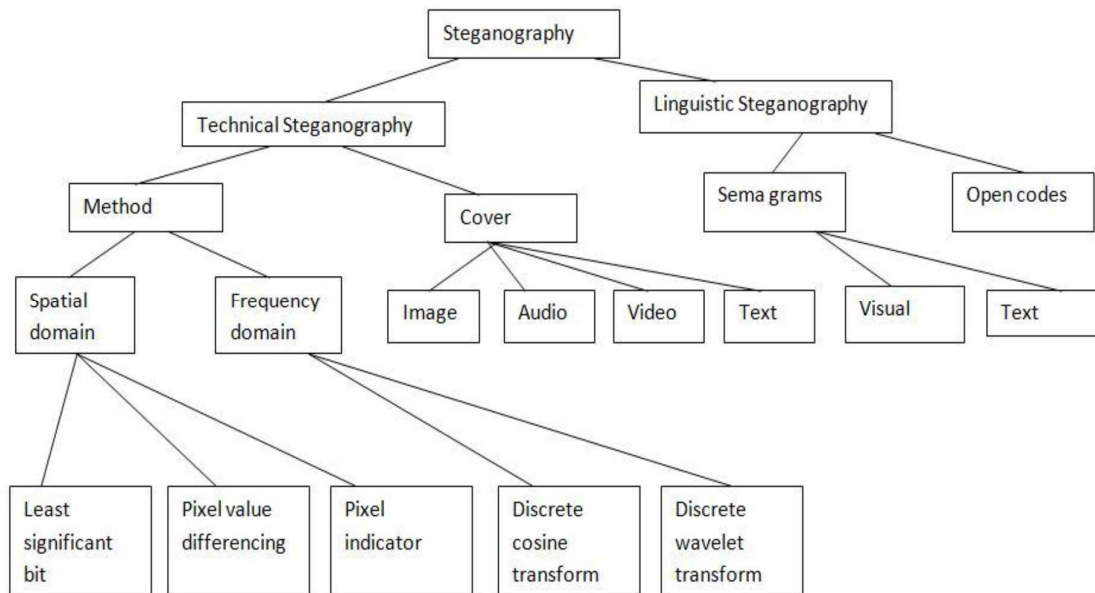**FIGURE 1**: **BLOCK DIAGRAM OF STEGANOGRAPHY SYSTEM**

FIGURE 2: TYPES OF STEGANOGRAPHY [11]

II.   TYPES OF STEGANOGRAPHY

1.   LINGUISTIC STEGANOGRAPHY

This steganography hides the information within the cover medium in some non-obvious way [15]. The technique utilizes written natural language to hide information. It is divided into two types:

1.1   Semagrams: The Semagram is the technique to hides the information by using sign or symbol. This technique uses of two types, which are as follows:

1.1.1   Visual Semagrams: This technique uses the physical objects everyday to communicate a message. e.g. the positioning of items on a particular website. In this technique painting, drawing, letters and symbols are used for hiding information.

1.1.2.   Text Semagrams: This technique is used to hides the information by modifying the cover message or by changing the font size or by adding extra space in words or by using different flourished in letters or hand written text.

1.2   Open Codes: Open code hides the information in such a way that the observer can't find the message immediately. Open code is openly readable text. This text is consisting of sequence of words, sentences that can be hidden in vertical or reverse order. The letter must be place at any position of text. This can be categorized into Jargon Codes and Covered Ciphers [14]. Jargon codes uses the languages which is understand by group of people but it is meaningless to other people. Jargon codes consist of symbols used to indicate the type and presence of wireless network signal undergoing terminology or an innocent conversation that conveys special meaning because of known facts only to the speakers [17]. Covered Ciphers uses a special technique to hide the message in an open carrier message such as embedding the message into the words of carrier message.

2.   TECHNICAL STEGANOGRAPHY

Technical Steganogrphy uses various methods or tools to hide the message.

2.1   Cover: The cover message is the carrier of message such as image, text, audio or video. The carrier message or cover is divided into number of bits and message bits are hidden in each bit of carrier message. The information is encrypted by changing the various properties of carrier message [2].

2.1.1   Text Steganography: In this technique number of tabs, white space, capital letters just like Morse codes and etc are used to achieve for hiding information [10]. In this approach the carrier message uses some random number of character sequences, changing the words in text or by changing the format of an existing text to conceal the message. Text Steganogrphy requires less memory because it can store only text files. Text steganography not commonly used as text files contains large amount of redundant data [9].

2.1.2   Audio Steganogrphy: Audio Steganography, is hiding information in audio i.e noise and in frequencies which human can't hear. There are various types of audio steganogrphy are available such as

2.1.2.1   Echo Hiding: This method embeds information into audio signals by adding a small echo to host signal. The data is unseen varying for three echo parameters i.e. initial amplitude, decay rate and offset. If only one echo is produced from the original signal, then only one-bit information could be encoded [12].

2.1.2.2   Phase Coding: In this phase components of sound are not as perceptible to the human ear as noise is. It can be done by substituting the phase of an initial audio segment with a reference phase that represents the data. It encodes the message bits as phase shifts in the phase spectrum of a digital signal, achieving an inaudible encoding in terms of signal-to-perceived noise ratio subsequent segments is then adjusted store the relative phase between segments. Disadvantage: It is a complex method and has low data transmission rate [12] [3]

2.1.2.3   Parity Coding: This technique breaks a signal down into separate regions of samples and encodes each bit from the secret message in a sample region's parity bit [8]. 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. Thus, the sender has more of a choice in encoding the secret bit, and the signal can be changed in a more unobtrusive fashion.

2.1.2.4   Spread Spectrum: In this technique the data can sent over a wide frequency range. This is the system using an implementation of the LSB coding that randomly spreads the message bits over the entire sound file. It is used to encode a category of information by spreading the encoded data across frequency spectrum. This allows the signal reception, even if there is interference on some frequencies. It can introduce noise into a sound file [12] [3].

2.1.2.5   Tone Insertion: In this inaudibility of lower power tones in the presence of significantly higher ones. Tone insertion method can resist to attacks such as low-pass filtering and bit truncation addition to low embedding capacity, embedded data could be maliciously extracted since inserted [4].

2.1.3   Video Steganography: The separation of video into audio and images or frames results in the efficient method for data hiding. The use of video files as a carrier medium for steganography is more eligible as compared to other techniques.

2.1.4   Image Steganography: This Steganography scheme is very popular in recent year than other steganography because of the plenty of electronic image information available. These image can use as a carrier message. It can involve hiding information in the naturally occurred noise within the image. Noise refers to the imperfections inherent in the process of rendering an analog picture as a digital image. In Image steganography we can hide message in pixels of an image. An image steganographic scheme is one kind of steganographic systems, where the secret message is hidden in a digital image with some hiding method [5]. The original images which carry the information are called cover image in steganography, and the message-embedded

image in cover image is called a stego image. Various methods of image steganography are done using spatial domain and frequency domain which are as follows

2.1.4.1   Spatial Domain: This method embeds the information in the intensity of the original image pixels directly. Basically the LSB method is used for spatial domain. In LSB method the cover or carrier message decomposed into number of bit planes and then LSB bit planes are replaced by secret information This substitution method includes embedding at the minimum weighting bit as it will not affect the pixel of original information or cover message. The only disadvantage of the LSB scheme is the third party can extract the secret message immediately**.**

2.1.4.2   Frequency Domain: Frequency domain is also known as transform domain where images are transformed and then the message is embedded in the image. In this domain the secret message is hidden in specific area of covered message which makes data impossible to attack such as compression, cropping, or image compression methods than LSB approach. There are different formats available in frequency domain. The DCT technique plays a vital role in JPEG compression technique. DCT allows an image to be broken up into three frequency bands namely the Low-frequency band (FL), High frequency band (FH) and mid-frequency band (FM). In this approach the secret data is embedded into the DCT blocks containing mid frequency (FM) sub band components whereas high frequency sub band component remains unused. It improves the capacity and quality of stego-images. The DWT technique is multi resolution decomposition process in terms of expansion of an image into a set of wavelet basis function. By applying DWT on cover image it generates four sub bands LL, LH, HL and HH and modifying the coefficients stego-image is generated [1]. The Haar wavelet is also possible wavelet transform technique [7].

III.   CONCLUSION

Information security has become one of the most significant problems during the communication of internet users. Unauthorized access to secret data can have serious loss of internet users. Steganography is one of solution to hide the secret in unsecure communication channel. This paper contains different steganographic system to hide the information. Each of these techniques tries to satisfy the factors of Steganography i.e. imperceptibility, Capacity and Roboustness. We have taken various types of steganography techniques from different sources. We mentioned the various techniques, Least Significant Bit (LSB), DCT (Direct Cosine Transform), DWT (Discrete Wavelet Transform) in this paper which helps to improve in security.

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