A

Seminar report

on

"Steganography"

Submitted in partial fulfillment of the requirement for the award of degree
of Bachelor of Technology in Computer Science

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Preface

I have made this report file on the topic **Steganography** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to …………..who assisting me throughout the prepration of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

WHAT IS STEGANOGRAPHY?

The word ***steganography*** literally means ***covered writing*** as derived from Greek. Steganography is the art of concealing the existence of information within seemingly innocuous carriers. In broad sense, term Steganography is used for hiding message within an image.

The art and science of hiding information by embedding messages within other, seemingly harmless messages. Steganography works by replacing bits of useless or unused in regular computer (such as graphics, sound, text, or even floppy disks) with bits of different, invisible information. This hidden information can be plain text, cipher text or even images

Steganography (literally meaning *covered writing*) dates back to ancient Greece, where common practices consisted of etching messages in wooden tablets and covering them with wax, and tattooing a shaved messenger's head, letting his hair grow back, then shaving it again when he arrived at his contact point.

Steganography is the art and science of communicating in a way which hides the existence of the communication. In contrast to cryptography, where the "enemy" is allowed to detect, intercept and modify messages without being able to violate certain security premises guaranteed by a cryptosystem, the goal of steganography is to hide messages inside other "harmless" messages in a way that does not allow any "enemy" to even detect that there is a second secret message present. Steganography is in the (especially military) literature also referred to as transmission security or short TRANSEC.

This basic design principle of steganographic systems, i.e. replacing high entropy noise with a high entropy secret transmission, is quite obvious. There have a number of simple software tools been published for e.g. hiding files in the least significant bits of digital images or for transforming PGP messages into files resembling pure random byte sequences.

STEGANOGRAPHY Vs CRYPTOGRAPHY

Steganography can be viewed as akin to cryptography. Both have been used throughout recorded history as means to protect information. At times these two technologies seem to converge while the objectives of the two differ. Cryptographic techniques "scramble" messages so if intercepted, the messages cannot be understood. Steganography, an essence, "camouflages" a message to hide its existence and make it seem "invisible" thus concealing the fact that a message is being sent altogether. An encrypted message may draw suspicion while an invisible message will not.

In an ideal world we would all be able to openly send encrypted email or files to each other with no fear of reprisals. However there are often cases when this is not possible, either because you are working for a company that does not allow encrypted email or perhaps the local government does not approve of encrypted communication (a reality in some parts of the world). This is where steganography can come into play.

A good steganography system should fulfill the same requirements posed by the "Kerckhoff principle" in cryptography. This means that the security of the system has to be based on the assumption that the "enemy" has full knowledge of the design and implementation details of the steganographic system. The only missing information for the "enemy" is a short easily exchangeable random number sequence, the secret key, and without the secret key, the "enemy" should not have the slightest chance of even becoming suspicious that on an observed communication channel hidden communication might take place.

Steganography cannot be detected. Therefore, it is used when encryption is not permitted. Or, more commonly, steganography is used to supplement encryption. An encrypted file may still hide information using steganography, so even if the encrypted file is deciphered, the hidden message is not seen.

EVOLUTION OF STEGANOGRAPHY

CODE BREAKERS : David Kahn's The Code breakers and Bruce Norman's Secret Warfare: The Battle of Codes and Ciphers recounts numerous tales of steganography .

INVISIBLE INK : An innocent letter may contain a very different message written between the lines with invisible ink.

Common sources for invisible inks are milk, vinegar, fruit juices and urine. All of these darken when heated. Later on, more sophisticated inks were developed which react to various chemicals.

MICRODOTS: The Germans developed microdot technology. Microdots are photographs the size of a printed period having the clarity of standard-sized typewritten pages. The first microdots were discovered masquerading as a period on a typed envelope carried by a German agent in 1941.

The message was not hidden, nor encrypted. It was just so small as to not draw attention to itself (for a while). Besides being so small, microdots permitted the transmission of large amounts of data including drawings and photographs.

TYPES OF STEGANOGRAPHY

□**MESSAGES IN TEXT program is called SPAM MIMIC.** Secret messages can be hidden in text format by reframing the text of the carrier file, while maintaining the context. On e form of steganography is a program called Spam Mimic.

Based on a set of rules called a mimic engine by Peter Wayner, it encodes your message into what looks like your typical, quickly deleted Spam message. However, hiding a message in plain text is a thing of past, as people are suspicious of irrelevant text.

□**MESSAGES IN STILL IMAGES** most popular tool is outguess.

□**MESSAGES IN AUDIO** data is hidden in layer III of encoding process of MP3 file. Messages in audio are always sent along with ambient noise. The data is hidden in the heart of the layer III encoding process of MP3 file, namely the inner loop during compression. The inner loop limits the input data and increases the step size until the data can be coded with the available number of bits. The data is compressed, encrypted and then hidden in MP3 bit stream.

□**MESSAGES IN VIDEO** embedding information into multimedia data has gained increasing attention lately. The method of encryption is the same as in audio steganography. Video files are generally very good carrier files since they have a lot of irrelevant bits.

AN EXAMPLE

Fishing freshwater bends and saltwater coasts rewards anyone feeling stressed. Resourceful anglers usually find masterful leapers fun and admit swordfish rank overwhelming anyday.

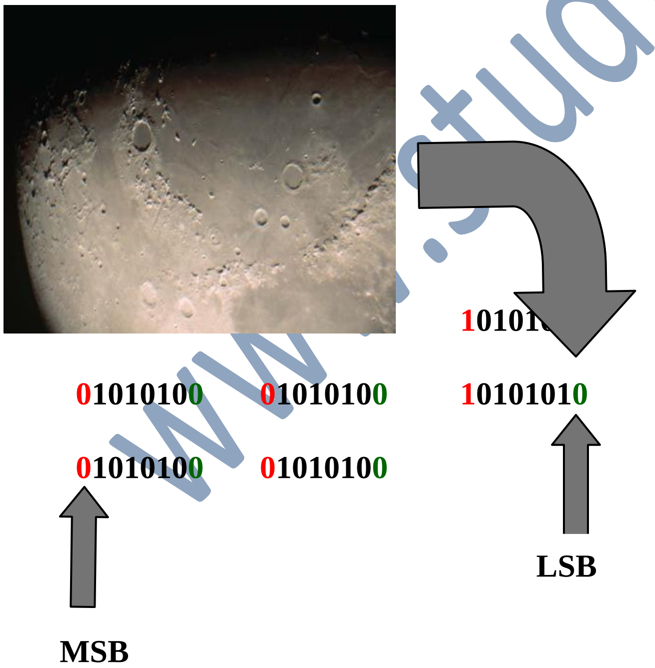
“Send lawyers guns and money”

Steganography is closely related to the problem of "hidden channels" in secure operating system design, a term which refers to all communication paths that can not easily be restricted by access control mechanisms (e.g. two processes that communicate by modulating and measuring the CPU load). Steganography is also closely related to spread spectrum radio transmission, a technique that allows to receive radio signals that are over 100 times weaker than the atmospheric background noise, as well as TEMPEST, techniques which analyze RF transmissions of computer and communication equipment in order to get access to secret information handled by these systems.

Most communication channels like telephone lines and radio broadcasts transmit signals which are always accompanied by some kind of noise. This noise can be replaced by a secret signal that has been transformed into a form that is indistinguishable from noise without knowledge of a secret key and this way, the secret signal can be transmitted undetectable.

DISSECTING STEGANOGRAPHY

Steganography is a term used for hiding messages within an image. Any color pixel is made of a combination of red –green-blue mode(RGB) wherein each RGB component consist of 8 bits. If letters in ASCII are to be represented within the color pixels, the rightmost digit, called the least significant bit (LSB), can be altered. Any variation in the value of this bit leads to **very** minimal variation in color. If we have to hide the word 'digit' in the image, we take the LSB of every color and hide each bit of the word in its RGB combination. To insert the letter 'D' we modify three color pixels with three bits in each color pixel, we utilize 14 color pixels to hide the entire word with only 1 bit in the 14th pixel.



ASCII CHARACTER CODE

D-01000100
I-01101001
G-01100111
I-01101001
T-01110100

AMOUNT OF DATA STORED INSIDE A PICTURE

Suppose we have a 24-bit image 1024 x 768 (this is a common resolution for satellite images, electronic astral photographs and other high resolution graphics). This may produce a file over 2 megabytes in size (1024x768x24/8 = 2,359,296 bits). All color variations are derived from three primary colors, Red, Green and Blue.

Each primary color is represented by 1 byte (8 bits). 24-bit images use 3 bytes per pixel. If information is stored in the least significant bit (LSB) of each byte, 3 bits can be a stored in each pixel. The "container" image will look identical to the human eye, even if viewing the picture side by side with the original.

STEPS FOR HIDING AN IMAGE USING STEGANOGRAPHY

1.start s-tool and window explorer using the later as drag and drop interface for the software.

2.drag and drop the image to be used as the carrier file from the explorer onto the actions window in s-tool.

3.drag and drop the data file on the carrier file.

4.give pass phrase and encryption algorithm when prompted. Pass these to receiver too.

5.the hidden file is ready. Receiver has to click on the “reveal” button to extract the data.

Steganography simply takes one piece of information and hides it within another. Computer files (images, sounds recordings, even disks) contain unused or insignificant areas of data. Steganography takes advantage of these areas, replacing them with information (encrypted mail, for instance).

The files can then be exchanged without anyone knowing what really lies inside of them. An image of the space shuttle landing might contain a private letter to a friend. A recording of a short sentence might contain your company's plans for a secret new product. Steganography can also be used to place a hidden "trademark" in images, music, and software, a technique referred to as watermarking

DIGITAL WATERMARKING

Usually carrier file carry hidden data unrelated to the content in which it is embedded, but digital watermarking holds information about its carrier medium. Information such as a number or a text into a multimedia file can be added to carrier file through slight data modification. this process has gained huge acclaim from the media for enabling copyright for their products. Video steganography is more suited to avoiding piracy and is mostly used for digital watermarking.

Types of digital watermarking

ROBUST DIGITAL WATERMARKING :- A robust watermark is embedded in the file in such a way that even if the file is later transformed, the watermark will not be removed. A robust digital watermark is concealed message that identifies the source of data. It is called robust because it is designed to survive modifications of the data that result from resizing, cropping or photographing the image to capture only the part of the image that doesn't have the watermark or even from re-sampling or making an analog recording of an audio stream. Its application includes copyright protection, labeling, monitoring, tamper proofing and conditional access.

FRAGILE DIGITAL WATERMARKING is similar to fragile analog watermarks-if the data is altered or copied in exactly, the watermark is corrupted. If changes are made to the file containing a fragile watermark, the originator of the watermark will be able to detect and identify the areas where the alterations have been made and maybe even determine what the data was before modification. This scheme serves at proving the authenticity of the data.

For ensuring the integrity of data, digital signatures are preferred but fragile digital watermarking can detect data tempering without alerting the culprit. Compatible players refuse to play content that does not bear a valid watermark.

WHAT IS "STEGANALYSIS"?

The art of detecting, decoding and altering messages hidden via steganography is called steganalysis. It is easiest when before as well as after steganography copies of file are present. Steganalysis can make the hidden data work against the creator. Any malicious interceptor could alter as carrier file without the knowledge of sender or the intended receiver. Hence inaccurate or wrong data could be passed under identity of the original sender.

SOME OUTSTANDING FACTS

1. steganos security suite 4 uses powerful 128-bit encryption. It would take 1 billion powerful computers million of years to try every combination to gain access to your personal information. this software uses steganography along with encryption to completely secure your data.

2. Blindside is an application of steganography that allows you to conceal a single file or set of files within a standard computer image. The new image looks identical to the original, but can contain up to 50k of data. The hidden files can also be password encrypted to prevent unauthorized access.
3. Mp3stego hides information in mp3 files during the compression process. The data is first compressed, encrypted and then hidden in the mp3 bit stream. Although mp3stego was written with steganographic applications in mind, it can also be used as a copyright marking system for mp3 files.

□***RECENTLY, NEWS CONFIRMED THAT MASTERMIND OSAMA BIN LADEN WAS USING STEGANOGRAPHIC TECHNIQUES FOR ORDERING HIS FOLLOWERS.***

However really good steganography is much more difficult and usage of most of the currently available steganographic tools might be quite easily detected using sufficiently careful analysis of the transmitted data. The noise on analog systems has a large number of properties very characteristic to the channel and the equipment used in the communication system. A good steganographic system has to observe the channel, has to build a model of the type of noise which is present and has then to adapt the parameters of its own encoding algorithms so that the noise replacement fits the model parameters of the noise on the channel as well as possible. Whether the steganographic system is really secure depends on whether the "enemy" has a more sophisticated model of the noise on the channel than the one used in the steganographic system.

Common communication systems have a huge number of characteristics and only a small fraction of what looks like noise can actually be replaced by the statistically very clean noise of a cryptographic cipher text. Noise in communication systems is often created by modulation, quantization and signal cross-over and is heavily influenced by these mechanisms and in addition by all kinds of filters, echo cancellation units, data format converters, etc. Many steganographic systems have to work in noisy environments and consequently require synchronization and forward error correction mechanisms that also have to be undetectable as long as the secret key is unknown.

It is my impression that the field of steganography has not yet been examined in detail by the scientific community outside the military world. Many of the above mentioned problems in the design of high quality steganographic systems have not been addressed in the literature and only very few attempts of practical solutions have been published and analyzed so far.

In order to encourage discussion and cooperation in the field of steganography, the STEGANO-L mailing list has been established. We want to invite people with a good background in modern communication systems, cryptography, digital signal processing, information theory, mathematics, etc. to publish tools for steganographic systems, to attack these and discuss weaknesses and possible improvements and to collect statistic and signal processing software tools as well as sample data that can be used for quality control of steganographic systems.

ADVANTAGES OF STEGANOGRAPHY

- It can be used for safeguarding data, such as in the field of media where copywriting ensures authenticity.
- It can be used by intelligence agencies for sending their secret data.

DISADVANTAGE OF STEGANOGRAPHY

Many a terrorist and anti humanist activities have been carried out cloaked under this technique.

A PICTURE SPEAKS A THOUSAND WORDS

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