

Introduction

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1. Problem

My friend Bob,
until yesterday I was using binoculars for stargazing.
Today, I decided to try my new telescope. The
galaxies in Leo and Ursa Major were unbelievable!
Next, I plan to check out some nebulas and then
prepare to take a few snapshots of the new comet.
Although I am satisfied with the telescope, I think I
need to purchase light pollution filters to block the
xenon lights from a nearby highway to improve the
quality of my pictures.

Cheers,

Alice.

1. Problem

- Message
- Cover object
- Crypto systems
- Steganographic key (stego key)

1. Problem

- Steganography can be informally defined as the practice of undetectably communicating a message in a cover object.

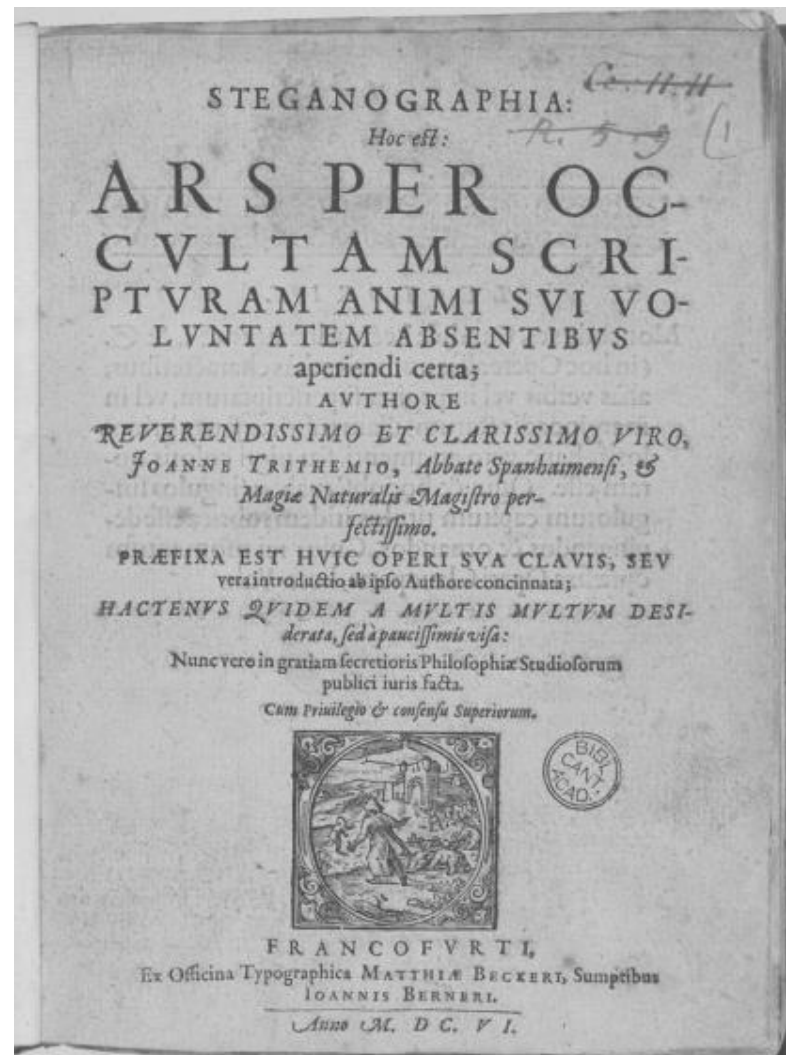
2. Steganography throughout history

- The word steganography is a composite of the Greek words steganos, which means “covered,” and graphia, which means “writing”.

2. Steganography throughout history

- In other words, steganography is the art of concealed communication where the very existence of a message is secret.

2. Steganography throughout history



2. Steganography throughout history

- Hiding messages in text is called linguistic steganography or acrostics. Acrostics was a very popular ancient steganographic method.
- To embed a unique “signature” in their work, some poets encoded secret messages as initial letters of sentences or successive tercets in a poem.

2. Steganography throughout history



2. Steganography throughout history

- Francis Bacon described a precursor of modern steganographic schemes. Bacon realized that by using italic or normal fonts, one could encode binary representation of letters in his works.

2. Steganography throughout history

- A modern version of this steganographic principle was described by Brassil. He described a method for data hiding in text documents by slightly shifting the lines of text up or down by $1/300$ of an inch.

2. Steganography throughout history

- In 1857, Brewster proposed a very ingenious technique that was actually used in several wars in the nineteenth and twentieth centuries. The idea is to shrink the message so much that it starts resembling specks of dirt but can still be read under high magnification.

2. Steganography throughout history

- Perhaps the best-known form of steganography is writing with invisible ink. The first invisible inks were organic liquids, such as milk, urine, vinegar, diluted honey, or sugar solution.

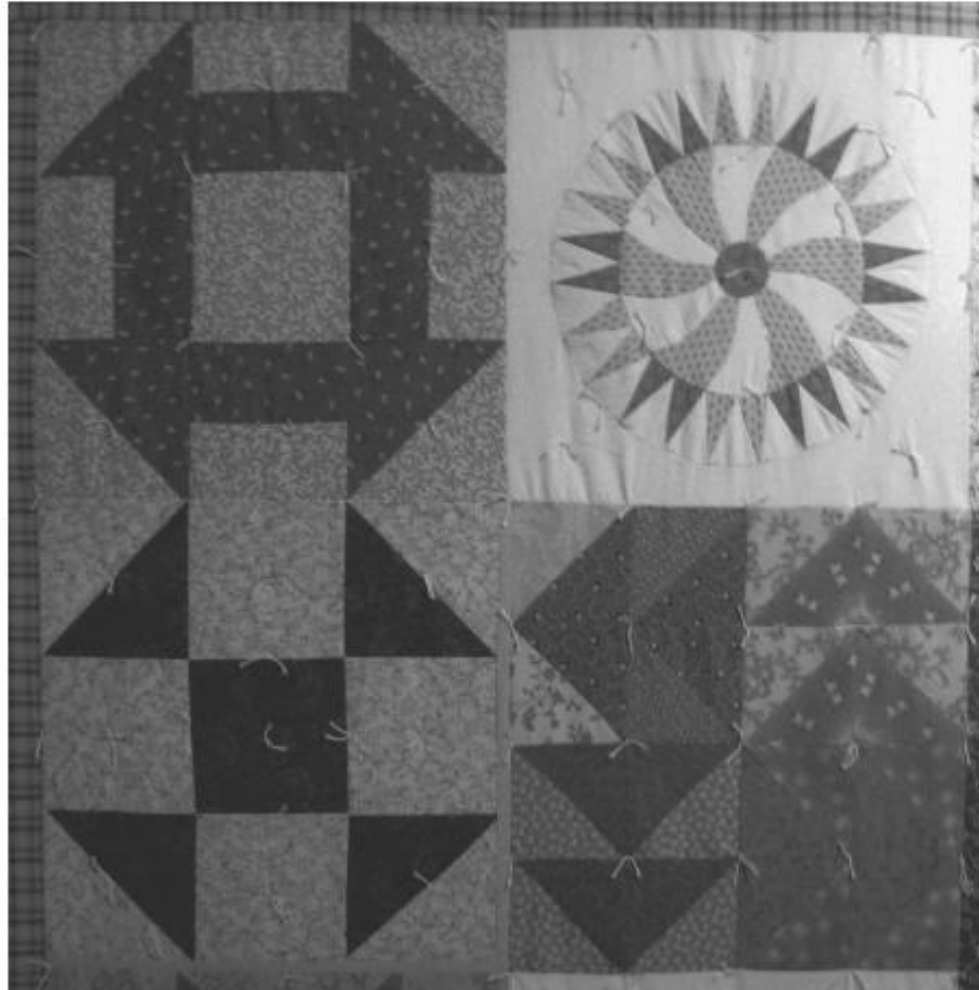
2. Steganography throughout history

- In 1966, an inventive and impromptu steganographic method enabled a prisoner of war, Commander Jeremiah Denton, to secretly communicate one word when he was forced by his Vietnamese captors to give an interview on TV. Knowing that he could not say anything critical of his captors, as he spoke, he blinked his eyes in Morse code.

2. Steganography throughout history

- Steganography became the subject of a dispute during the match between Viktor Korchnoi and Anatoly Karpov for the World Championship in chess in 1978 [117]. During one of the games, Karpov's assistants handed him a tray with yogurt.

2. Steganography throughout history



2. Steganography throughout history

- The recent explosion of interest in steganography is due to a rather sudden and widespread use of digital media as well as the rapid expansion of the Internet.

3. Modern Steganography



3. Modern Steganography

- Steganography offers a feasible alternative to encryption in oppressive regimes where using cryptography might attract unwanted attention or in countries where the use of cryptography is legally prohibited.

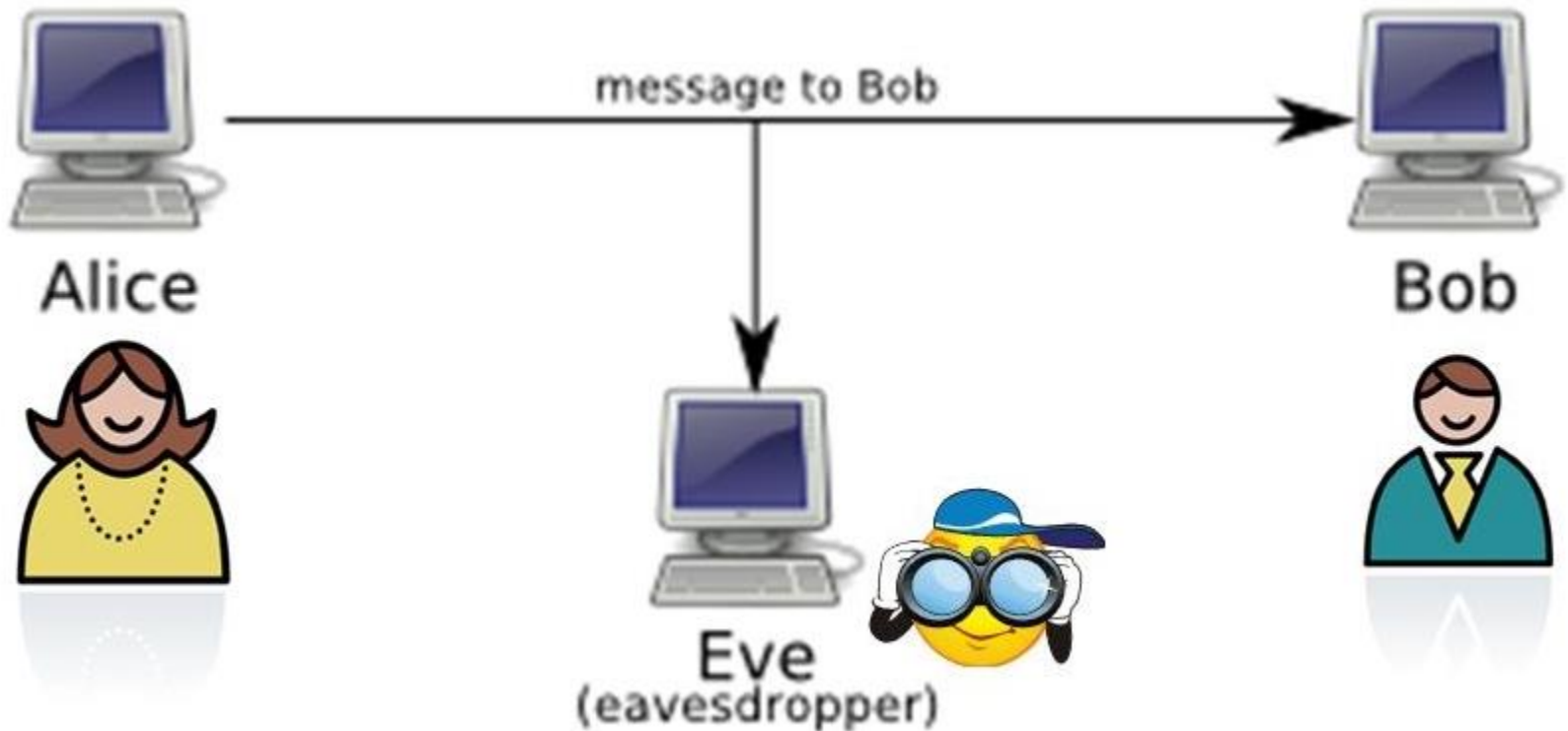
3. Modern Steganography

- Steganography offers a feasible alternative to encryption in oppressive regimes where using cryptography might attract unwanted attention or in countries where the use of cryptography is legally prohibited.

3. Modern Steganography

- The most important property of a steganographic system is undetectability, which means that it should be impossible for an eavesdropper to tell whether Alice and Bob are engaging in regular communication or are using steganography. Simmons provided a popular formulation of the steganography problem through his famous prisoners' problem.

3. Modern Steganography



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3. Modern Steganography

- Steganography is a privacy tool and as such it naturally provokes the human mind to attack it.
- The effort concerned with developing methods for detecting the presence of secret messages and eventually extracting them is called steganalysis.

3. Modern Steganography

- The defining property of steganography is the requirement that Eve should not be able to decide whether or not a given object conveys a secret message. Formalizing this requirement mathematically, however, is far from easy.

3. Modern Steganography

- Even though watermarking and steganography share some fundamental similarities in that they both secretly hide information, they address very different applications.

3. Modern Steganography

- In steganography, the cover image is a mere decoy and has no relationship to the secret message.
- In contrast, a watermark usually carries supplemental information about the cover image or some other data related to the cover, such as labels identifying the sender or the receiver.

3. Modern Steganography

- The second and perhaps even more important difference between steganography and watermarking is the issue of the existence of a secret message in an image.

3. Modern Steganography

- Additionally, steganography is a mode of communication and as such needs to allow sending large amounts of data. On the contrary, even a very short digital watermark can be quite useful.