

ENSE 496AE

Video and Article Summary of Steganography

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Introduction To Steganography

- Steganography is the art of covered or hidden writing
- The purpose of steganography is covert communication to hide a message from a third party
- Steganography involves hiding information so it appears that information is not hidden at all
- Steganography in the modern sense means to conceal information or file in another form of media like a picture, video, audio file, or text file
- The form of media that the information or file is concealed in is known as cover media
- Steganography tries to exploit human perception

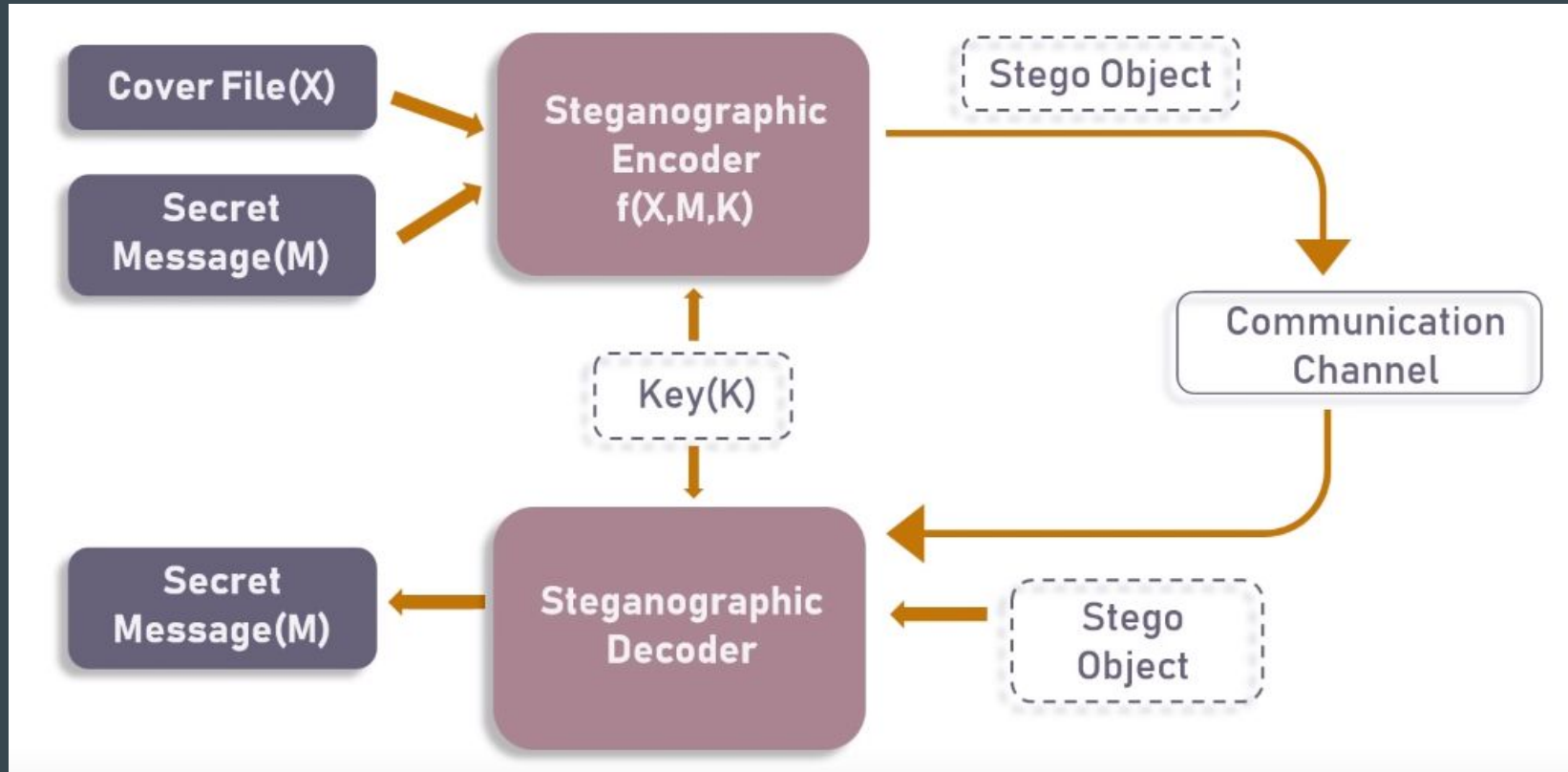
A Brief History of Steganography

- Steganography comes from the greek words Steganos meaning Covered and Graptos/Graphen meaning writing
- The concept of steganography can be traced back to 440 BC,
- Although the term steganography has only been used since the end of the 15 century
- Secret message written on a tablet which is covered with wax were exchanged

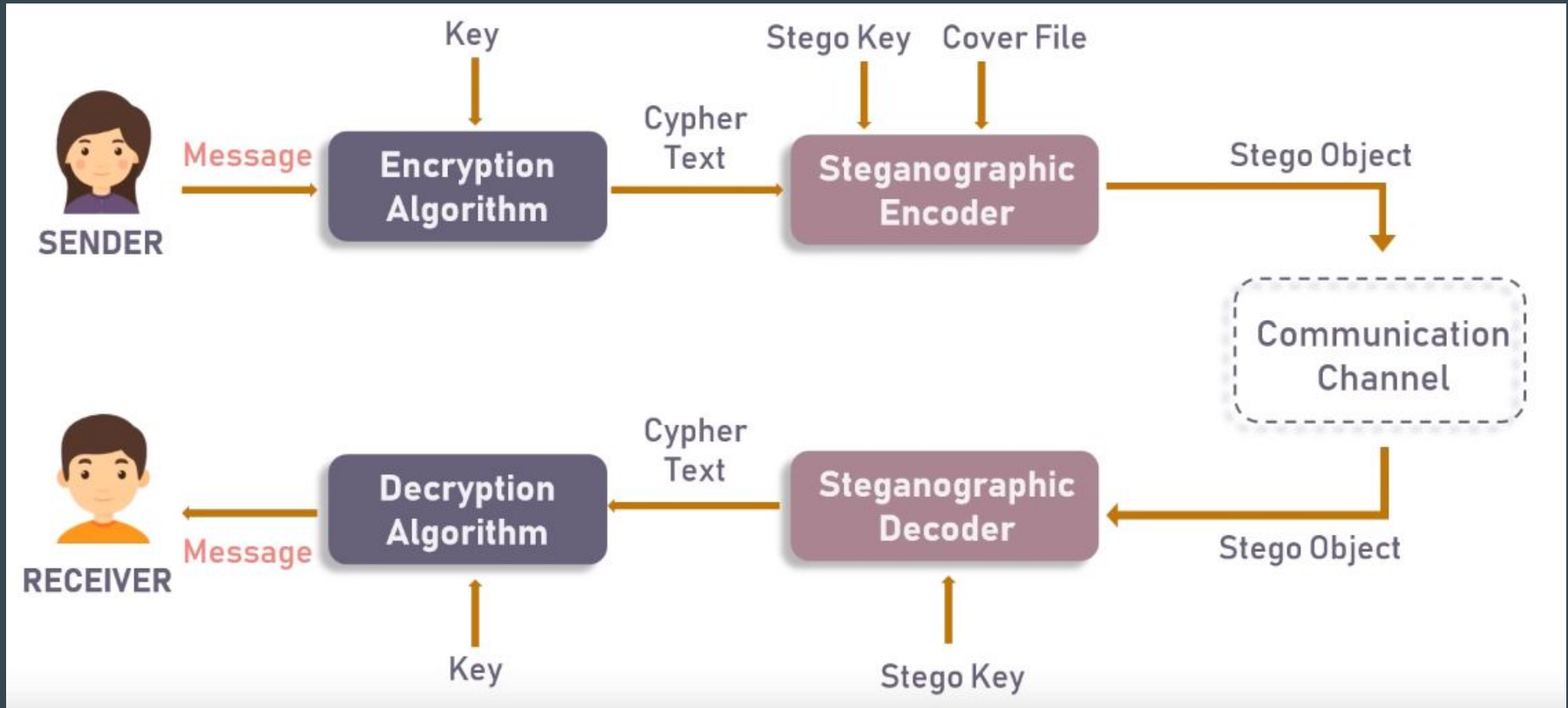


**What is the difference between
Cryptography and Steganography?
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Basic Steganographic Model



Steganographic Model with Encryption



Different Forms of Steganography

With Modern Steganography, text, images, audio and video can be hidden within other multimedia objects in the forms of:

- Text Steganography
- Image Steganography
- Audio Steganography
- Video Steganography
- Protocol Steganography

Text Steganography

- Changing the layout of text
- Using every n th character
- Altering the amount of white space after lines or between lines

Image Steganography



Fig. 1: The cover image

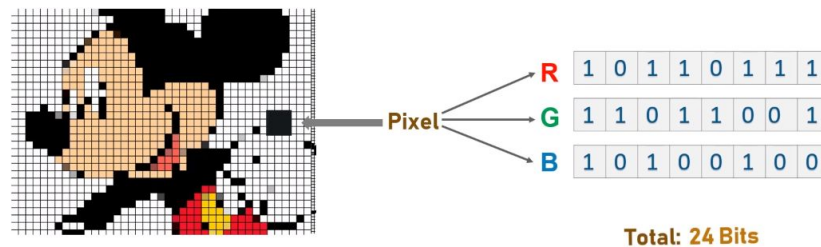


Fig. 2: The stego-image (after A is inserted)

The message is embedded in the noisy areas of the image to make it undetectable.

Types include:

- Least significant bit insertion (LSD)
- Masking and filtering
- Redundant pattern encoding
- Encrypt and scatter



Least Significant Bit Steganography(LSBS) involves overwriting the bit with the lowest arithmetic value

Secret message to hidden:
Letter 'A'

1 0 0 0 0 0 1

Pixels before insertion(3 pixels)

10000000 10100100 10110101
10110101 11110011 10110111
11100111 10110011 00110011

Pixels after insertion

10000001 10100100 10110100
10110100 11110010 10110110
11100110 10110011 00110011

Audio Steganography

The message is embedded by altering the binary sequence of a sound file.

Types include:

- LSB coding
- Parity coding
- Phase coding
- Spread spectrum
- Echo hiding

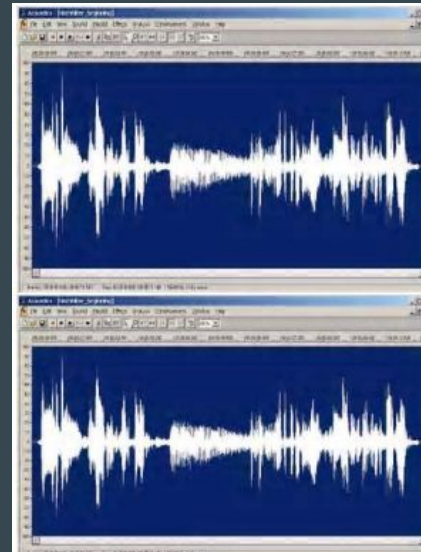


Fig. 3: The signal level comparisons between a WAV carrier file before (above) and after (below) the LSB coding is done

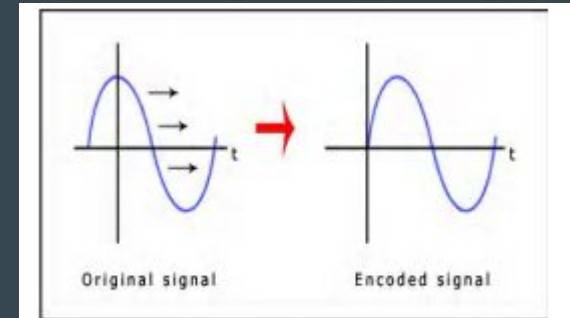


Fig. 4: The signals before and after Phase coding procedure

Video Steganography

As video is a collection of image and audio files, the same techniques apply as with the image and audio formats

Huge amounts of data can be hidden in a video file

It becomes hard to notice any distortions as it is streaming continuously

Protocol Steganography

Protocol steganography is the technique of embedding information within messages and network control protocols used in network transmission

There are covert channels within the OSI network model where Steganography can be used

For example, information can be hidden in the header of a TCP/IP packet in some fields that are either optional or never used

Detection Techniques for Text Steganography

- Most techniques involve an alteration to cover source
- Modifications can be detected by:
 - Looking for odd or disturbing patterns
 - Odd use of language
 - Unusual amounts of whitespace
 - etc.

Detection Techniques for Image Steganography

- Stegno images can rarely be spotted by the naked eye
- Analysis tools may be able to detect discrepancies
- Statistical analysis
- Done to LSB to detect random vs real values

Detection Techniques for Audio and Video Steganography

- Statistical analysis can be used for audio too
- Odd distortions or patterns might point out a secret message
- Differences in pitch echo or background noise
- Hand signs or gestures hard to detect by computers

Steganography Tools

| Tool | Description |
|--------------------|--|
| Stegosuite | Hide text inside any image |
| Stegohide | Hide secret file in image or audio file. |
| Xiao Steganography | Free software that can be used to hide secret files in BMP images or in WAV files. |
| SSuite Picsel | Portable application to hide text inside image file |
| OpenPuff | Tool to conceal files in image, audio & flash files |
| Camouflage | Tool that lets you hide any type of file inside of file. |

Applications

The modern Steganographic applications include:

- Hiding a formula or a plan for new inventions by a business
- Sharing information by terrorists to coordinate attacks
- Usage in commercial sector to hide private information

Questions?