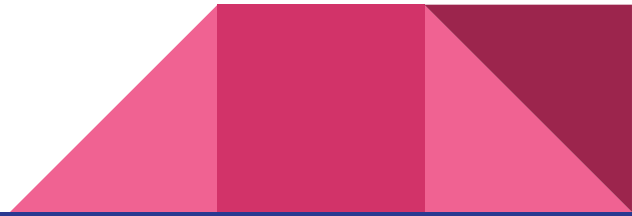
Information Hiding

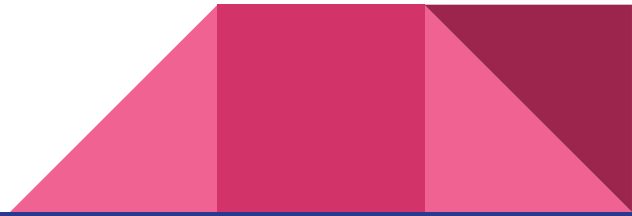
Review bitwise

- 10000100 | 10000010
- 10001111 ^ 11110000
- 10001000 & 11111000
- 11110000 >> 4
- 00011100 << 3
- 00011111 >> 4 << 3



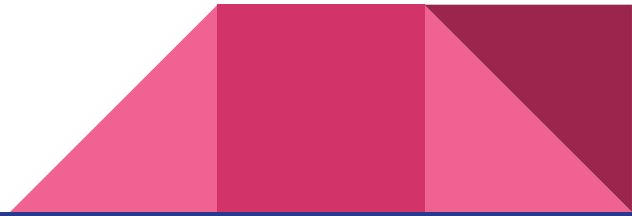
Review bitwise

- 10000100 | 10000010 = 10000110
- 10001111 ^ 11110000 = 01111111
- 10001000 & 11111000 = 10001000
- 11110000 >> 4 = 00001111
- 00011100 << 3 = 11100000
- 00011111 >> 4 << 3 = 00001000



Information hiding

- Concealing the very **existence** of some kind of **information** for some specific **purposes**

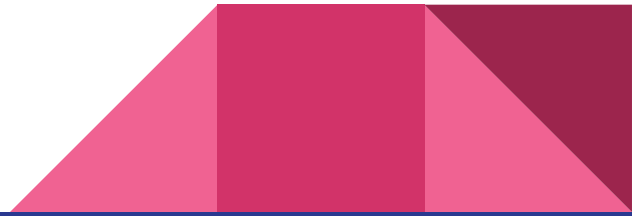


Steganography

https://www.youtube.com/watch?v=WTA7KR9-9lM

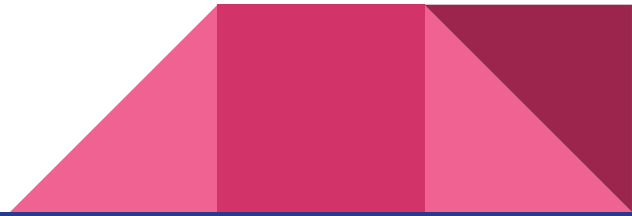
Steganography

- Embedding some **valuable** information within a digital media so that the digital media looks unchanged to human / machine.

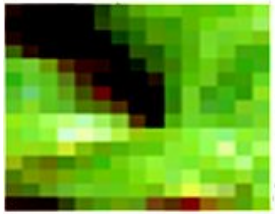


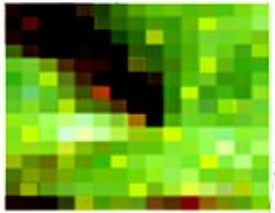
How can we do this?

- There are **unused/redundant** data bits in digital media, changing them would be im**perceptible**
- We are going to hide information in these **unused/redundant** data.

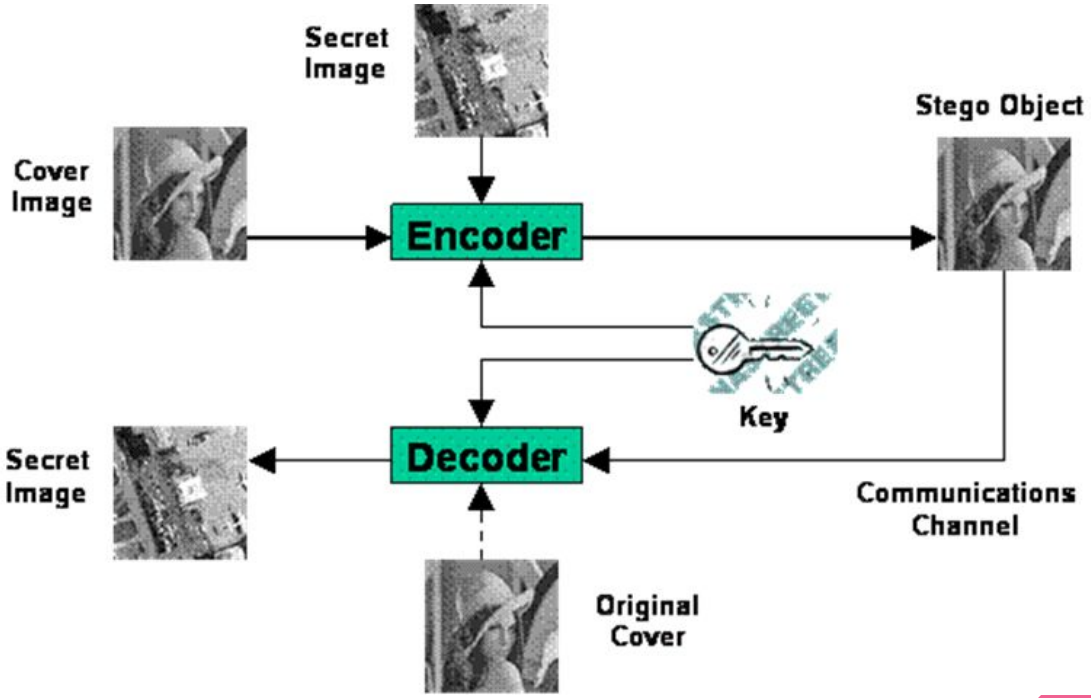


Example:

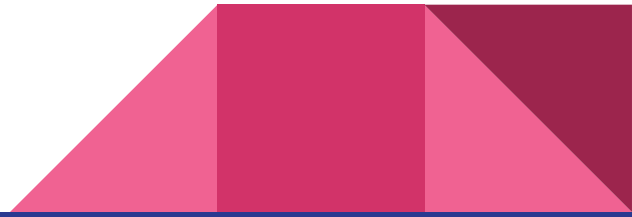




General Model

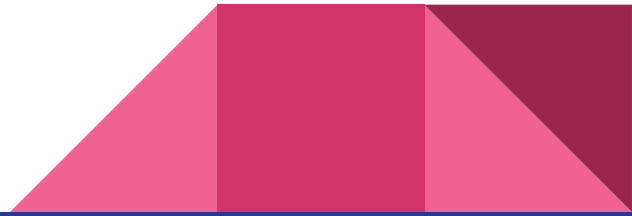


Similar to Encryption except?



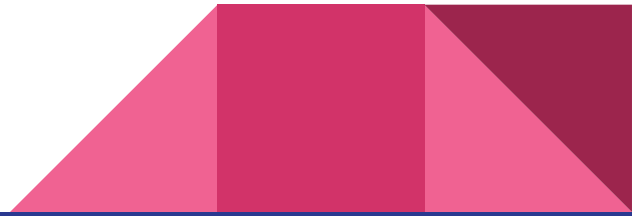
Kerckhoffs’s principle

- The information should be safe even if the method is known by the adversary.
  - Encryption
- In steganography, the method relies on not letting the adversary to know about the method or the information.

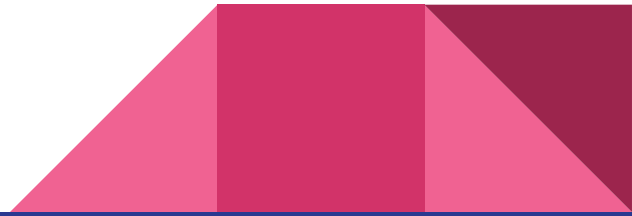


Watermarking

- Embedding some information within a **valuable** digital media so that the digital media looks unchanged to human / machine.



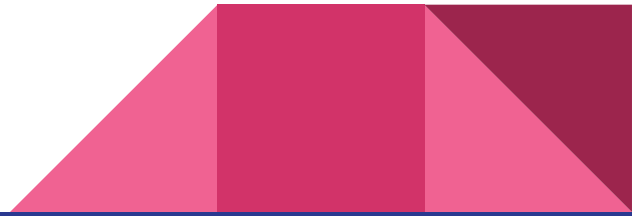
Steganography vs Watermarking



Steganography vs Watermarking

Steganography: The covertext is not important, what is important is the stegotext.The stegotext is independent of covertext.

Watermarking: The hidden information is not so important by itself, but it does say something about the covertext.



Application: Steganography vs Watermarking

Steganography:

-

Watermarking:

-
-
-

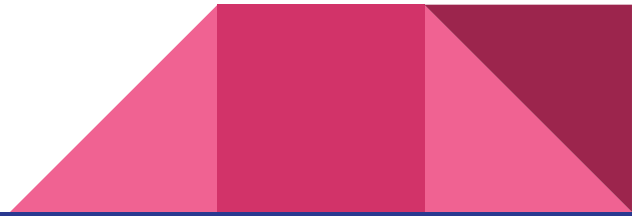
Application: Steganography vs Watermarking

Steganography:

- Stealth communication

Watermarking:

- Authentication
- Tampering Detection
- Piracy Prevention

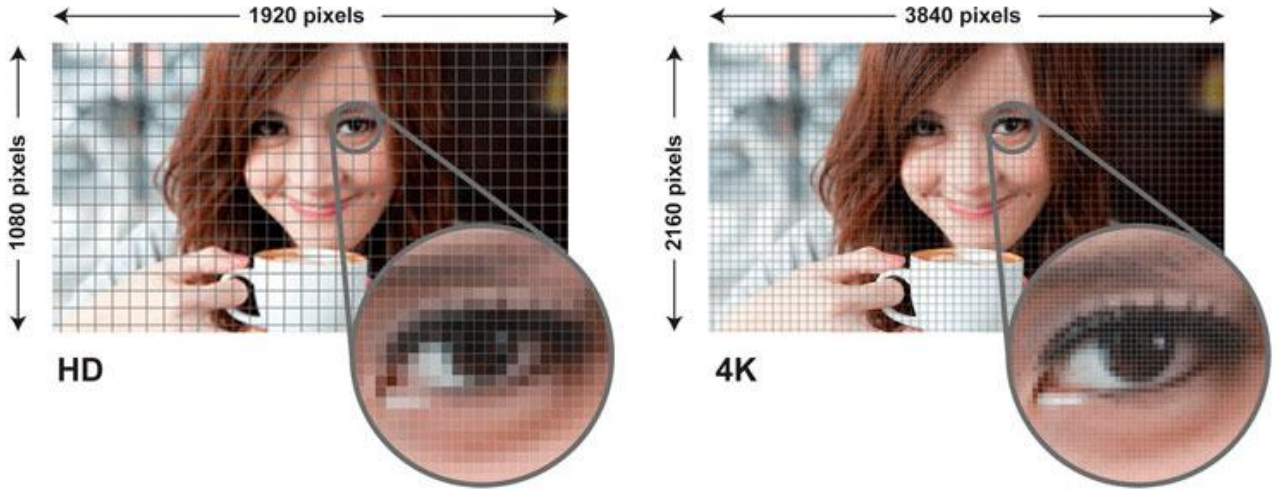


Steganography project

- Hiding pictures using the LSB method
- Find two image and name them (Or more if you want)
  - im1.jpg
  - im2.jpg
- Make sure they are jpg format.
- Make sure they are **Same size**. (ie. both are 800X600)

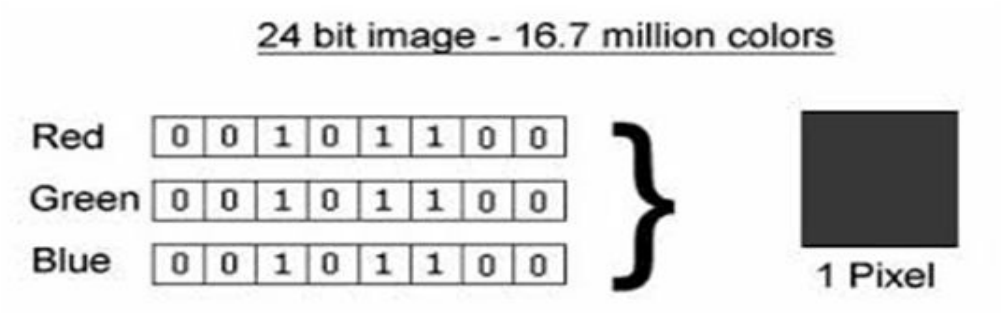
A digital image

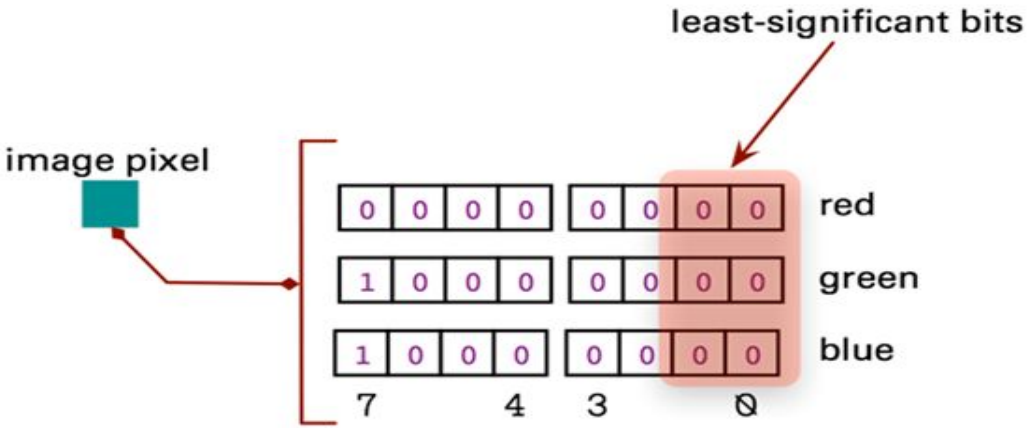
- A digital image contains millions of pixels



Pixels

-


24 bit image - 16.7 million colors
Red
Green
Blue
0 0 1 0 1 1 0 0
1 Pixel


least-significant bits
image pixel
red
green
blue
7
4
3
0

The hiding process

- Bits used=4
- Cover pixel: 10110001
- Secret pixel: 01100110
- New pixel: 10110110

Original Images

Bits Used: 1

Bits Used: 4

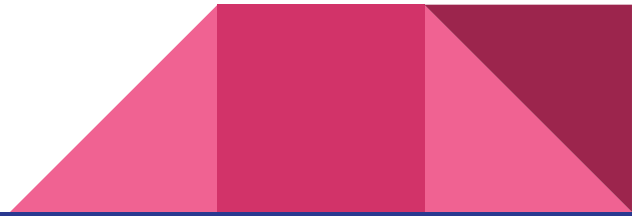
Bits Used: 7

Follow up

- Try different bits

Weakness:

- Not robust to resizing.
  - The secret message is ruined if you resize it.
- Security through obscurity, not safe if adversary knows the method



Steganography

- You can use it with encryption.
  - Hiding the encrypted message in the secret image