

# IMAGE WATERMARKING

The background of the slide is a dark blue-grey color. It features a large, semi-transparent fingerprint in the center-right. Overlaid on the fingerprint and the background are various digital and network-related graphics, including binary code (0s and 1s) in a light blue color, and a network diagram with nodes and connecting lines. The overall aesthetic is high-tech and digital.

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# Methods

- Spatial Domain
  - Additive Watermarking
  - LSB Watermarking
- Frequency Domain
  - DCT Watermarking
  - DWT Watermarking
- Visual Watermarking



# Spatial Domain Watermarking

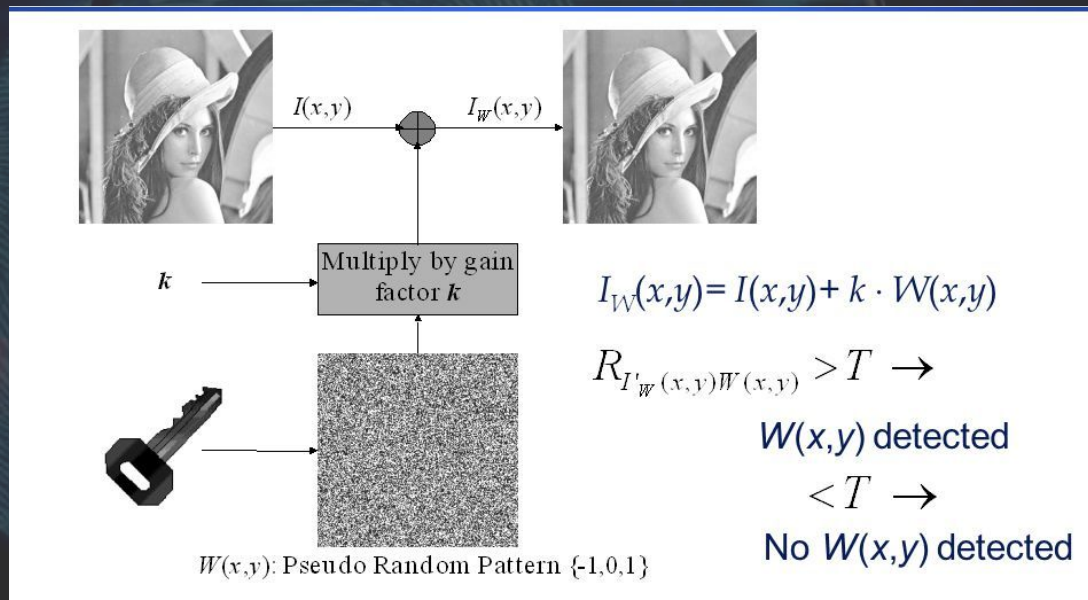
- The spatial domain watermarking embeds the watermark by changing the intensity and the colour value of some preferred pixels.
- The spatial domain watermarking is simpler and its processing is faster than transformed domains but it is less versatile against attacks.

# Spatial Domain Watermarking

- Additive Watermarking

- An imperceptible signal is added to the original image, rather than modifying the image itself.
- The visual quality of the image is not compromised.

Additive watermarking also allows for easy extraction of the watermark, making it a suitable technique for copyright protection and authentication purposes

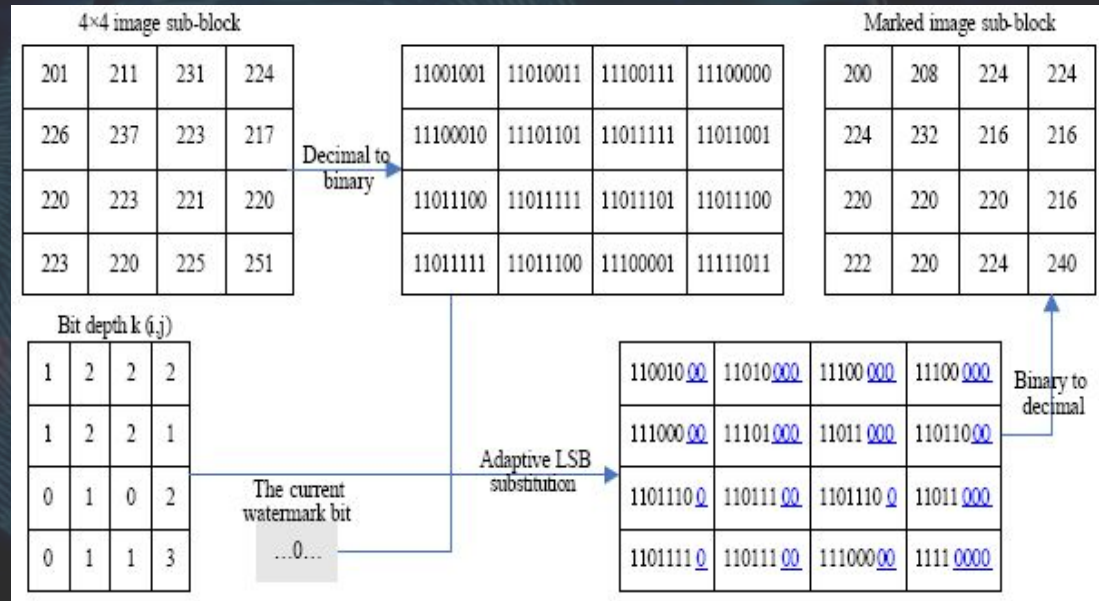


# Spatial Domain Watermarking

- LSB (least significant bit) Watermarking
  - It embeds a message by manipulating the LSB of the image pixels.
  - Modification of the LSB is usually imperceptible to the human eye.

It is relatively simple.

However, it has limitations in terms of the amount of information that can be embedded. And it can be susceptible to attacks that can easily remove or alter the watermark





# Transform Domain Watermarking

- Transform domain image watermarking methods involve transforming the image into a frequency or wavelet domain and embedding the watermark into the transformed coefficients.
- It requires more computational resources than spatial domain methods, and can cause some degradation of image quality depending on the selected embedding parameters.

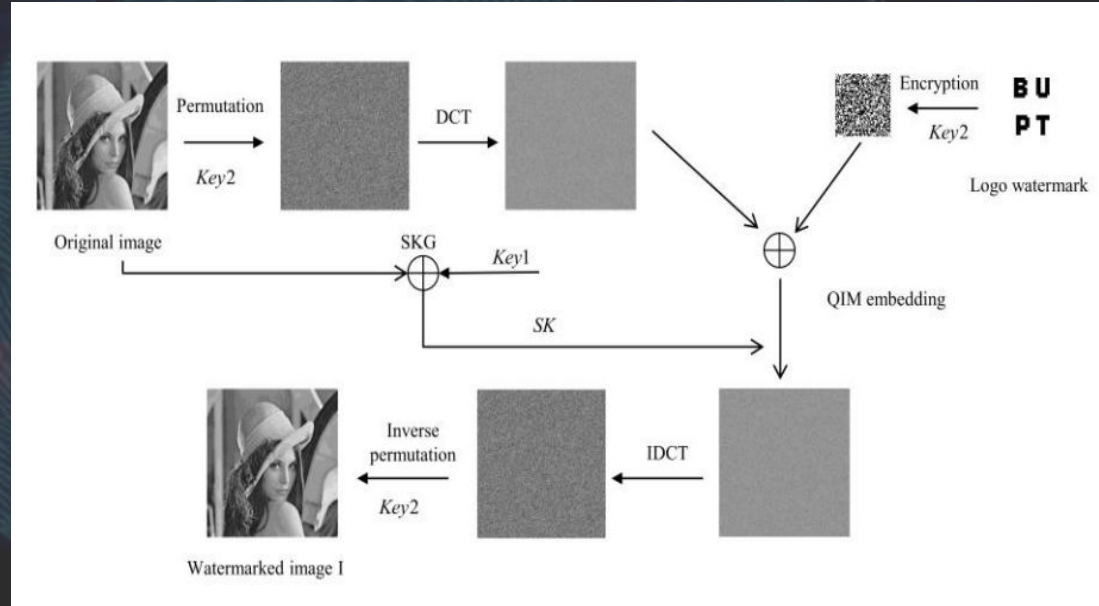
# Transform Domain Watermarking

- DCT Watermarking

- It embeds watermark by modifying the DCT coefficients of the image
- it is resistant to common attacks such as noise addition, cropping, and compression.

It requires more computational resources due to the transform into the frequency domain.

Degradation is minimized by careful selection of the embedding parameters.



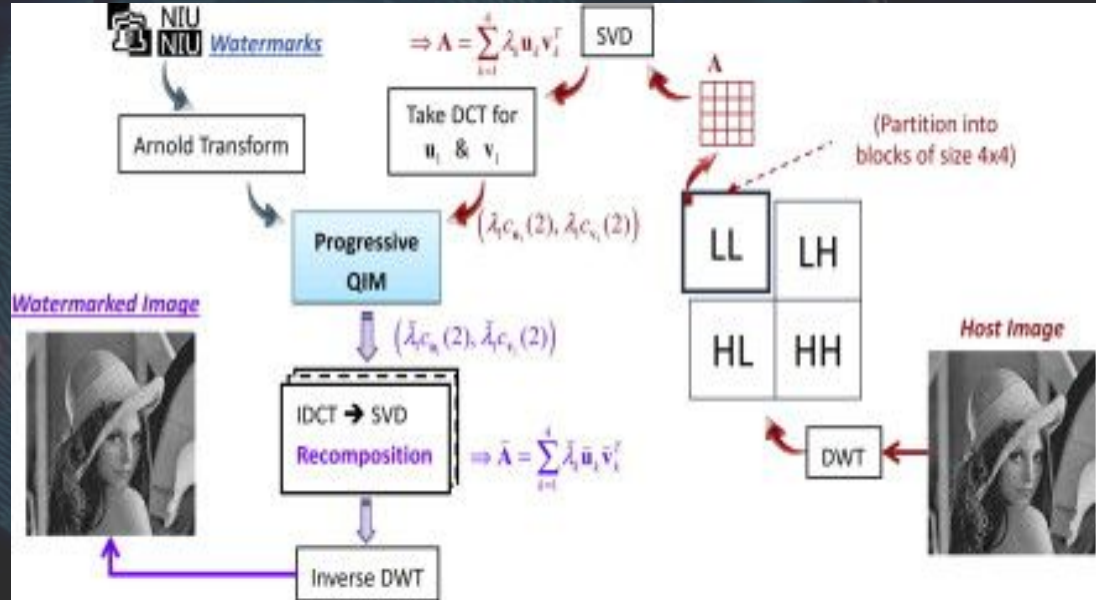
# Transform Domain Watermarking

- DWT Watermarking

- It transforms the image into a multi-resolution wavelet and modifies coefficients.
- It is particularly resistant to geometric distortions, such as rotation and scaling.

Used in applications that require high security and robustness.

Degradation of image quality can be minimized by careful selection of the watermark embedding parameters.



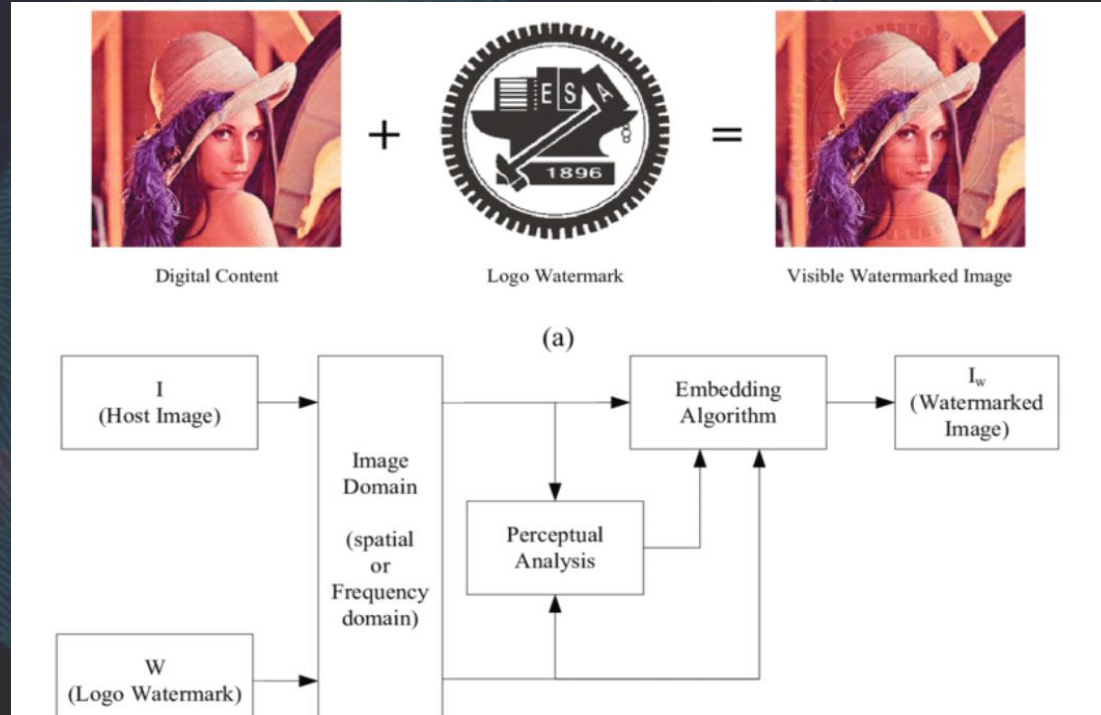


# Visual Watermarking

- The watermark  $W$  is hidden as a part of the image and visible to anyone. This is implemented simply by adding an overlay on the cover image  $I$ .
- Stock photos are an example of such watermarking. We model a watermarked image  $J$  by
$$J = \alpha W + (1 - \alpha)I$$
  - Here  $\alpha$  is the matting Constant

# Visual Watermarking

- The Implementation of visual watermarking is simple
- Watermark embedding is appreciably visible to the human eye.





Thank You