

# A New Approach to Digital Watermarking

Jong Uk, Choi (Sangmyung Univ.)

Department of Information and Communication, Sangmyung University  
110-743, 7 Hongji-dong Jongno-Gu, Seoul, South Korea

(E-mail) [s3choi@unitel.co.kr](mailto:s3choi@unitel.co.kr)

## 1. Introduction

# Requirement to protect property right

- Copy detection to identify unauthorized copies of the image.
- Content authentication to verify the content of a copy of an image, since the copy may have been forged or filtered.
- Owner authentication to prove that the user is the true owner of the image.

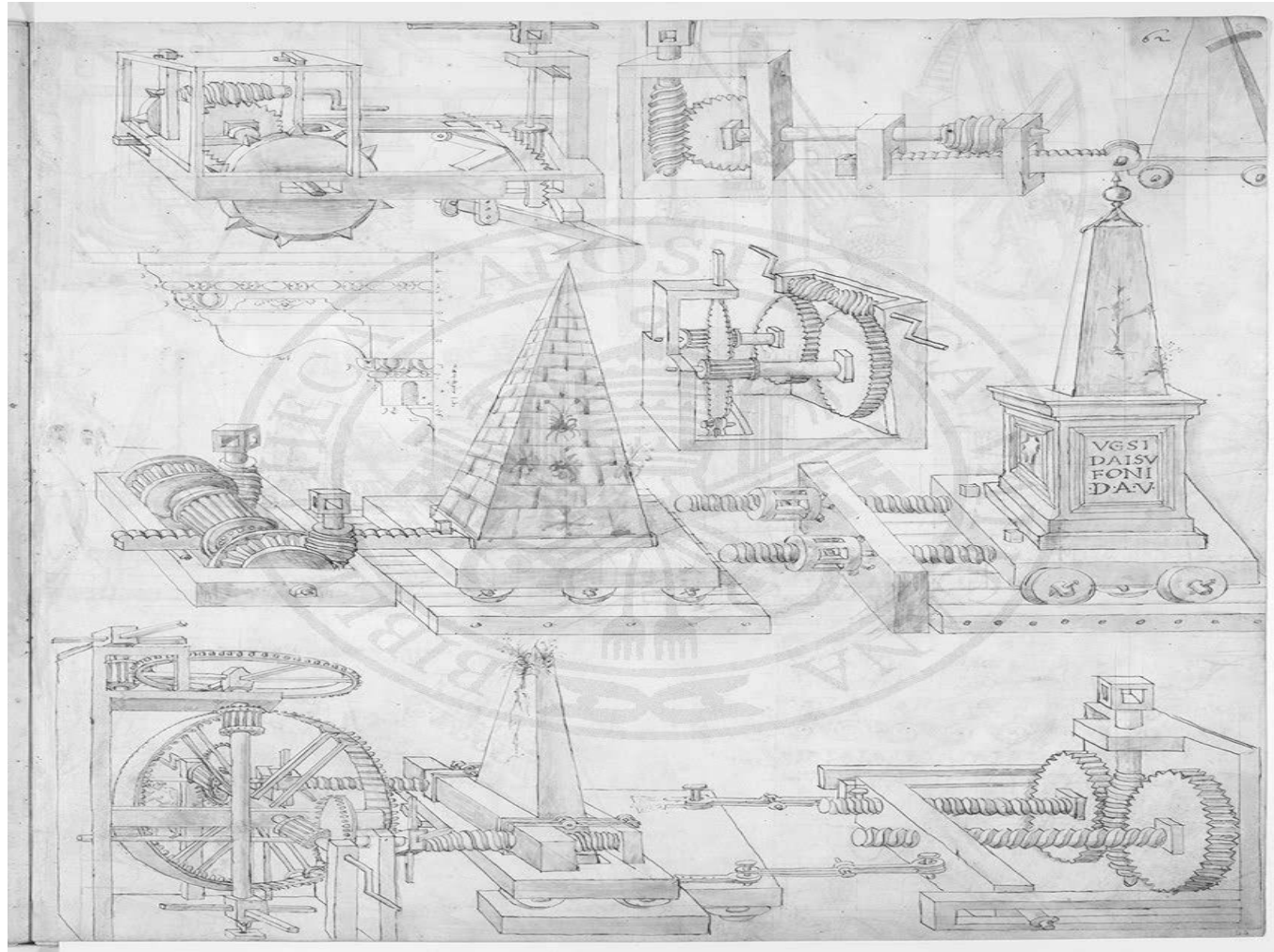
## 1. Introduction

# Requirements of watermark

- should be difficult or impossible to erase watermarked data.
- should be robust to image compression, cropping, dithering, color requantization, scaling and other image manipulation.
- The effect of hiding watermark on original image should be minimal.
- Invisible watermark should not be discerned by sensitive observers who are owner of the image.

## II. Previous Approach

# Visible Watermark



## II. Previous Approach

# Invisible Watermark

Ex.) Spatial Method.



Original Image

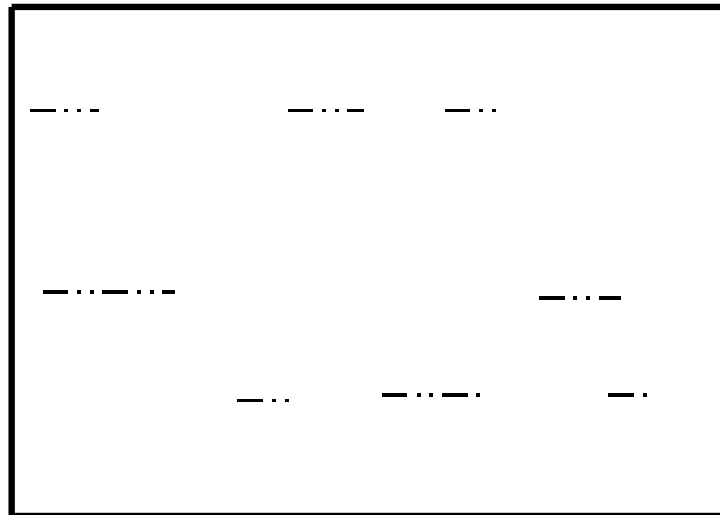


Watermarked Image

## II. Previous Approach

# Invisible Watermark

Ex.) Spatial Method.

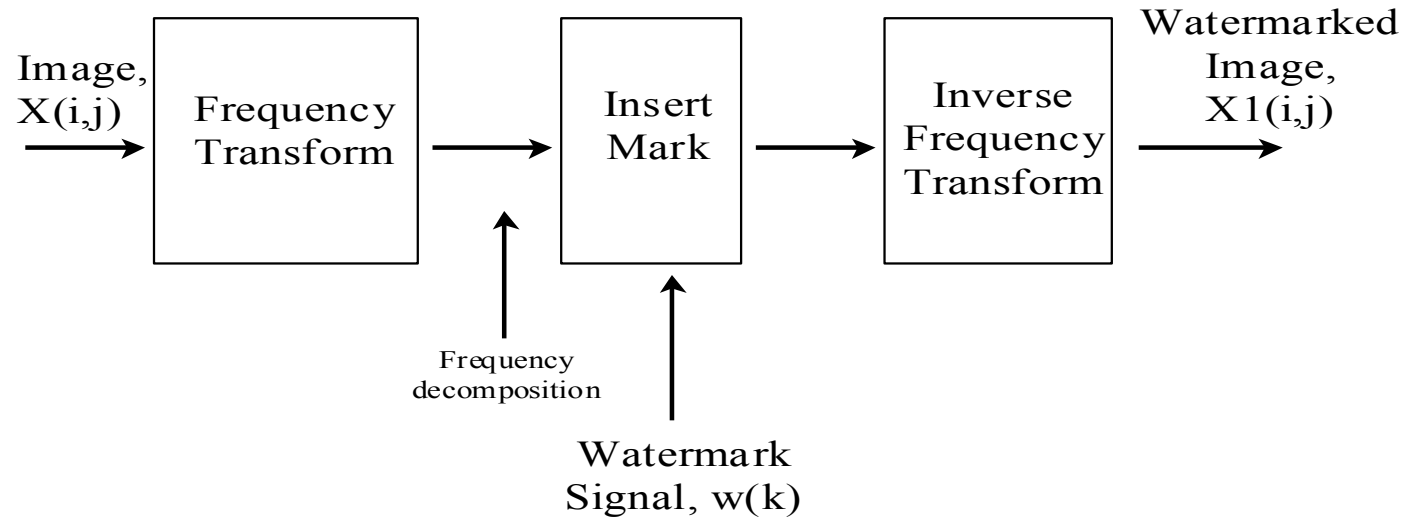


Watermark Position

## II. Previous Approach

# Invisible Watermark

Ex.) Frequency Domain Method.



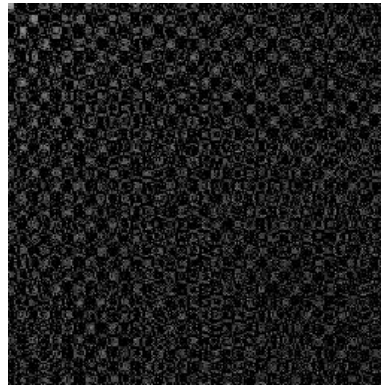
## II. Previous Approach

# Invisible Watermark

Ex.) Frequency Domain Method.



Original  
image



Transform  
Coefficient



Watermarked  
image



## II. Previous Approach

# Watermarking Technique

1) Spatial Method.

: Just flip the lowest-order bit of chosen pixels in a gray scale or color image.

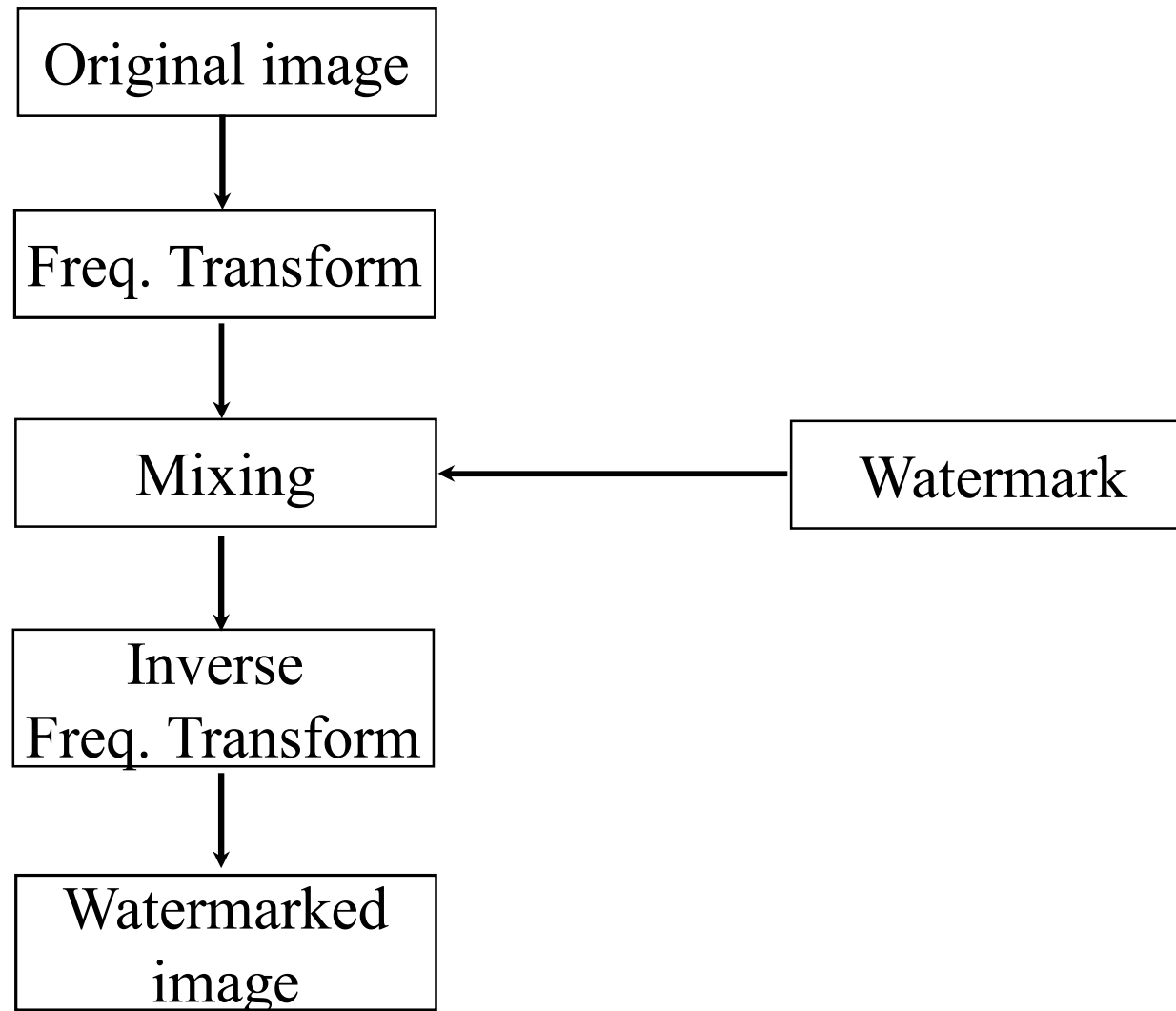
2) Frequency Domain Method

: Simply mix two signals.

- The watermark can be added in almost freq. domain (DCT, Wavelet, Fourier, etc..) using different methods.

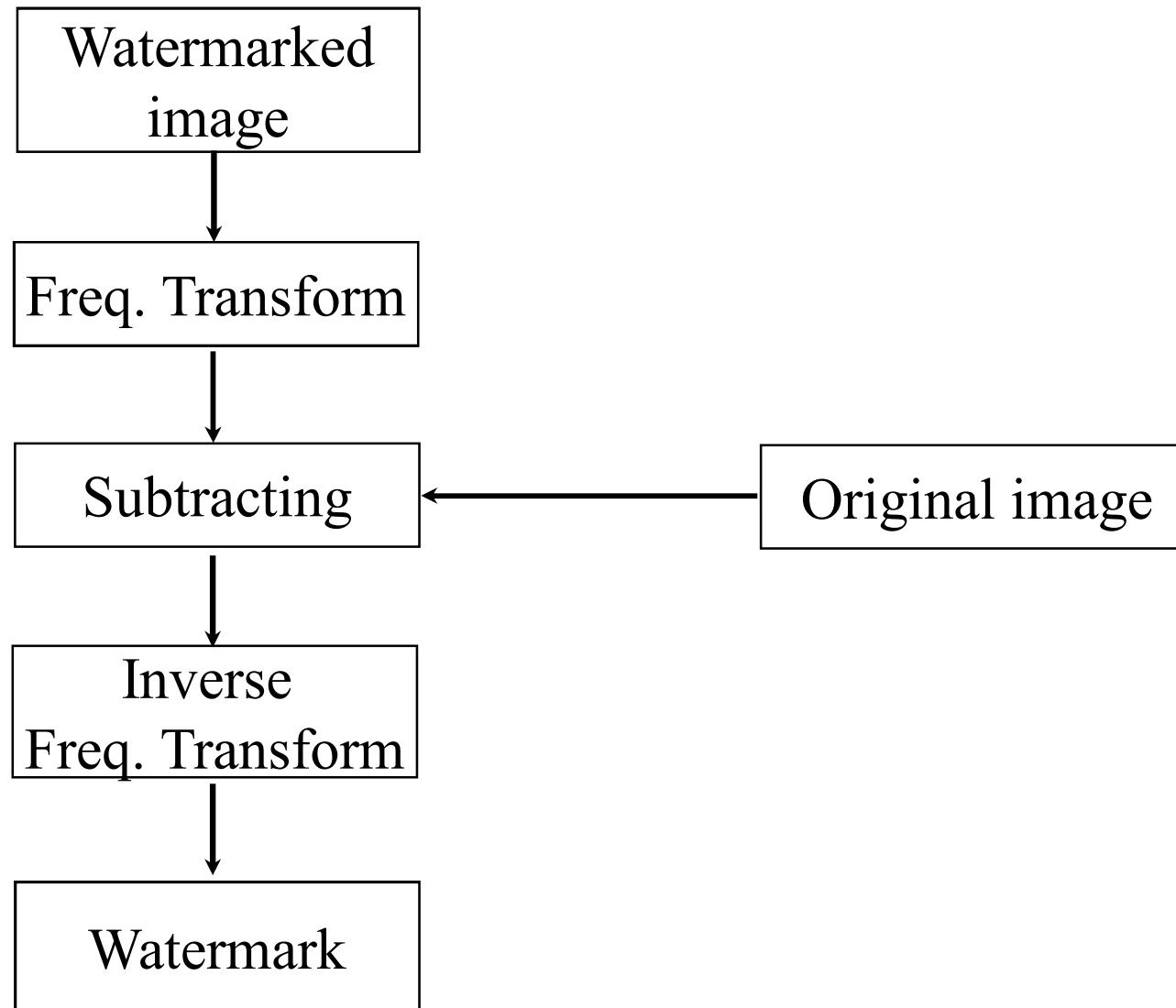
## Example> Frequency Domain Method

### <Embedding Flowchart>



## Example> Frequency Domain Method

<Extracting Flowchart>



### III. New Technology

☐ Result of AIT lab. research



**A) Original Image**

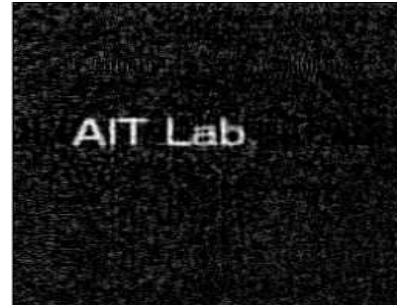


**B) Watermarked Image**

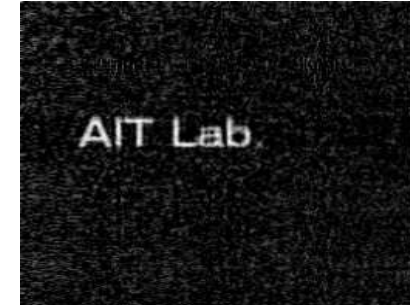
# Jpeg compression



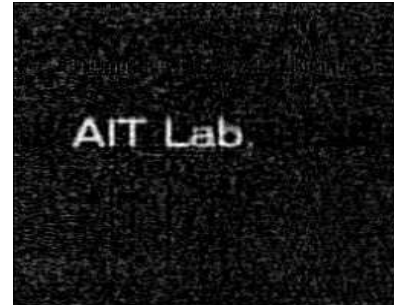
5%



10%



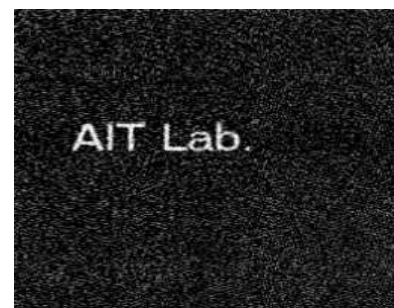
20%



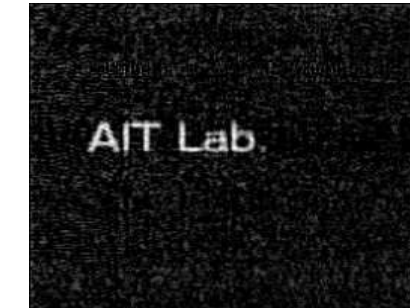
30%



40%



50%



# Filtering & Cropping



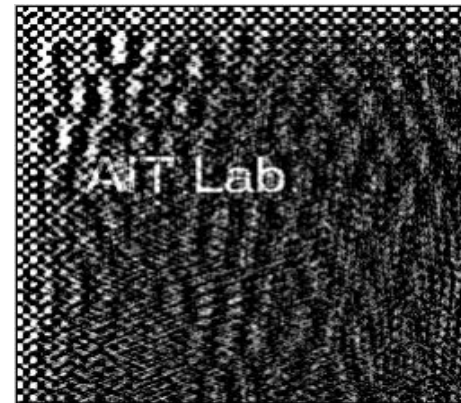
**Low-pass filtering**



**High-pass filtering**



**Low-pass filtered watermark**



**High-pass filtered watermark**

# Cropping



Cropping  
(192X192)



#### IV. Application

- DigiMarc & Photoshop(USA)  
<http://www.digimarc.com>
- SureSign(United Kingdom)