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
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.
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](image1.jpg) ![Watermarked Image](image2.jpg)

Original Image    Watermarked Image
II. Previous Approach

Invisible Watermark

Ex.) Spatial Method.

Watermark Position
Invisible Watermark

Ex.) Frequency Domain Method.

II. Previous Approach

Image, $X(i,j)$

→ Frequency Transform

→ Insert Mark

→ Inverse Frequency Transform

Watermarked Image, $X1(i,j)$

Watermark Signal, $w(k)$

Frequency decomposition
II. Previous Approach

**Invisible Watermark**

Ex.) Frequency Domain Method.
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>

Original image → Freq. Transform → Mixing → Watermark

Watermarked image

Freq. Transform → Inverse Freq. Transform
Example> Frequency Domain Method

<Extracting Flowchart>

Watermarked image

Freq. Transform

Subtracting

Inverse Freq. Transform

Watermark

Original image
III. New Technology

hões Result of AIT lab. research

A) Original Image  B) Watermarked Image
Jpeg compression
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)