# A FRACTALS-INSPIRED APPROACH TO DATA EMBEDDING IN DIGITAL IMAGES FOR AUTHENTICATION SERVICES

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**Abstract - The aim of this demonstration is to present the ongoing performance of our R. & D. watermarking scheme software for owner and image authentication. The proposed illustrations cover a large panel of original images (in grey levels and colors), watermarks and attacks. Evaluation is performed according to ratio, visibility and robustness.**

## INTRODUCTION

Security is becoming a necessary component of commercial multimedia applications which provide access to images through public channels. Many different types of services are required including privacy, copyright and authentication services [1]. We present preliminary results obtained in the field of watermarking for owner, users or content authentication using an original approach [2]. This scheme is derived from a basic data hiding algorithm [3] which exploits the properties of the fractal transform. Each of the services we investigate, is based on a robust invisible watermark.

## PROPOSED DEMONSTRATION

**Owner authentication:** For owner authentication, our algorithm supports different types of watermarks such as binary logos or ascii strings hidden in an image in order to guarantee its ownership. The table 1 summarizes different watermark recoveries from various attacks, including geometric and luminance manipulations.

**Image authentication:** For image authentication (fig. 1), the basic idea is to hide features of the image within itself, then to check the invariance of these characteristics from the transmitted and possibly corrupted image. Contrary to the owner authentication application, this service requires a high capacity of insertion for embedding relevant attributes of the image.

| Attack | Type of Watermark | Type of Image | Recovered Signature |
|---|---|---|---|
| Jpeg Q25% | ascii : "Eurecom" | Lena 512 × 512, 256 grey levels | "Eurecom" |
| Slight rotation 0.7 degree | ascii : "Lena" | Lena 512×512, 256 grey levels | "Lena" |
| Horizontal shift 7 pixels | Eurecom's binary logo 4096 bits | Fruit 512×512, 24 bit colors | logo recovered |
| Crop 10% | Eurecom's binary logo 4096 bits | Fruit 512×512, 24 bit colors | logo recovered |
| Horizontal stretch 105 % | random sequence 900 bits | House 256×256, 24 bit colors | 97 % bits recovered |
| Tilt (or skew) horizontal 1 degree | random sequence 900 bits | House 256×256, 24 bit colors | 82 % bits recovered |
| Printing & Scanning colors 600dpi | ascii : "Eurecom" | Fruit 512×512, 24 bit colors | "Eurecom" |
| RAW2GIF conversion | random sequence 900 bits | Fruit 512×512, 24 bit colors | 74 % bits recovered |
| Stirmark cracker | ascii : "Eurecom" | Fruit 512×512, 24 bit colors | "Eurecom" |

Table 1: *Some test examples of the Eurecom's watermarking scheme browsing numerous attacks, watermarks and several images*

a) b) c)

Figure 1: Watermark for image authentication. a) original image, b) attacked image, c) detection of the corrupted locations

## References


[1] J.-L. Dugelay, C. Rey, and S. Roche. Introduction au tatouage d'images - etat de l'art. In *Compression et Représentation des Signaux Audiovisuels (CORESA'99)*, June 1999.

[2] J-L. Dugelay and S. Roche. Image watermarking by hiding a binary information. patent pending fr 9807607, August 1998.

[3] J-L. Dugelay. Technique of hiding and retrieval, in particular using fractals, of a digital information inside a multimedia document. patent pending fr. 98 04083, April 1998.