PERFORMANCE OF IMAGE TATTOOING BY WAVELET DISCRETE TRANSFORM

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ABSTRACT

This paper Digital image watermarking involves introducing a brand, signature, name or logo of the author into the image to protect it from counterfeit, various illegal copies and shares. There are several watermark methods, most of them based on mathematical transformations. In this document, we had compare two watermarking algorithm: the domain of wavelets and the domain of discrete cosines. By exploiting the results obtained, we have found that embedding the mark in the sub-layer A is the best against attacks.

Keywords: *Piezoelectric, Vibration, Energy harvesting, Bridge, Fourier and Laplace transform*.

1. INTRODUCTION

Currently there is a switch to a digital world where via the internet access to information is very simple and very fast. However, scanned documents can be copied, edited and then re-posted on the internet without worrying about copyrights.
Even though some organizations are fighting piracy this has not solved the problem of copyrights, so we opted for tattooing. It consists of inserting a mark called "signature" that only authorized persons can detect thus proving the integrity of any document.

2. PRINCIPLE AND METHODOLOGY

2.1 Instructing phase

In general, all tattooing methods are based on an identical principle. For the tattoo scheme given in figure 1, a message m containing L bits of information is transformed according to a key k into a mark w which is then inserted in the document x also called "host" (can be an image, a sound , or a video), to give a tattooed document y, this is the insertion phase. Here, w is expressed as a noise that is added to the document, the deformation depending on the power of the noise. k is secret and specific to the tattoo artist. It is then copied and etched, which is modeled by transmission in a noise-laden channel. After deformation, the received document is called z.

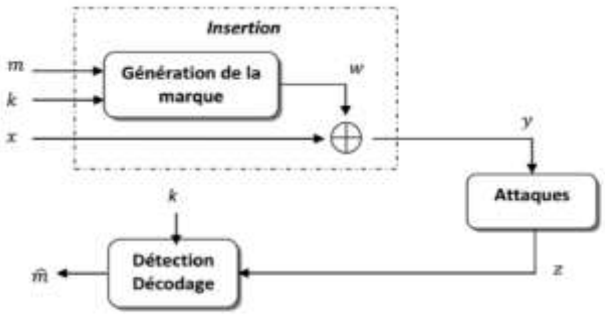

Fig - 1: Principle of image tattoo

2.2 Extraction phase

This phase makes it possible to detect the inserted signature. Between the insertion phase and the phase of detecting the tattooed image may have undergone modifications.
The goal is to check if the mark inserted in a specific document (the copyright information) is present or not.

3. CHOICE OF TECHNIQUES AND ALGORITHMS FOR TATOOS

3.1 Algorithm using DCT coefficients

- *Insertion of the mark*

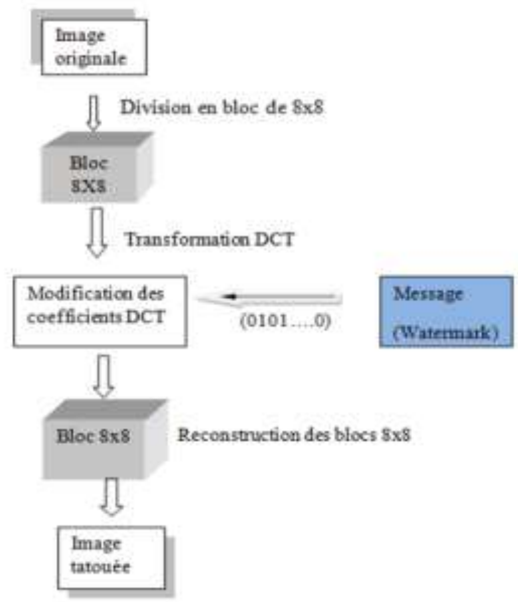

Fig - 2: Diagram of the different stages of insertion of the brand in the DCT domain

- *Extraction de la marque*

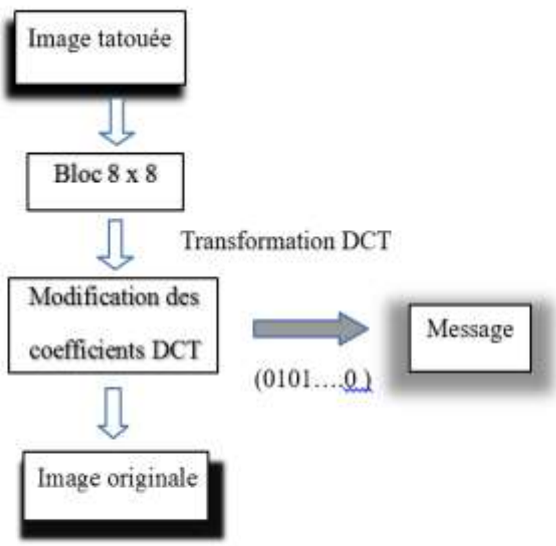

Fig - 3: Diagram of the different stages of extraction of the brand in the DCT domain

The extraction of the bits of the message according to the values of the predefined DCT coefficients:

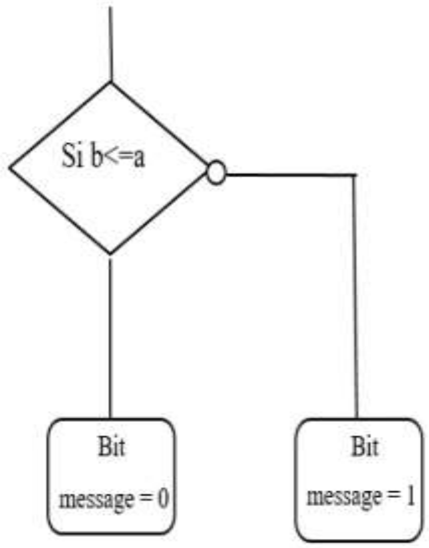

Fig - 4: Schema of extraction of the bits of the message

3.2 Algorithm using the wavelet transform

- *Insertion of the mark*

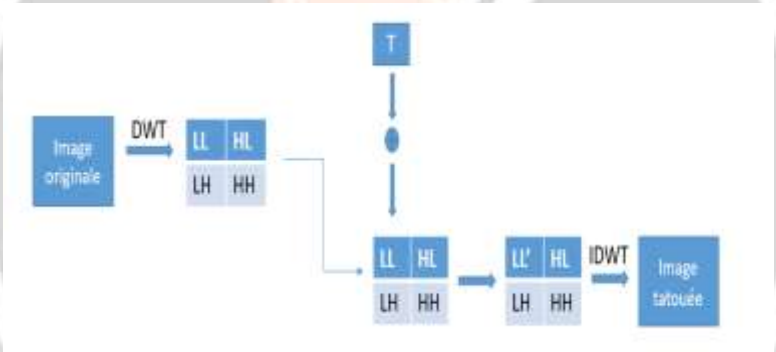

Fig - 5: Inserting a mark in the wavelet domain

- *Extraction of the mark*

To extract the mark, simply perform the reverse of the insertion steps in the DWT domain. The tattooed image will be broken down into four equal frequency coefficients, that is, a decomposition of the first level. The signature will be extracted in the frequency band $LL'1$ where it has been inserted hence the following equation:

$$Watermark(i,j) = (LL'1(i,j) - LL1(i,j)/K) \quad (1)$$

Then, for each pixel in the sub-band $LL'1$ of the tattooed image, the same procedures will be performed in order to extract the bits of the message

4. RESULTS OF THE SIMULATION AND DISCUSSIONS

We will use the image of "Lena" as a host image size: 512 x 512 and the image "Copyright" that will be served as a trademark with a size of 256 x 256.

Fig - 6: Host image on the left and image mark on the right

Below we have the result, that is to say the original image and the tattooed image.

Fig - 7: Lena image on the left, Tattooed image on the right Original

Table - 1: Influence of parameter K on the perceptibility of the tattoo

		
K=0.03	K=0.07	K=1.00
PSNR=32.85dB	PSNR=18.17 dB	PSNR==-3.43dB

To evaluate our tattooing methods we used different attacks, and we get the following table:

Table - 2: NCC values following the different attacks on the brand

Tatoo's algorithm	DWT		
	D	A	H
Ajout de bruit	0.9381	0.9360	0.9357
Découpage	0.0396	0.0351	0.0850
Filtre Moyenneur	0.0075	0.8975	0.0654
Filtre Médian	0.7661	0.9911	0.0125
Rotation	0.2228	0.3074	0.2499

Etirement	−0.0432	−0.0015	0.0355
Flou de gauss	0.0251	0.8776	0.0104
Compression JPG 50%	0.7664	0.9920	0.9432
Compression JPG 70%	0.9612	0.9955	0.9775
Compression JPG 90%	0.9765	0.9967	0.9939

5. CONCLUSION

As a conclusion, the different tests of the tattoo algorithms, leads us to say that the insertion of the mark in the under layer A in the field of wavelets is the most robust tattooing method. Note that for the image mark must be the same size as the LL sublayer.
Also the original image is essential to find the mark insert. The greater the amount of information inserted, the toughness and imperceptibility will decrease. It is therefore necessary to find the best possible compromise between these three parameters depending on the intended application.
This technique can be improved by performing decomposition at level 2 or even performing a hybrid tattoo algorithm based on DCT and DWT.

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