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# Embedding and Extracting a Watermark in an Image using DCT

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***Abstract:***
*The DCT watermarking algorithm has been implemented in this paper for the image cryptography. Security and capacity of watermarking data are important issues to be considered. Number of researched are going in this field and major studies are going to increase capacity and security feature of a watermark. In this paper a new approach is to achieve capacity and security feature in watermarking. To enhance capacity feature, idea of branching or say nesting is being used. As per nesting concept, one watermark is inserted into another. This helps to increase the number of bit that can be included in watermarks.*

***Keywords:*** *DCT, Image Watermarking, PSNR, Cryptography*

## 1. Introduction

More than 700 years ago, paper watermarks were used in Fabriano, Italy to indicate the paper brand and the mill that produced it. By the 18th century it began to be used as ant counterfeiting measures on money and other documents. They are still widely used as security features in currency today.

## 2. Implementation

The block diagram for the encrypted watermark image transmission is given below.

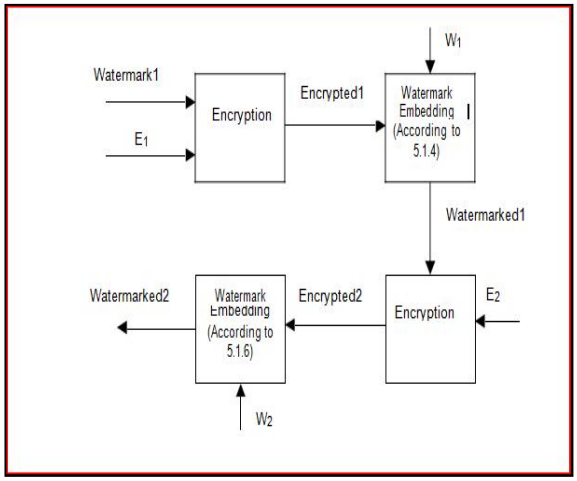


*Figure 1*

Watermark1 is taken. It is encrypted by utilizing XOR operation. Encryption key E1 is utilized. We will get Encrypted E1 as output. Encrypted E1 is now embedded in the watermark2. Key W1 is utilized and the image received in output is watermarked1. Now watermarked watermark will be encrypted utilizing XOR operation and key E2 is utilized. The output of this will be Encrypted 2. Now the output received in step 3 will now be embedded in the grey scale cover image. Key W2 is utilized. And the output received from this step will be final watermarked image.

We have considered a single image. We quantify the quality of watermarked images in terms of PSNR (Peak Signal to Noise Ratio) and MSE (Mean Square Error). In ideal case PSNR should be illimitable and MSE should be zero. But it is not possible for watermarked image. So, sizably voluminous PSNR and minuscule MSE is desirable. To visually perceive that if the recuperated watermark is identical to the one that is embedded we calculate only MSE. In this case it should be zero.

*2.1. Experimental Results and Algorithm*

*Figure 2: Input Image*

The 'LENA' image is used as the input image in which watermark image is embedded. First we see the effect of embedding nested watermark in each image.


*Figure 3: Watermark Image*

The image given in the figure above is used as the watermark in the input image of LENA. The watermarked image is then encrypted and the final output image is obtained with the invisible watermark.

Original Watermark  Watermarked Watermark  Difference 

*Figure 4: Output Image with Invisible Watermark4*

| | | Wm1 | Wm2 | PSNR1 | MSE1 | PSNR2 | MSE2 |
|---|---|---|---|---|---|---|---|
| Image | | | | | | | |
| Lena | | h.bmp | Lenatext.bmp | 17.3239 dB | 0.0185 | 37.1587dB | 11.736 |
| (512 | × 512) | (12 × 12) | (27 × 56) | | | | |

*Table 1: PSNR and MSE Calculation*

*2.2. Future Scope and Conclusion*

The concept that we have used in watermarking can further be elevated in security prospects without disturbing the quality of the digital image. The other future scope is that our technique can be enhanced to embed colored nested watermark in colored image. Since the technology we have used for security is on XOR-ing, we can enhance it using more convincing security methods.

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