

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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**WATERMARKING METHOD IN DIGITAL IMAGE USING PRIVATE KEY**

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**ABSTRACT**

According to the paper watermarking used to hide data or identifying information. Watermarking may be applied at digital images, through digital video, audio and documents are also routinely watermarked. Digital watermarking is become popular for adding undetectable identifying marks, such as author or copyright information. The technique can hide an entire image or pattern as a watermark directly into the original image. The quality of image is to be preserved the entire image is not altered for embedding, instead few blocks are used based on the size of watermark. Watermark is tested with Lena grey scale image of size 256x256 and watermark of size 64x64 using mat lab software. Watermarking System based on Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) which is used to protect the security and integrity of transmitted biometric color images. Data hiding method based on interpolation which calculates the interpolation error and the residual histogram of the interpolation errors of the host image to hide secret data. The residual image is obtained by interpolation and histogram shifting is applied to obtain the watermarked image. Entropy masking model for watermarking embedding algorithm to keep the balance between watermarks imperceptibility and its robustness.

**KEYWORDS**

Digital watermarking, Transform domain watermarking, entropy based watermarking , Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT), Data hiding interpolation, image histogram.

**INTRODUCTION**

Technology rising day by day, similarly modern life increases the use of computer technology day by day. These systems should be both a fast response these expectations and this process must be reliable. However, security applications are exposed to many serious attacks. To overcome the problem, other than as usual tried to develop new security systems. To provide a safer and an biometric identification system provides advanced solutions. The general physical and behavioral features used biometric are given below.

- 1. Facial features
- 2. Ocular features
- 3. Fingerprint
- 4. Hand
- 5. Audio features
- 6. Handwriting and signature

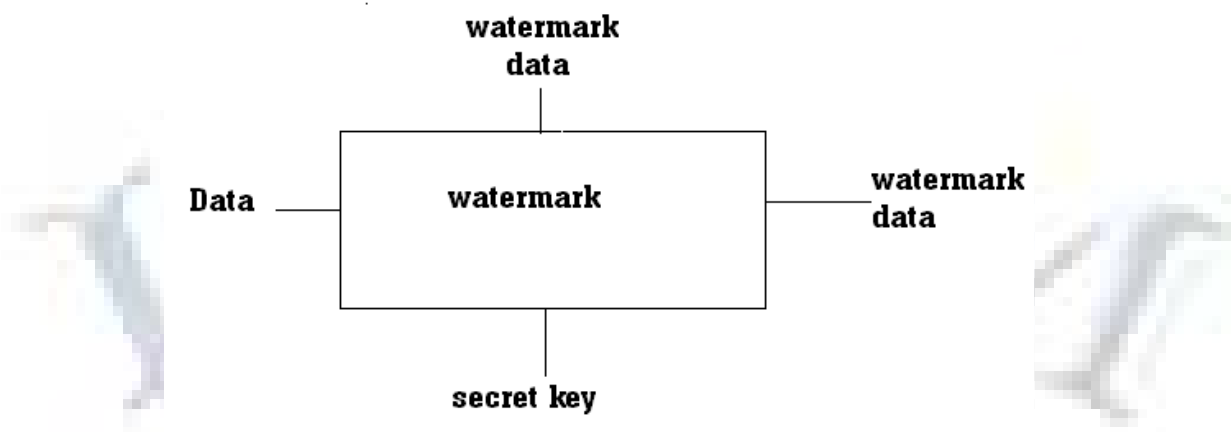
Biometric systems such as face recognition, fingerprint recognition, speech recognition, etc.,

The new method to hiding data, to improve security is watermarking. Digital data that may be picture, audio or video. The embedding takes place by manipulating the content of the digital data, which means the information is not embedded in the frame around the data. The hiding process has to be such that the modifications of the media are imperceptible. The most important features of watermarking method are

- 1. Reliability
- 2. Invisibility
- 3. High capacity

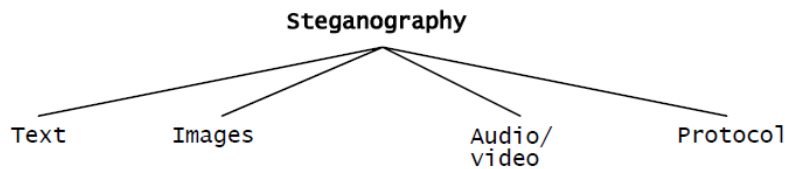
THE BASIC BLOCK DIAGRAM OF WATERMARKING METHOD IS GIVEN BELOW:

FIG 1



Digital watermarking of multimedia content has become a very active research[5]. Digital watermarking techniques derive from steganography, which means covered writing. Steganography is the science of communicating information while hiding the existence of the communication. The goal of steganography is to hide an information message inside harmless messages in such a way that it is not possible even to detect that there is a secret message present. Both steganography and watermarking belong to a category of information hiding, but the objectives and conditions for the two techniques are just the opposite[1]. In spatial domain, the watermark is embedded directly by modifying the intensity values of pixels. In frequency domain, the watermark is embedded by changing the frequency coefficients. To transform image into frequency domain, the transformation techniques such as (DWT), (DCT), discrete Hadamard transformation and discrete Fourier transformation are used. Spatial domain watermarking technique is easier and its computing speed is high, than transform domain watermarking.

FIG. 2



**HADAMARD TRANSFORM**

The Hadamard transform is a non-sinusoidal, orthogonal transformation that decomposes a signal into a set of orthogonal, rectangular waveforms. The transformation has no multipliers has only two values +1 or -1

The transformation process is carried out on 8x8 blocks:

FIG. 3

1	1	1	1	1	1	1	1
1	-1	-1	-1	-1	-1	-1	-1
1	-1	-1	-1	-1	-1	-1	-1
1	-1	-1	-1	-1	-1	-1	-1
1	-1	-1	-1	-1	-1	-1	-1
1	-1	-1	-1	-1	-1	-1	-1
1	-1	-1	-1	-1	-1	-1	-1
1	-1	-1	-1	-1	-1	-1	-1

**ENTROPY:** Entropy defined as

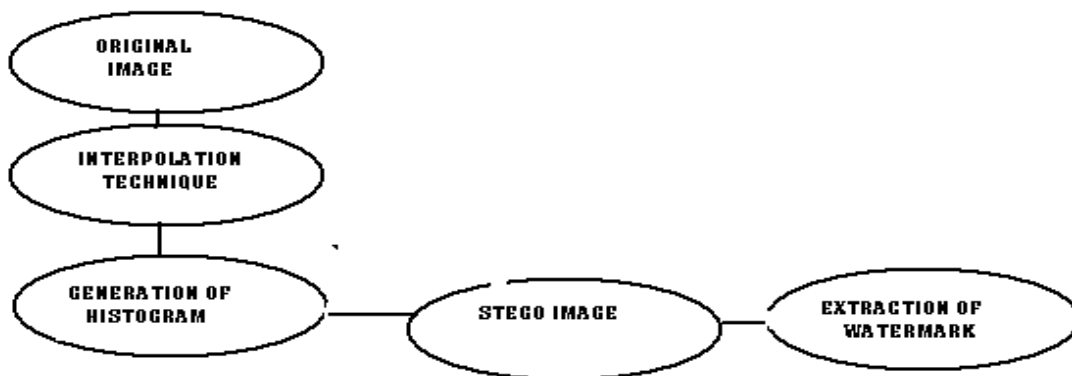
$$E = -\sum h \log_2(h)$$

Let h contains the histogram counts[2].

**Watermarking Using Interpolation and Histogram Shifting :** This method only modifies the interpolation error values slightly; the stego image quality is often higher than that of expansion-embedding-based techniques. Besides, the capacity is larger than those histogram-shifting based techniques because the peak of the interpolation error histogram is often higher than that of the original image histogram.

**BASIC BLOCK DIAGRAM FOR WATERMARKING**

FIG. 4



The histogram shifting embedding procedure, firstly the pair of peak and zero points from the image histogram is searched. The peak point is the pixel value with maximum occurrences in the histogram. The zero point is the one with zero or minimum occurrences in the histogram. Pixels with their values ranging from the peak point to the zero point have to be modified for this technique. By contrast, pixels with values outside the range are not changed. The rule for pixel modification is based on the location of pixels in the image histogram [3].

**DCT and DWT:** Discrete Fourier transform(DFT), DCT turn over the image edge to make the image transformed into the form of even function. It's one of the most common linear transformations in digital signal process technology. Wavelet transform is a time domain localized analysis method with the window's size fixed and form convertible. There is quite good time differentiated rate in high frequency part of signals DWT transformed. Also there is quite good frequency differentiated rate in its low frequency part. It can distill the information from signal Effectively.

**DWT DECOMPOSED MAP**

FIG. 5

LL3	HL3	HL2	HL1
LH3	HH3		
LH2	HH2		
LH1	HH1		



Here, L represents low-pass filter, H represents high-pass filter. An original image can be decomposed of frequency districts of HL1, LH1, HH1. The low-frequency district information also can be decomposed into sub-level frequency district information of LL2, HL2, LH2 and HH2. By doing this the original image can be decomposed for n level wavelet transformation. The information of low frequency district is a image close to the original image. Most signal information of original image is in this frequency district. The frequency districts of LH, HL and HH respectively represents the level detail[4].

**METHODOLOGY**

The Hadamard transformation technique and entropy concepts are used, here input image is divided into many blocks and entropy is calculated for each block. If the information content is very high then those blocks are marked as primer blocks for embedding watermark [2].

DWT digital watermark algorithm based on human vision characters. By using the block technology, watermarking signal is embedded into the high frequency band of wavelet transformation domain. And before embedding this watermark image has been DCT in order to improve its robustness [4].

**EMBEDDING PROCESS**

FLOW CHART OF DIGITAL WATERMARKING

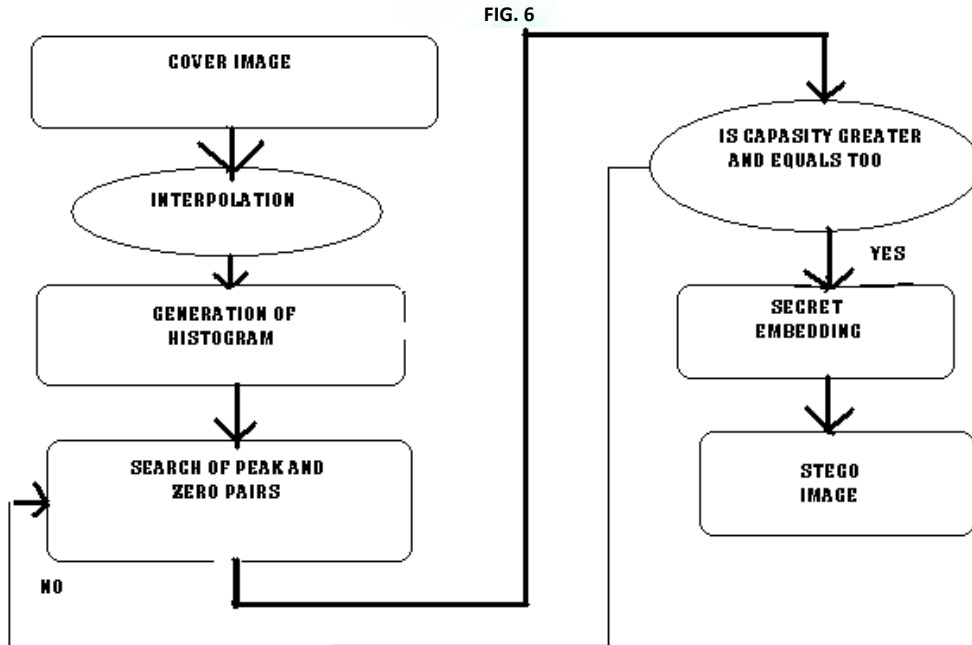


FIG. 6

**RESULTS**

EXTRACTED WATERMARK FROM WATERMARKED IMAGE

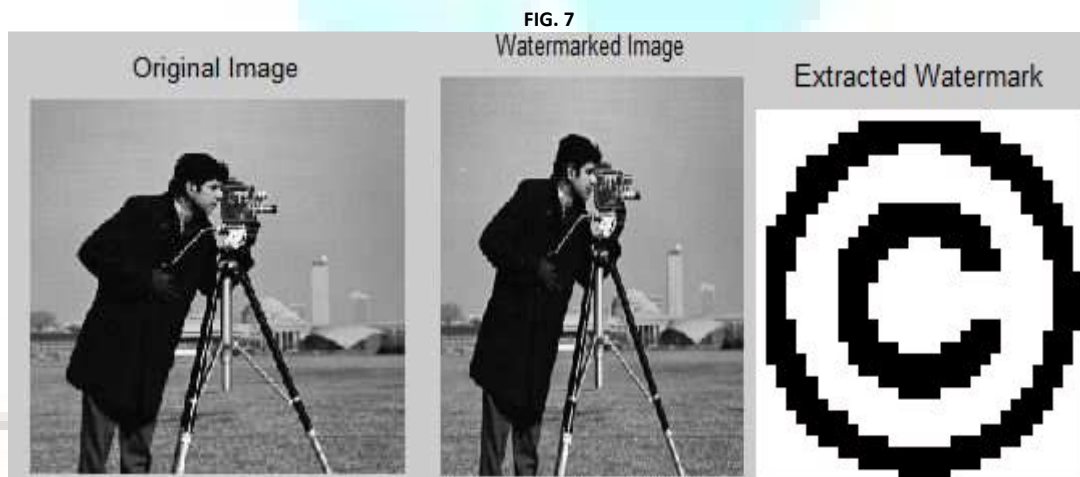
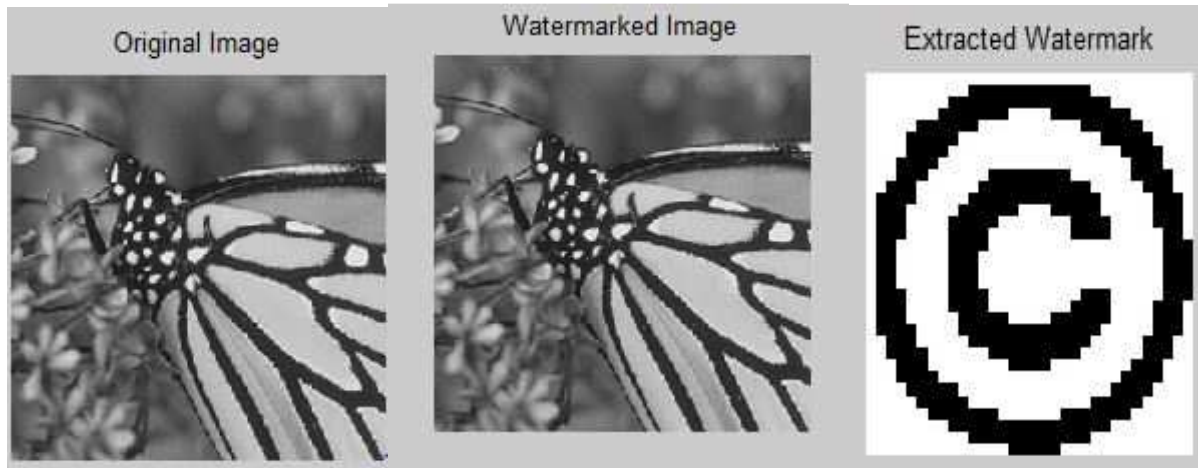


FIG. 7

Normalized Cross Correlation is 1.0000  
 Bit-Error-Rate is 0.0000 %

FIG. 8



Normalized Cross Correlation is 1.0000  
 Bit-Error-Rate is 0.0000 %

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