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Digital Water Marking

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Abstract

As technology is thriving, everyone looks for something which can comfort their life. In this paper we are presenting a technology which will explain how digital image processing can be achieved without great efforts. Digital image processing is developing gradually in field of science and technology, and it has a broad spectrum of applications. Digital water marking is referred as a method which is used for copyright protection and authentication.. Concept of Digital water marking is used to increase watermark embedding capacity but there are many problems related to noise, compression, enhancement and attacks are arise during digital watermarking but these problems can be minimized during different technique such as LSB, DCT, DWT, DFT, SVD. By using all these techniques watermark image would be compressed or enhanced in revert information will also compressed or enhanced. Using PSNR, histogram or compression ratio, we could easily spot the scale of compression or enhanced. These techniques are mainly used for square matrix images but in this paper it is illustrated that how we can use these techniques for different size of images.

Keywords: Watermarking, DCT, DWT, PSNR, Compression Ratio

Introduction

With the ample expansion in the uses of the internet, digital media files such as images, audio-video files have been easily accessible by the public. Consequently, an original digital multimedia content suffers with the violation of their copyrights and easy modification which resulted into 'data piracy'. In order to protect one's ownership rights some effective measures should be taken to overcome with this problem. Besides many new techniques most important technique has come into existence. The most popular approach invented in the 13th century in Italy was

'Digital water marking' and was considered as a tool for providing copyright protection.

Digital watermarking

Digital water marking is a process of hiding data/information by embedding it into multimedia file such as digital image, digital audio-video file. Here the data/information is called as Host/watermark image and the digital image or digital audio or digital video in which original image is to be embedded is called as cover image And consequence is termed as watermarked image which can be pseudo-random binary sequence, chaotic sequence, spread spectrum sequence or binary/gray scale image.

The different digital image watermarking technique based on domain are a) Spatial domain. b) Transform domain.

a) Spatial domain:

Here pixels are taken into consideration which means host image pixels are embedded on cover image pixels. The oldest and the most common used method in this category is the insertion of the watermark into the least significant bits (LSB) of pixel data.

b) Transform domain:

In transform domain technique transform coefficient is taken into consideration means the information is embedded into cover image by altering its transform coefficient. This is robust watermarking with respect to the spatial domain technique The different transform domain technique that are as follows: 1) DFT. 2) DCT. 3) DWT. 4) SVD.

- DFT**:** DFT is discrete Fourier transform which transform the discrete signal into frequency domain and the coefficient of this DFT is then used to hide watermark image. Under this technique the watermark is composed of two parts, one is a template which contains no information in itself but can detect any transformations undergone by the image, and another one is a spread spectrum message that contains the hidden information. In the watermarking processing of image through this technique, image to be hidden is suppose to be processed according to algorithm which then produced the image of new length. Secondly, the luminance part of cover image is extracted and DFT of it is calculated. DFT coefficient of cover image is utilized to hide watermark/original image i. e the hidden data and the template are then embedded in these coefficients. The template is embedded along two lines in the cover image which go through the origin and its purpose is to detect any attacks on the image.
- DCT**:** DCT is the discrete cosine transform watermarking technique. This uses only real part of DFT coefficient to hide the information. Since DFT have both low and high frequency component which are occupied by watermark image but in DCT technique the watermark image concentrate in low frequency component of DFT coefficient. Due this property it is used in jpeg compression

- DWT**:** Discrete wavelet transform based on small waves called wavelet means it transformed the cover image into the series of waves producing wavelet coefficient which includes different sub band frequency such as Low-Low pass sub band (LL), High-Low (horizontal) sub band (HL), Low-High (vertical) sub band (LH) and High-High (diagonal) pass sub band (HH). Now to embed watermark image into cover image the watermark image strength is varied according to the sub band level where the corresponding coefficients reside.

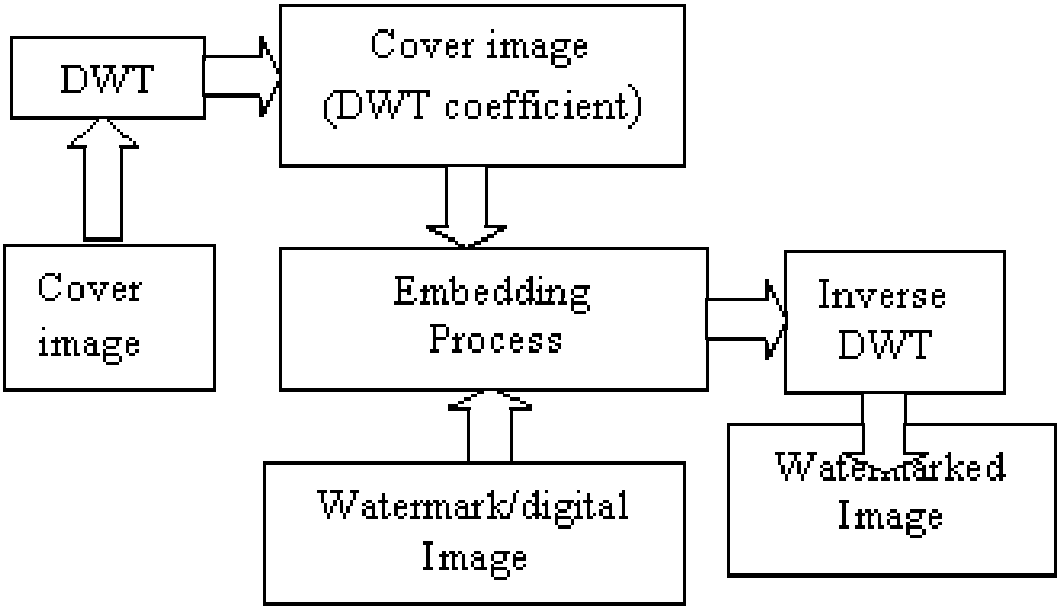

Fig1. Embedding process of DWT watermarking

- SVD**:**SVD is the singular value decomposition watermarking technique which is apart from all other transform domain technique it is very robust and resistive to the attacks like histogram equalization, compression, cropping, noise and median filtering. SVD technique based on matrix manipulation. In this method host image or cover image are represented in the form of square matrix are decomposes into three matrix of same size. For example, a square matrix A of size N x N, is decomposed into U, V and D matrix such that A= UDV^T where V^T is the transpose of matrix V. Here U and V are orthogonal and D is square diagonal. Secondly, watermark image is also in the form of matrix size are embedded into the cover image according to algorithm as given below. Remember that the size of watermark is required to be equal to the number of blocks in which the cover image is divided. If not, it is padded with appropriate number of ones.

Proposed methodology

In this system we are presenting effect on comparison techniques of different size of watermark images and standard square size of watermark images.

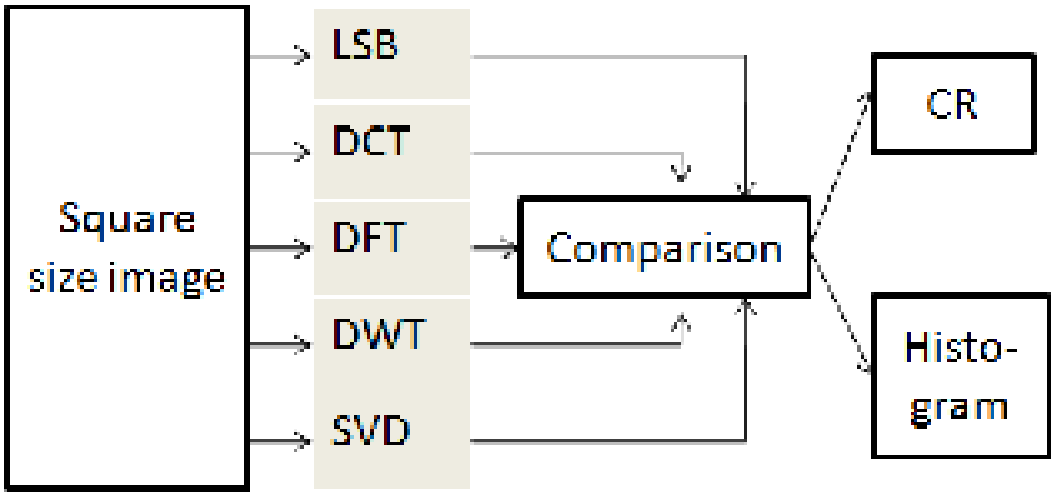

Fig 2. Comparison effect of square size image

Here in figure 2 we are taking two images one for cover image and another one is text images, sizes of two images are square image which is of dimension 256*256 and text image dimension is 99*137. We made watermarked image using LSB, DCT, DFT, DWT, SVD According to comparison technique we cannot spot which image is compressed or enhanced.

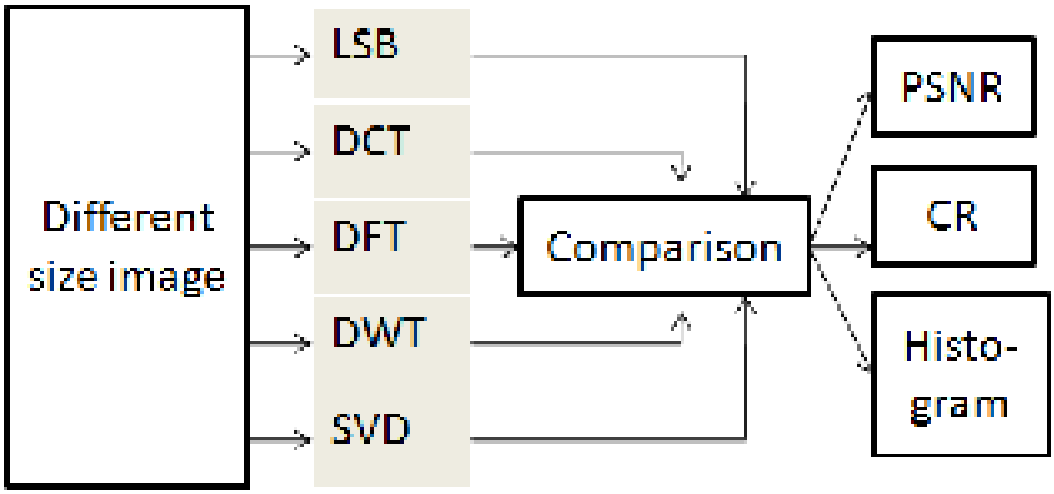

Fig 3. Comparison effect on Different size image

In figure 3 we are taking two images one for cover image and another one is text images, sizes of two images are 576*768*3 and 99*137*3. We made watermarked using techniques. we have three techniques of comparison a)peak signal to noise ratio, b)compression ratio, c)histogram (intensity graph).

PSNR=$10*\log_{10}((255)^2/MSE)$

s=s+(watermark (double)(j) – original (double)(j))^2

Mean squared error=s/size of original image

Compression Ratio=size of original image/size of watermark image.

When we compare a different size of watermarked image using these three techniques then we found compression and expansion of images according to the mathematical values of psnr, compression ratio and histogram techniques. so we can easily spot which image is compressed or enhanced.

Results:

Fig 4. cover image of dimension 256*256

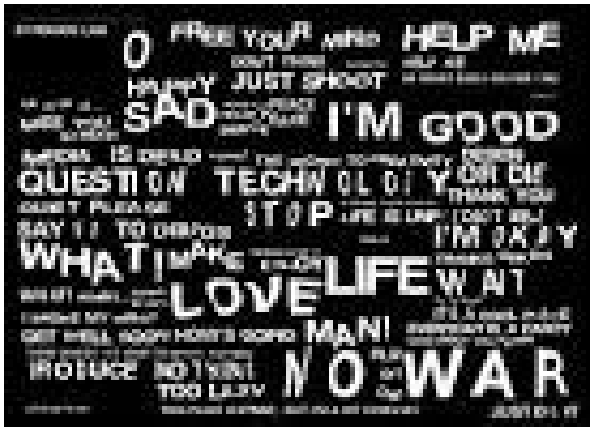

Fig 5. Text image of dimension 99*137

Fig 6. Cover image of dimension 576*768*3

Fig 7. Watermark image of dimension 99*137*3

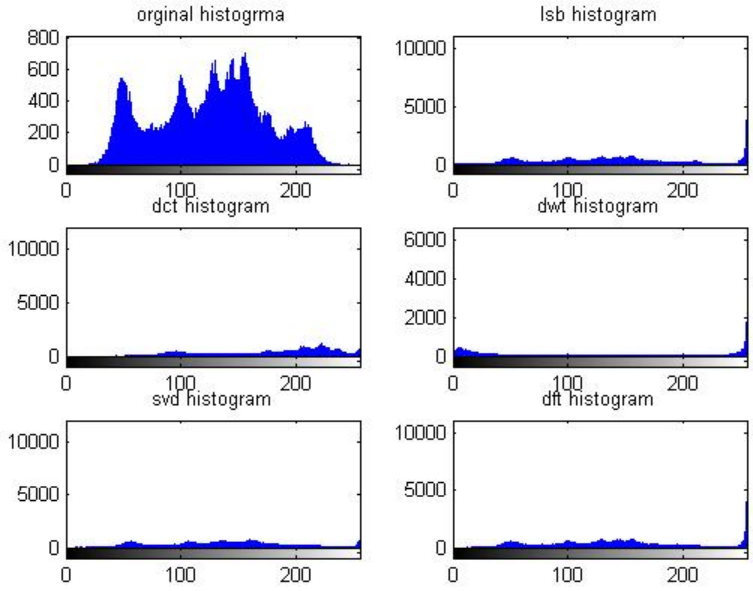

Fig 8. Histogram for square size image

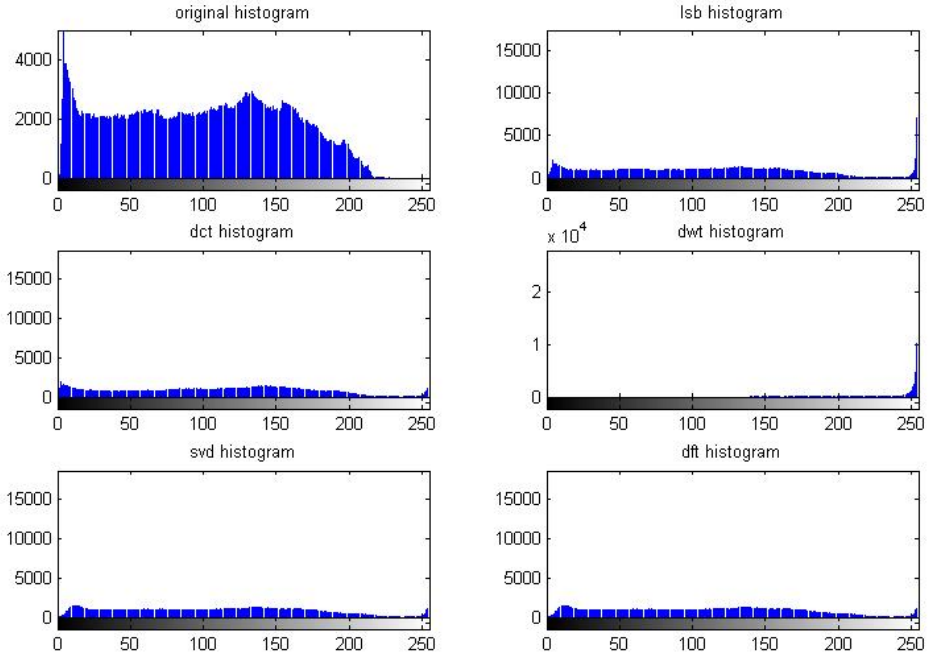

Fig 8. Histogram for Different size image

Following table will signify the effect on comparison technique of different size and square size image.

Table 1. Comparison table for different & square sized image

S. NO	PROCESS NAME	DIFFERENT SIZE IMAGE		SQUARE SIZE IMAGE	
		PSNR	COMPRESSION RATIO	PSNR	COMPRESSION RATIO
1	LSB	6.2258	1.1640	-	0.6639
2	DCT	6.2055	1.1640	-	0.6639
3	DWT	4.6399	2.6413	-	0.9847
4	SVD	6.2293	1.1640	-	0.6639
5	DFT	6.2190	1.1640	-	0.6639

Conclusion:

Digital watermarking is a method which is used to secure data, images, videos and to avoid access of unauthorized person. These technique is mainly used for square size

image, as it is illustrated in paper psnr value for square image is not identified because value of original image is being used in psnr formula but watermarked image size is enhanced but for the images of different size can be evaluated easily. Histogram is a better technique as compared to psnr as it readily shows the results of square size or different size images. We can look forward for the work where we can find the psnr of each and every image for that concentration should be on the psnr formula.

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