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Digital Watermarking Using Discrete Wavelet and Cosine Transformation

Mayuri Alamalkar *(Department of Computer Science, Pune University, India)*

Ashwini Mitkari *(Department of Computer Science, Pune University, India)*

Sonali Patole *(Department of Computer Science, Pune University, India)*

Prof. Amol G. Baviskar *(Department of Computer Science, Pune University, India)*

Abstract

Digital Watermarking has emerged as a new area of research in an attempt to prevent illegal copying and duplication. Now a days the use of computer network has boosted the use of information technology. Thus the digital information which includes images, videos, text etc. is easily available to anyone. At the same time care is taken to prevent the unauthorized use of the images commercially. To fullfil these need owners moved towards watermarking. In this the embedding and extraction technique for watermarking is presented based on DCT & DWT transforms. In this technique the insertion and extraction of the watermark in the gray scale image is found to be simpler than other transform techniques. Various values of PSNR's, NC's are analyzed for watermarked image quality and extracted watermark quality. This introduces the basic concepts in digital watermarking.

Keywords -Digital watermarking, Discrete Wavelet Transform, Discrete Cosine Transform, Peak Signal to Noise Ratio (PSNR), Normalized Correlation (NC).

1. Introduction

The multimedia industry unauthorized manipulation and reproduction of original digital objects are continuously increases because of The development of effective digital image copyright protection. The new technology of digital watermarking has been advocated by many specialists as the best method to such multimedia copyright protection problem. It's expected that digital watermarking will have a wide-span of practical applications such as digital cameras, medical imaging, image databases, and video-on-demand systems, among many others. In order for a digital watermarking method to be effective it should be hardly noticeable and vigorous to common image manipulations like compression, filtering, rotation, scaling cropping, and collusion attacks among many other digital signal processing operations. The digital image watermarking techniques can be divided into two major classes: spatial-domain and frequency-domain watermarking techniques.

Compared to spatial domain techniques, frequency-domain watermarking techniques proved to be more effective with respect to achieving the hardly noticeable and vigorous requirements of digital watermarking algorithms. Digital Watermarking is an alteration of the commonly used and well known paper watermarks to the digital world. Digital Watermarking describes methods and technologies that hide information, for example a number or text, in digital media, such as images, video or audio. The embedding takes place by manipulating the substance of the digital data, which means the data is not embedded in the frame around the data. The hiding process has to be such that the modifications of the media are hardly noticeable. For images this means that the modifications of the pixel values have to be undetectable.

The most commonly used transforms are Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) .In this paper, a digital image watermarking algorithm is described which is based on combining two transforms; DWT and DCT. The DCT has high energy compaction property and requires less computational resources. The energy compaction property of an algorithm refers to the ability to concentrate most important information signal into as much as few low frequency component. On the other hand, DWT is a multi-resolution transform and variable firmness can be easily achieved. The main

disadvantages of DCT are introduction of false contouring effects and blocking artifacts at higher compression, and, that of DWT is requirement of large computational resources. In this paper we will describe the method of digital watermarking using combined DWT-DCT. The DCT and DWT transforms have been comprehensively used in many digital signal processing applications. In this section, the two transforms are briefly introduced, and outline their relevance to the implementation of digital watermarking.

2. Related Work

The Internet is an brilliant sales and distribution channel for digital resources, but copyright fulfillment and content management can be a dispute. These days, digital images can be used all over with or without permission. Images that are leaked or misrepresented can spoil advertising efforts, brand image and, eventually, sales. With one click, your digital assets can be detached from your copyright information, so guarding brand and academic property resources is indispensable. Watermarking solutions let you add an additional stratum of fortification to your digital images.

A.Digital Image Watermarking[1]

The following definitions will refer particularly to watermarking applied to digital, grayscale images. A cover image is an image file into which a secret image will be embedded. A stego image is an image file which has been distorted to contain a significance. This is also referred to as a watermark. A clean image is an image which has not been altered since its formation.

B.What Is Digital Watermark?[4]

A digital watermark is best described by comparing it to a conventional paper watermark. Traditional watermarks are supplementary to some types of paper to offer proof of legitimacy. They are undetectable, excluding when the paper is held up to a light for examination. Similarly, digital watermarks are added to digital images in a way that can be seen by a computer but is invisible to the human eye. A digital watermark carries a message containing information about the inventor or dispenser of the image, or even about the image itself. A digital watermark is used to communicate copyright information about an image in order to trim down copyright violation. A person opening a digitally watermarked image in a image editing application or our Internet- or Windows-Explorer reader receives notification through a copyright symbol ((c)) that the image contains copyright and possession information. The digital watermark can provide a link to entire contact details for the copyright controller or image dispenser, making it easy for the observer to permit the image, license another one like it, or charge new work. Digital watermarks are hardly noticeable to the human eye, yet provide images with a strong, persistent identity. To help hide the digital watermark, varies the digital watermark energy within the image so that it remains imperceptible in both horizontal and detailed areas. The digital watermark is vigorous, existing many characteristic image edits and file format conversions.

3. Implementation

In the given research work we have to projected methodology of image watermarking, basically we will imbed the original image into the cover image both images will be a bitmap images. After completion this process watermarking image will be generated. At the other end when final recipient receive the watermark image he will extract the given using two special approaches

1: DCT

2: DWT

We have mainly focus to differentiate the result between the DCT and DWT using fractal methodologies[2]. We will get different results for BER Bit Error Rate, SNR Signal to Noise Ration, PER Packet Error Rate, Gaussian, Noise ration etc then finally evaluate the system presentation using mathematical modules like precession and evoke.

A. System Architecture

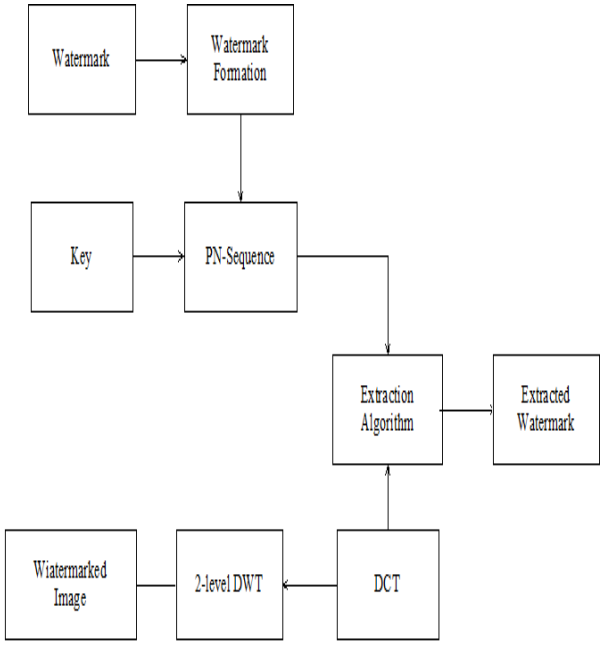

Fig. DWT-DCT watermark extraction procedure

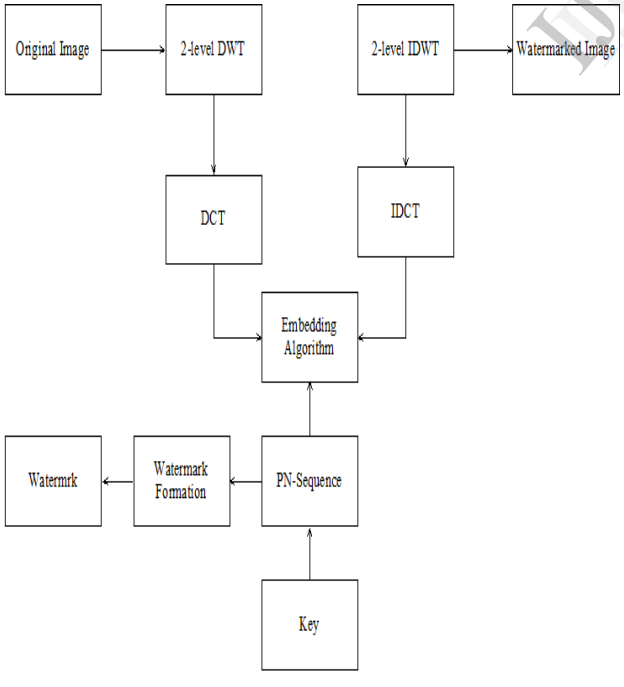

Fig.DWT-DCT watermark Embedding procedure

B. Algorithm

1. DCT

A discrete cosine transform (DCT) expresses a restricted sequence of data points in terms of a sum of cosine functions oscillating at different frequencies. DCTs are important to frequent applications in science andengineering,from lossycompression of audio (e.g. MP3) and images (e.g. JPEG), to spectral methods for the algebraic solution of partial differential equations. The use of cosine moderately than sine functions is critical in these applications: for compression, it turns out that cosine functions are much more efficient where as for differential equations the cosines express a finicky choice of boundary conditions.In particular, a DCT is a Fourier-related transform analogous to the discrete Fourier transform (DFT), but using only real numbers.

2. DWT

In numerical analysis and functional analysis, a discrete wavelet transform (DWT) is any wavelet transform for which the wavelets are discretely sampled. As with other wavelet transforms, a key benefit it has over Fourier transforms is sequential declaration: it captures both frequency and location information .

4.Result

In this paper, a number of colored host images and colored watermark logos are used. The paper results are accomplished in the form of watermarked image quality and extracted watermark quality. The quality metrics of watermarked image and extracted watermark are measured in terms of Normalized Correlation (NC) [3], and Peak Signal to Noise Ratio (PSNR)[7] and Universal Image Quality Index (Q)[5].Whenever there is enhance in size of watermark causes decrease in PSNR.

5.Conclusion

In this paper inevitability of digital watermarking, different techniques of watermarking are discussed. Here a relative study of different images has been done using PSNR, Qand NC. The proposed algorithm with colored images shows brilliant PSNR to different images like LENA image. This algorithm shows that increase in size of watermark decreases the

PSNR. So one can prefer dimension of the watermark as per requirement.

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