Comparative study of single watermarking to multiple watermarking over a color image

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Abstract- Digital watermarking in recent years outshined due to the excessive unauthorized usage of digital information .In order to protect the copyright of the digital Information, watermarks are embedded into the digital information. thus, digital watermarking is a technique that embeds watermark (single or multiple) to hide the secret signal into digital signal which preserves the overall quality of the image. Watermarking has been useful in various application such as copyright control, authenticity of documents, captioning ,broadcast ,monitoring, in contrast to this digital watermarking, multiple watermarking has been drawing attention because of the robustness it provides, multiple watermarks provides extra protection by embedding more than one watermark on the image. Thus in the present review contrast of single watermarking to multiple watermarking has been proposed.

Keywords – Watermarking, LSB, DWT, DCT, multiple watermarkimg

I. INTRODUCTION

In the new era of technology,Internet has seemed to publicise the digital data such as audios,videos,images to thpublic.technological advancements in both software and hardware are making communication easy and cost effective which in yurn is producing large volume of digital information being transmitted through the internet and communication networks. This advancement,in recent years,has created awareness on the risk of piracy and on the importance of protection of content being shared.several researchers have been focused on providing solutions to copyright protection and authentication.yhese techniques mainly fall in three categories stegnography,cryptography and watermarking.out of this watermarking has gained more popularity for proving integrity and authenticity of th owner[2,3 and 4].digital watermarking ,the technology embeds a data , an unprecievable digital code, namely the watermark, carrying information about the copyright status of the work to be protectedThere are two important properties of a watermark; the first is that the watermark embedding should not alter the quality and visually of the host image and it should be perceptually invisible, the second property is robustness with respect to image distortions. This means that the watermark is difficult for an attacker to remove and it should be also robust to common image processing and geometric operations, such as resizing, scaling, cropping, filtering and rotation [1]. it embeds a watermark with intellectual property rights into images videos, audios and other multimedia data by a certain algorithm.

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II. PROPOSED ALGORITHM

2.1 Basics of watermarking

A watermarking algorithm embeds a visible or invisible watermark in a given multimedia object.the embedding process is guided by use of secret key which decided the locations wirhin image(multimedia object).Where watermark would be embedded

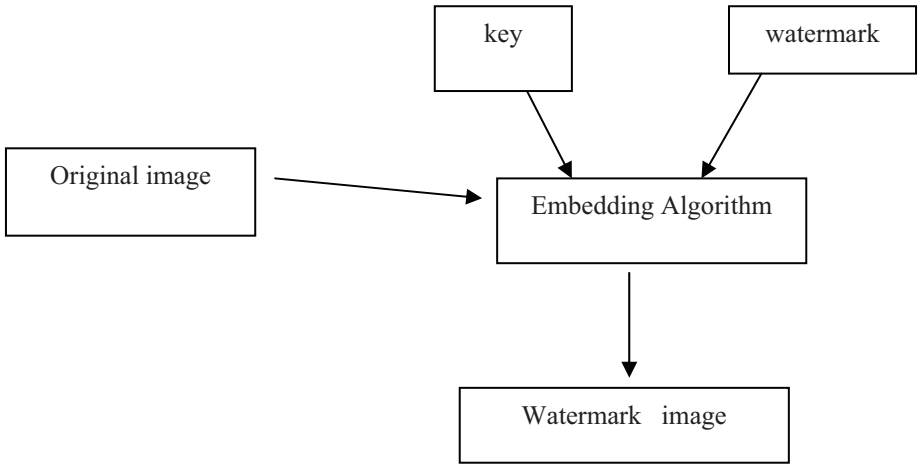

Figure1: Watermark Embedding

2.2 Watermark extraction algorithm –

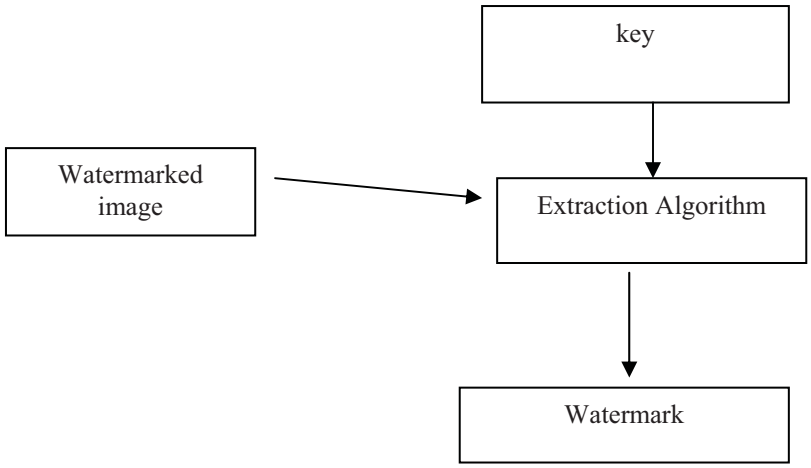

Figure2: watermark Extraction

III.WATERMARKING DOMAINS:

Based on their embedding domain, watermarking schemes can be classifieds either as spatial domain or transformed domain.In spatial, the watermarking system directly alters the main data elements like pixels in an image, to hide the watermark data.In the transformed domain,the watermarking systems alter the frequency transforms of the data elements to hide the watermark data

3.1 .Spatial domain method

The spatial domain method is the normal image space ,in which a change in position in I directly projects to a change in position in space.distances in I(in pixeks) corresponds to real distances(e.g. meters) in space.this concept is used most often when discussing the frequency with which image values change,that is over how many pixels does a cycle of periodically repeating intensity variations occur[5]

3.2.Transform Domain method

The produce of high quality watermarked image is by first transforming the original imagei nto the frequency domain by use of fourier,discrete cosine transform or discrete wavelet transform. Each of these transform has its own characterstics and represents the image In different ways,watermarks can be embedded within images by modifying these values i.e.the transform domain coefficients.

IV.WATERMARKING TYPES

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4.1. Digital watermarking:
A safeguard against failures of encryption and/or copy protection, *digital watermarking* has been proposed as a "last line of defense" against unauthorized distribution of valuable digital media [6,7]. A digital watermarking system embeds information directly into a document. For example, information about copyrights, ownership, timestamps, and the legitimate receiver could be embedded.the watermarking techniques are grouped as text-based watermarking [8], imagewatermarking [9], video watermarking [10], audio watermarking[11] and 3D watermarking [12]. As almost 90% of the content being transmitted in image and video [13,14]more number of techniques have been developed for these two groups. Digital watermarking is an algorithm that can be used to protect the host media.the watermark contains the useful certified information for the owner of the host media.the watermark later can be extracted or detected to make an assertion about the host media.

4.2. Multiple watermarking:
In relation to digital watermarking, another area that is drawing attention is the multiple watermarking where multiple watermarks are embedded into single multimedia object[16].multiple watermarks are normally proposed as a method to provide extra security to an image by embedding two or more secret messages into the cover image. The goals of such schemes(multiple watermarking)is to propose a robust watermarking technique that has the confidentiality ,availability, reliability. the reliability can be achieved through integrity and authenticity.moreover multiple watermark aims at providing two major conflicting requirements first it must not introduce any distortion in the host image and the watermark should be immune against the intentional and unintentional attacks or removal. Finally the criteria for transparency and the capacity are to made efficient while using multiple watermarking over an colored image..thus multiple watermarking acts as an authentication mechanism and which can protect the copyright information[17].The initial contribution to the field of multiple watermarking
was proposed , where methods to recover multiple watermarks from the same image was first shown. This work was followed several contributions. According to , the insertion of multiple watermarks can be exploited to convey multiple sets of information. Most of the works focus on extending single watermarking algorithms to use multiple watermarks . Proposed the use of virtual border, where extra line of pixels was added around the image as borders and watermarks were embedded within these borders. Used the concept of multiple watermarking to protect relational database using images. Employed pair-coupled maps to improve the security of watermarked image, and to encrypt the embedding position of the host image. [18]

V.WATERMARKING METHODS

5.1. LEAST SIGNIFICANT BIT:
The most common method of watermark embedding is to to embed the watermark into the leastsignificant-bits of the cover object[15]. One of the simplest technique in digital watermarking is in spatial domain using the two dimensional array of pixels in the container image to hold hidden data using the least significant
bits (LSB) method.

5.2 . Steps of Least Significant bit
1) Convert RGB image to gray scale image.
2) Make double precision for image.
3) Shift most significant bits to low significant bits of watermark
4) Make least significant bits of host image to zero
5) Add shifted version (step 3) of watermarked image to
modified (step 4) host image.[b]

LIMITATIONS:

This method is comparatively simple, lacks the basic
robustness

5.3. DISCRETE COSINE TRANSFORM WATERMARKING

In the transform domain, the dct technique, the image is first divided into square blocks of size 8x8 for DCT computation. A pair of mid-frequency coefficients is chosen for modification from 12 predetermined pairs. a method is developed that modifies DCT coefficients satisfying a block site selection constraint. After dividing the image into blocks of size 8x8, certain blocks are selected based on a Gaussian network classifier decision. The middle range frequency DCT coefficients are then modified, using either a linear DCT constraint or a circular DCT detection region. A DCT domain watermarking technique based on the frequency masking of DCT blocks was introduced by Swanson.[a]

Advantages

1) DCT domain watermarking is comparatively much better than the spatial domain encoding since DCT domain watermarking can survive against the attacks such as noising, compression, sharpening, and filtering.

2) It use JPEG compression method to apply DCT watermarking as a parameter. One may use different parameters related to image processing, and these parameters might provide equal or even stronger robustness against various attacks based on image processing.

3) Discrete cosine transform (DCT), where pseudorandom sequences, such as M sequences, are added to the DCT at the middle frequencies as signatures.[b]

5.4. Discrete Wavelet Transform

The DWT (Discrete Wavelet Transform) separates an image into a lower resolution approximation image (LL) as well as horizontal (HL), vertical (LH) and diagonal (HH) detail components. The process can then be repeated to computes multiple "scale" wavelet decomposition. one of the many advantages over the wavelet transform is that that it is believed to more accurately model aspects of the HVS as compared to the FFT or DCT. This allows us to use higher energy watermarks in regions that the HVS is known to be less sensitive to, such as the high resolution detail bands {LH,HL,HH).[a]

Advantages

1) The watermarking method has multi resolution characteristics and is hierarchical. It is usually true that the human eyes are not sensitive to the small changes in edgesand textures of an i image but are very sensitive to the smallchanges in the smooth parts of an image. With the DWT, the edges and textures are usually to the high frequency subbands, such as HH, LH, HL etc. Large frequencies in these bands usually indicate edges in an image [b]

VI.FACTORS AFFECTING WATERMARKS

Robustness. The watermark should be reliably detectable after alterations to the marked document. Robustness means that it must be difficult (ideally impossible) to defeat a watermark without degrading the marked document severely—so severely that the document is no longer useful or has no (commercial) value

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Imperceptibility . To preserve the quality of the marked document, the watermark should not noticeably distort the original document.

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Security. Unauthorized parties should not be able to read or alter the watermark. Ideally, the watermark should not even be detectable by unauthorized parties.

Fast embedding and/or retrieval. The speed of a watermark embedding algorithm is important for applications where documents are distributed. The large bandwidth necessary for video also requires fast embedding methods.

Multiple watermarks. It may also be desirable to embed multiple watermarks in a document. For example, an image might be marked with a unique watermark each time it is downloaded

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Unambiguity. A watermark must convey unambiguous information about the rightful owner of a copyright, point of distribution, etc.

VII.COMPARATIVE STUDY BASED ON THE REVIEW STUDY

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Factors	Single watermarking	Multiple watermarking
robustness	Less robust	More robust
Imperceptibility	Quality may not be restained	Assurance of no loss
Security	Less secure	More secure
Unambiguous	More ambiguous	Less ambiguous

VIII. CONCLUSION

Digital image watermarking algorithms have been used for the past few years, which increase robustness of the watermark against different kinds of attacks and embed a single watermark for this purpose. Recently, the usage of multiple watermarks has attracted several proposals [18,19]. While in most of the cases, multiple watermarking is used in multimedia applications, it has also been used in other applications like protection in wireless sensor networks .In this paper a review has been made on the digital watermarking to the multiple watermarking

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