A SURVEY OF DIGITAL IMAGE WATERMARKING TECHNIQUES

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ABSTRACT

Security of multimedia data is very crucial for the internet based technology as there are several problems associated with the multimedia content. The problems are replication and content distributed at several sites. The technique of digital watermarking is playing a vital role for securing the multimedia data as it hides the relevant information so that no replicated copies can be formed further and this prevent from the unnecessary explosion of data or distribution of data. Several techniques are given for the encapsulation of the contents like audio, text, video and images. In this technique, some secret information is included in the data so that its consistency can be maintained. This secret information can be an image cover and further during decryption this can be removed for authorization and copyright protection. This paper reviews different methods of digital watermarking for protecting digital information.

Keywords—DCT, DWT, DFT.

I. INTRODUCTION

Image watermarking is becoming more popular due to large use of multimedia applications and internet. Image watermarking hide the digital data into the host image or cover image in the form of logo/audio/video or text. Copyright protection, content protection, ownership identification, data integrity are the main applications of the digital watermarking .A Digital watermarking is a kind of marker embedded in noise tolerant signal such as audio or image data. The digital watermarking is typically used to identify ownership of the publishing of such signal. Watermarking is the process of hiding digital information in a carrier signal. The hidden information should be digital but does not need to contain a relation to the carrier signal. The convention watermarks may be applied to visible media (like image or video), where as in digital watermarking the signal may be audio , pictures, video, text, or 3D models.

The development and growth of internet has yield the new challenges to protect digital data from piracy [1]. The digital watermarking techniques manages a superior and robust, solution for ownership problem These watermarks are arduous to remove by altering or damaging the original host image. The digital image watermarking is

techniques of embedding watermark into audio signal to show authenticity and ownership proof. watermark into audio signal to show authenticity and ownership proof.

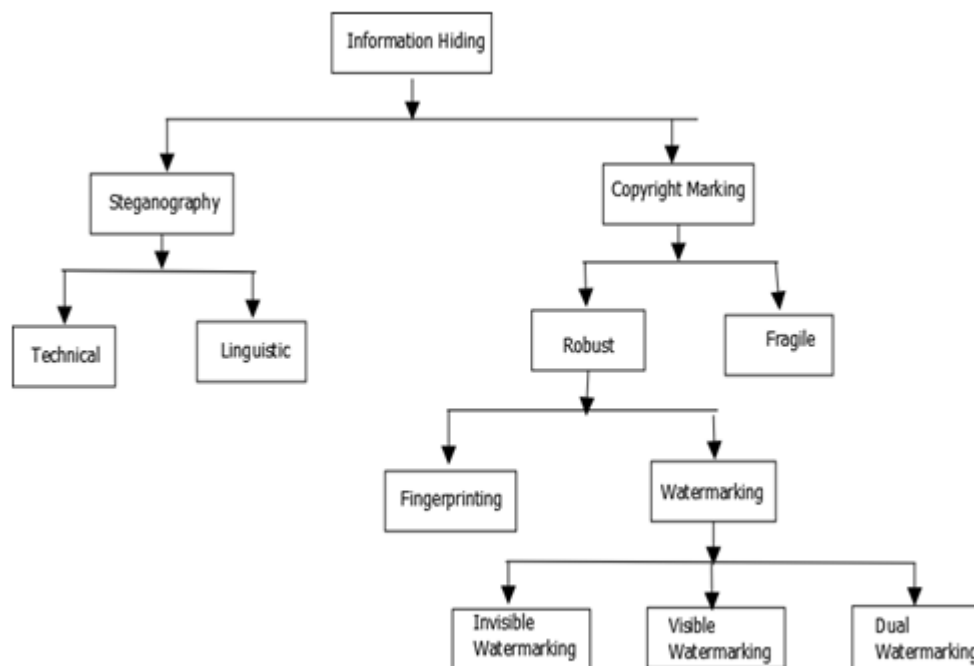The several types of information hiding are described in thefollowingdiagram.

Figure 1: Different Categories of Information Hiding

II.REQUIREMENT OF DIGITAL WATERMARKING

The resources of an optimal image watermarking system, some desire feature requirement to be taken into consideration. Some important feature are as follows

- **Perceptual Transparency**

Perceptual transparency is the basic requirement of the watermarking [2]. The watermark which has embedded as the owner's information should not degrade the quality of the host signal . The watermark cannot be seen by human eye.

- **Robustness**

The embedded watermark should not be removed from the host image even after exploring the watermarked information to different kind of attack [3] is one of the major design issues for all watermarking applications.
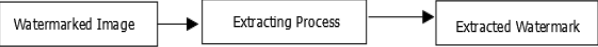
- **Security**

The security of the watermarking system is protégé on the user of private or secret key .

- **Data rate**

The number of watermark that is embedded with in a host signal is termed as data payload [4]. For audio, data payload refers to the number of watermark bits that may be reliably embedded within a host signal per unit time, usually measured using bits per second (bps).

- **Verification**   **and reliability**

The   watermark   Watermarked Image → Extracting Process → Extracted Watermark   should   be   able   to   manage complete and reliable information for proving ownership of copyright products. Watermarking process should be giving the reliability of recovery of watermark.

III.WATERMARKING PROCESS

There are two most popular digital watermarking techniques included in spatial domain and transformation domain. The techniques consist of two main sub processes.

1. Embedding Technique

2.   Extraction Technique

Embedding technique

The embedding block, show in figure 1 consist of original image, embedding process ,as the input creates the watermarked image.

Extraction Technique

The extraction technique is watermarked image, extraction process and sometimes watermark as shown in figure 2.

In 'Blind Watermarking' original image is not used during extraction process.

IV. APPLICATION OF WATERMARKING

There are several applications of digital image watermarking.

1.Digital Signatures

Watermarking is the use to identify the owner of the content. By having this information, the user may content the owner for acquiring the legal rights to copy or using the content [5].

2. Broadcast Monitoring

The watermarking is the automatic identification of owners of data may be required to be done and used in systems responsible for the monitoring the broadcasts.
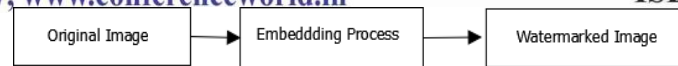
3.Copy Control

The watermarking is the contain information required by the content owner that decided the policy of copying the digital content. The device used for copying the content may be required by law to contain watermark detector, which follows directives given by the content owner [6] [7].

4.Authentication

The watermark is used to manage authentication. The managing an incorrect watermarked image can either destroy the watermark or leads to incorrect watermark after extraction.

5.Secret Communication

The process of watermarking is also used in transmitting secretly information from source to goal in a hidden way. Several public domain and shareware programs are available which use watermarking for secret communication [8].

V.IMAGE WATERMARKING TECHNIQUES

Based on working domain, Image watermarking techniques is divided in to two domains

1.Watermarking based on Spatial Domain

The most extremely straight forward and fundamental scheme for the field of digital watermarking are watermarking in the spatial domain. At the beginning of the watermarking research while designing the embedded and extraction algorithms, researchers tended to propose schemes to add a pseudo random noise pattern or the watermarking to the original image by modify the luminance values of the pixels in the spatial domain like the methods in one of the earliest paper this approach [9] [10].

Spatial watermarking is embedded easily and fast but they are generally considered fragile [11] [12] [13].

- **General Embedding Structures in the Spatial**

The spatial domain watermarking the watermarking is embedded by altering the pixel values slightly in the spatial domain pixels. A typical example is proposed by pitas [14] [15]. Assume the binary bit pattern watermark W to be embedded into the original media X. If the watermark size is smaller than that of the original, it can be replicated until its size is the larger than the original. The embedded procedure can be represented by: -

$X_i = X_i + \alpha_i . W_i$

Where i represents the positions to be embedded, α_i denotes the strength factor [16] [17].

- **General Extraction Structures in the Spatial Domain**

The watermark extraction in the spatial domain is a cross correlation techniques. To detect a watermarked in a possibly watermarked image X_i', we calculate the correlation between the received the image X_i' which is possibly corrupted or attacked and the pseudo random noise pattern Wi by [18] [19].

2.Watermarking Based on Transform Domain

The watermarking based on transform domain is mostly encountered in literature. Among the practical schemes discrete cosine transform(DCT) [17] and discrete wavelet transform (DWT) [20] [21] the most popular transform coding scheme for academic researches and practical implementations

- **General Structures for Transform Domain Watermarking**

The scheme for embedding the watermarked in the transform domain is also called the multiplicative embedding rule, which can be denoted by

$$X_i' = X_i.(1+\gamma W_i)$$

Where Xi and X is stand for the watermarked media and the original counterpart, and w denoted the watermark, and γ is the gain factor.

The watermarking with length L, i∈ [0, L, -1].

The correlation (Rx, w) between the possibly attacked image X", and the watermark W, can be calculated by

$$R_{x''} = \frac{1}{L}\sum_{i=0}^{L-1} X''i. \text{Wi}$$

- **Discrete Cosine Transform (DCT)** It is a process which converts a sequence of data points in the spatial domain to a sum of sine and cosine waveforms with different amplitudes in the frequency domain. The DCT is a linear transform, which maps an n-dimensional vector to a set of n coefficients. It is very robust to JPEG compression, since JPEG compression itself uses DCT. However, DCT methods lack resistance to strong geometric distortions

3. Image Adaptive Transform Domain Watermarking

All watermarking scheme do not employ explicitly the human visual model in the marking process. The image adaptive scheme proposed by podilchuk and Zeng has a specific feature. The zero-mean unit variance white Gaussian mark is added as follows:

$$X(i,j) = \begin{cases} X'(i,j) + J(i,j)W(j,j), if X(i,j) > J(i,j) \\ X,(i,j) \qquad Otherwise. \end{cases}$$

Because the mark is added to the components that are greater than J(i,j), the number of mark components is picture dependent. A process like the decoding process of the spread spectrumscheme is used to extract/detect the mark. It is reported that this scheme can survive strong cropping,

VI CONCLUSION

This paper provides detailed and comparative analysis of various digital watermarking techniques and application. The procedures of watermark embedding extraction have also been discussed in this paper.We have tried to provide all the necessary information about digital watermarking techniques which would be of important to all the researchers.

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