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A Study of Orthogonal Components for Visible Image Data Hiding

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Abstract:- Digital data security covers many topics like authentication, copyright related protection and controlling of all still images, audio, multimedia related products. So the watermarking technique is so important because it is relevant to these protection areas. Watermarking technique can be classified in two types, Transformed Domain & Spatial Domain. In this paper we discuss about the process of marking digital pictures with undetectable hidden information but visible, which is called Watermark. It is based on complete Copyright Protection System (CPS). Digital Watermark Technique is a technology which is used for copyright protection of media & all digital applications. It is done by using Principal Component Analysis (PCA) & Discrete Wavelet Transform (DWT).

Keywords: Digital Watermarking, Copyright Protection, Digital Data Security.

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I. INTRODUCTION

We use Digital Image in daily life. The use of digital Image is growing day by day. Digital Image comprise audio & Image conferencing, digital cinema, distance learning program, entertainment programs, Image-on-demand, surveillance, advertising. All users involve in digital Image like when they watch motion picture which is recorded on a digital Image disc (DVD). So the owners of digital products are related of illegal copying of their products. So the security and protection of these products are very important.

It is a pattern inserting bits into the digital image (like as .jpeg, .jpg, .png etc.), audio or Image files that recognize the file's copyright related information (author's name, publication and rights). The name of owner's organization comes in the fainted manner visible watermarks, which is printed stationery. The main purpose of digital watermarks is providing copyright protection.

II. LITERATURE SURVEY

2.1 Digital Watermarking

It requires many different types of elements from many disciplines like signal processing system, cryptography, telecommunications network, psychophysics,

law. We target on the processing of inserting and retrieving watermarks in the formatted text documents, images and Image file [1]. We highlighted the signal processing & telecommunications facets of watermarking techniques because it is digital watermarking techniques which is a new topic [2].

2.2 Classification

This technique can be differentiated broadly into the four categories based on the type of the multimedia document, which to be watermarked:
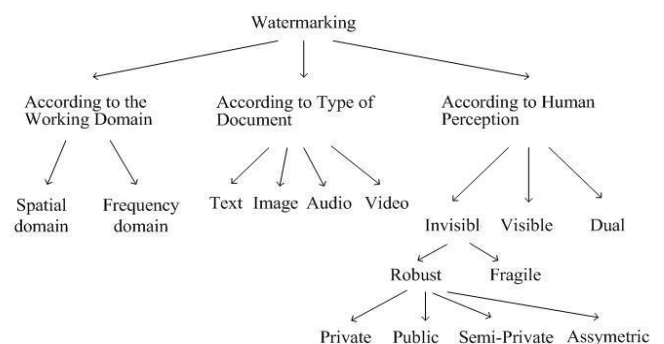

Fig. 2.1 Classification of Watermarking.

For the effectiveness of watermark technique there are several properties and attributes essential like Security, Robustness, Multiple watermarks, Imperceptibility. They

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depend upon the application of watermarking [3]. Continuous efforts in this field are making watermarking technique efficient but the technique is not robust to the attacks and the operations of multimedia data processing operations.[4] Discrete Wavelet Transform (DWT), Discrete Cosine Transform (DCT) or Discrete Fourier Transform (DFT) are the reversible conversions techniques which are used in the transferring an image to its representation.[5]

2.3 The Spatial Domain Techniques

In this technique data is inserted into digital signals in the noise free environments.

2.4 Transformed Domain Techniques

Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT) and Discrete Fourier Transform (DFT) are the Transformed Domain Techniques, which are used as the technique of data changes. In these methods, watermark is inserted distributive manner in the domain of the original data & the watermark, which is inserted is very hardly to removed or destroyed after inserting.

2.5 Application of digital watermarking

Digital watermarking is very widely and very successful in the many more media objects in the wide range of different application, like

- Copy protection
- Source Tracking
- Broadcast
- Finger printing
- Medical safety
- Data authentication
- Broadcast monitoring
- Copyright Protection
- Data Hiding

III.   PROPOSED APPROACH

3.1 Discrete wavelet transform

Discrete wavelet transform is the alternative of the wavelet transform. It represents alternative to cosine

transform which used in the standard JPEG format. It is based on the tree structure with D levels, which can be implemented by using an relevant collection of the filters. Most watermarking schemes operate on the Discrete Wavelet Transform (DWT) or the Discrete Cosine Transform (DCT) domain [10, 11]. Some watermarking algorithms contain exotic transforms like the Fourier-Mellin Transform.

3.2 DWT and Filter Banks

3.2.1 Multi-Resolution Analysis using Filter Banks

The most widely used & appropriate signal processing task is filters. Indication of the measuring resolution in the detail information DWT is computed by the successive low pass and high pass filtering of the discrete time-domain signal in the sign, which is resolved by the filtering operation. This method is called Mallet algorithm.

At every level of decomposition the half-band filters produces signals, which spans only half frequency bands. When we doubles the resolution of a frequency the ambiguity in the frequency is reduced by half. The Nyquist's rule consist that, when the original signal has the peak value of frequency f, it requires 2f radians of sampling frequency, then it has the highest value of frequency of f/2 radians. It is sampled at the frequency of f radians which discarded half of the samples and we doesn't loss any information.

When we use this approach time resolution becomes swiftly good at the peak frequency. DWT of a signal is obtained by the all coefficients.

Approximation & the detail coefficients at each level are the two up sampled, which passed through the low pass & high pass synthesis filters and after that they are added.

3.2.2 Conditions for Perfect Reconstruction

In the most Wavelet Transform application, it is mandatory that the original signal has to be synthesized from the wavelet coefficients. Let G_0 (z) and G_1 (z) are the low pass analysis and synthesis filters, respectively and H_0 (z) and H_1 (z) high pass analysis and synthesis filters

respectively. These filters satisfy the following two conditions which are:

$$G_0 (-z)G_1 (z) + H_0 (-z).H_1 (z) = 0 \qquad (3.1)$$

$$G_0 (z)G_1 (z) + H_0 (z).H_1 (z) = 2z^{-d} \qquad (3.2)$$

In the first condition, the reconstruction is aliasing-free and in the second condition, amplitude distortion has one of the dimensions. The accuracy of this transform is determined after the reconstruction by the calculation of the Signal to Noise Ratio (SNR) signal.

After the transformation of the original image into the DWT, it is decomposed in 4 region frequency, which is one low-frequency region (LL) and three high-frequency region (LH, HL, HH).

If the information of low-frequency region is DWT transformed frequency then we obtain sub-district level information. After a 2D image three times decomposed, the L represents low-pass filter and H shows the high-pass filter. We can decompose an image in frequency HL1, LH1, and HH1 region. Low frequency region Information can also be decomposed into the sub-level frequency region LL2, HL2, LH2 and HH2 information.

Our eyes are very sensitive to the changes in the region of smooth image but they are not very sensitive in the tiny torrent or in the changes streak.

3.3 Principal component analysis

It is a mathematical procedure, which uses orthogonal transformation for changing the set of observation of variables into the set of values of unrelated variables, which are called the major components. By reducing the number of these components, the first major change possible variance is defined in this way.

IV. CONCLUSION AND FUTURE SCOPE

After the study we conclude that we can use the watermarking technique in the frequency domain of many digital applications. We can also used in the advanced encryption technique.

Watermark technique is viewed as the software and can be reported by the unique id code, which can be traced to the copyright owner.
In the future the concept of the watermarking technique like Digital watermarking technique and cryptography can be combined in the secure digital watermarking system.

Some other companies offering on-line tracking services, by using it the owner who is a copyright owner, can see the whole information related to the objects or materials.

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