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A Survey on Digital Image Watermarking Techniques Based on Frequency Domain

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Abstract-Digital image watermarking techniques base on frequency domain in dwt against different attack and digital watermarking is weak to various attacks in frequency domain, digital watermarking has applications in several areas like broadcast monitoring, copy right protection etc. digital image watermarking is that the method .the proprietor of a copyright holder in a digital image watermarking works for copyright protection. Digital image watermarking quality is effect of DWT. Discrete wavelet transform based fully image watermarking technique, classification and analysis of frequency domain based watermarking techniques. A digital image high protection has proposed technique a discrete wavelet transform based high robust technique based on the method of watermark embedding and extraction is also given host image. It's not visible watermark .digital watermarking will be used to protect digital info from illegal and it's additionally high robust in digital image.

Keywords— Digital Image processing, Watermarking, Visibility, Frequency domain, Robustness, DWT, PSNR.

I. INTRODUCTION

The digital communication technology, like internet technology confronts various difficulties related to the privacy and security of the data. Security techniques are required because of illegal access of data without permission. Therefore, it is necessary to protect data in the internet technology. For providing the security of digital data various techniques are used like encryption, decryption, cryptography, steganography and digital watermarking. In this paper discusses about the digital watermarking. The digital watermarking is an application of the digital image processing. The digital watermarking is a process of information hiding. There are various techniques for hiding the information in the form of digital contents like image, text, audio and video. Basically digital watermarking is a method for embedding some secret information and additional information in the cover image which can later be extracted or detected for various purposes like authentication, owner identification, content protection and copyright protection, etc. Sometimes the scaling factor is also used for embedding the watermark in the cover image. The digital watermarking is used for the security of the digital content and to protect the data from illegal users and provides the ownership right for the digital data. An important characteristic of digital watermarking is robustness and imperceptibility against various types of attacks or common image manipulation like rotation, filtering, scaling, cropping and compression. The efficiency of digital watermarking algorithms is totally based on the robustness of the embedded watermark against various types of attacks. Digital watermarking is a method used to improve the ownership over image by replacing low level signal directly into image. Digital watermarking method is also used for the tamper proofing and authentication [1].The digital image watermarking is divided into two part first watermark embedding and part next watermark extraction. A watermarking system is usually divided into three distinct steps, embedding, attack and detection. In embedding, an algorithm accepts the host and the data to be embedded and produces a watermarked signal. The watermarked signal is then transmitted or stored, usually transmitted to another person. If this person makes a modification, this is called an attack. There are many possible attacks. Detection is an algorithm which is applied to the attacked signal to attempt to extract the watermark from it. If the signal was not modified during transmission, then the watermark is still present and it can be extracted. If the signal is copied, then the information is also carried in the copy. The embedding takes place by manipulating the content of the digital data, which means the information is not embedded in the frame around the data, it is carried with the signal itself.

1.1 Frequency Domain

The most commonly used transforms are the Discrete Cosine Transform, Discrete Fourier Transform, and Discrete Wavelet Transform. The discrete wavelet transforms and the discrete cosine transforms are implemented very effectively in numerous digital images watermarking scheme [2].

Discrete Fourier Transform (DFT):- Fourier Transform is an operation that transforms a continuous function into its frequency components. It has robustness against geometric attacks like rotation, scaling, cropping, and translation etc. The equivalent transform for discrete valued function requires the Discrete Fourier Transform [3].

Discrete Cosine Transform (DCT): Discrete Cosine Transform is related to DFT in a sense that it represents data in terms of frequency space rather than an amplitude space. DCT based watermarking techniques are robust compared to spatial domain techniques. Such algorithms are robust against simple image processing operations like low pass filtering, brightness and contrast adjustment, blurring etc. However, they are, difficult to implement and are computationally more expensive. At the same time they are weak against geometric attacks like rotation, scaling, cropping etc. DCT domain watermarking can be classified into Global DCT watermarking and Block based DCT watermarking [4].

Discrete Wavelet Transformation (DWT): Wavelet Transform is a modern technique frequently used in digital image processing, compression, watermarking etc.

The transforms are based on small waves, called wavelet, of varying frequency and limited duration. A wavelet series is a representation of a square integral function by a certain ortho-normal series generated by a wavelet. Furthermore, the properties of wavelet could decompose original signal into wavelet transform coefficients which contains the position information. The original signal can be completely reconstructed by performing Inverse Wavelet Transformation on these coefficients. Watermarking in wavelet transform domain is generally a problem of embedding watermark in sub bands of cover image. The wavelet transform decomposes image into three spatial directions, i.e. horizontal, vertical and diagonal [5].

1.2 Applications of Watermarking

Protection: Watermark is used to provide authentication. Providing an incorrect watermarked image can either destroy the watermark or leads to incorrect watermark after extraction.

Digital Signatures*:* Watermarks may be used to identify the owner of the content. By having this information the user may contact the owner for acquiring the legal rights to copy or using the content.

Copy Control*:* Watermark may contain information required by the content owner that decided the policy of copying the digital content. The information contained by the watermark may specify „content may not be copied" or „only one copy" etc. subsequently, the devices used for copying the content may be required by law to contain watermark detector, which follows directives given by the content owner [6].

Broadcast Monitoring*:* Automatic identification of owners of data may be required to be done and used in systems responsible for monitoring the broadcasts. This may help in deciding the royalty payments. It also helps in ensuring that commercials of a particular advertiser are played at right time and for a right duration.

1.3 Requirements of Watermarking

The major requirements for digital watermarking are:

Data Hiding: This quantity describes the maximum amount of data that can be embedded into the image to ensure proper retrieval of the watermark during extraction.

Data Reliability: Watermark should be able to provide complete & reliable information for proving ownership of copyright products. The watermarking technique should be giving the reliability of recovery of watermark. The robustness of the watermarking technique is dependent upon how securely and intelligently the watermark is embedded into the host signal without any noticeable change. Robustness of the algorithm to attacks and quality of the watermarked image are related properties that are indispensable. All applications presupposing protection and use in verification of the watermarking systems require this type of marking in order to survive any kind of alterations or intentional removal introduced by standard or malicious processing and attacks [8].

3. Perceptual Transparency: The main requirement of watermarking is perceptual transparency. 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. It can be detected by special processing or dedicated algorithms.

4. Robustness: This is by far the most important requirement of a watermark. There are various attacks, unintentional (cropping, compression, scaling) and intentional attacks which are aimed at destroying the watermark. So, the embedded watermark should be such that it is invariant to various such attacks [7].

1.4 Attacks on Watermarking

There are various possible malicious intentional or unintentional attacks that a watermarked object is likely to subject to. The availability of wide range of image processing soft ware's made it possible to perform attacks on the robustness of the watermarking systems. The aim of these attacks is prevent the watermark from performing its intended purpose. A brief introduction to various types of watermarking attacks is as under. Smoothing Attack in Smoothing filters tend to blur an image, because pixel intensity values that are significantly higher or lower than the surrounding neighborhood values change across the area. Geometric Attacks in all manipulations that affect the geometry of the image such as flipping, rotation,

cropping, etc. should be detectable. A cropping attack from the right-hand side and the bottom of the image is an example of this attack. Geometric attacks include basic geometric transformations in an image. These include geometrical distortions like rotation, scaling, translation, cropping, row-column blanking, warping etc. Geometric attacks attempt to destroy synchronization of detection thus making the detection process difficult and even impossible. [8].

II.LITERATURE REVIEW

Ali Al-Haj [9] Combined DWT-DCT Digital Image Watermarking In this paper, Watermarking is done by embedding the watermark in the first and second level DWT sub-bands of the host image, followed by the application of DCT on the selected DWT sub-bands. The combination of the two transforms improves the watermarking performance considerably when it is compared to the DWT-Only watermarking approach.

Victor V [10] have developed an algorithm that relies upon adaptive image watermarking in high resolution sub-bands of DWT. Weighting function is the product expression of data extracted from the HVS model.

N. Kaewkamnerd [11] developed a wavelet based image adaptive watermarking scheme. Embedding is performed in the higher level sub-bands of wavelet transform, even though this can clearly change the image fidelity. In order to avoid perceptual degradation of image, the watermark insertion is carefully performed while using HVS.

Chih-Chin Lai [12] Proposed Digital Image Watermarking Using Discrete Wavelet Transform and Singular Value Decomposition. A hybrid image-watermarking technique based on DWT and SVD has been presented, where the watermark is embedded on the singular values of the cover image's DWT sub band. The main objective of developing this technique is to satisfy both imperceptibility and robustness.

Wang Hongjun [13] Have proposed a DWT based method in which watermark was embedded in middle frequency coefficient using α as flexing factor with α =β |m|, where m is mean value of all coefficients watermarking embedded. But this method doesn't provide enough security.

Sasmita Mishra [14] described a survey on digital watermarking techniques, the idea behind this survey is to study different kind of watermarking techniques and present a robust watermark data using DWT and introduce fragile and semi-fragile watermarking techniques.

V Gupta [15] Robust and Secured Image Watermarking using DWT and Encryption with QR Codes. In this Paper, algorithm for embedding watermarking is presented by using DWT and encrypted with QR codes. Here cover image is selected and DWT is applied on it. A key K is selected to generate the QR code as secret key. QR code and watermark image is encrypted by using XOR operation. Then the encrypted watermark is embedded into the cover image and inverse DWT is applied on the embedded watermark image. For extraction, simply apply the DWT on the cover image. This algorithm is quite simple because of the use of simple X-OR operation for encryption. This algorithm is suitable on different kind of attacks on watermarked images like JPEG Compression, Poisson Noise Attack, Salt & Pepper Noise and Gaussian Noise.

Kwon O H [16] Proposed a watermarking method using the human visual system based on wavelet transform. The number of watermark elements is proportional to the energy contained in each wavelet transform bands. To estimate the characteristic of the image, the changing rate of a sinusoidal pattern per subtended visual angle in cycles per degree is calculated. The result is used as the visual weight of watermarks in each wavelet transform band.

Barni M et al. [17]. Have developed an improved wavelet-based watermarking through pixel-wise masking. It is based on masking watermark according to characteristics of HVS. The watermark is adaptively added to the largest detail bands. The watermark weighing function is calculated as a simple product of data extracted from HVS model. The watermark is detected by correlation.

M. Kim et al. [18]. A Robust and Invisible Digital Watermarking Algorithm based on Multiple Transform Method for Image Contents. In this paper, algorithm for embedding watermarking is presented. Firstly, the original image is compressed into JPEG image and generates the watermark by using the 2D barcode and scrambling. Secondly, JPEG image is decayed into 3 sub bands: H, V and D by using 2D DWT. Thirdly, the DFRNT (discrete fractional random transform) are performed on the sub-band coefficients. And then, watermark image is embedded into the sub-band coefficient value using quantization technique. Fourthly, the inverse DFRNT and inverse DWT is performed and lastly watermark JPEG image is obtained. The proposed algorithm has good invisibility and extraction performance, and ensures robustness

III.EXPECTED OUTCOME

A study in digital image technique will be provides a high robust in digital image. It is providing high protected digital image. It is high robustness and

rights. It is providing protected in data hiding in digital image.

IV.CONCLUSION

In this study of digital watermarking various application, challenge and limitation. In search focuses on data hiding and this paper focuses on digital image in frequency domain and digital watermarking techniques like SVD, DWT, DCT their advantages, disadvantages and applications. Both embedding and extraction of watermark is being done using the techniques. For checking the robustness of these methods various attacks on watermarked images are performed Noise in watermark embedded. Hence we have concluded that if DWT is being applied in the digital watermarking, the image becomes low robust and the watermarked quality is also low. DCT-DWT shows better results among these methods compared in terms of PSNR after attack on watermarked image.

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