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# A Review of Watermarking Scheme for Confidential Image Data Transmission

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***Abstract: Digital watermarking techniques play an important role in privacy protection and copyright protection for multimedia data. In current research trend various watermarking technique are available such as spatial watermarking technique and frequency based watermarking technique. In frequency based watermarking technique used wavelet transform function and Fourier transforms function. The transform based watermarking techniques are very good in quality assessment of watermark image, but lacked from a problem of geometrical attack such as rotation attack translation attack and noise attack. The transformation of attack in watermark multimedia data compromised with the problem of privacy protection and copyright act. For the minimization of geometrical attack used various techniques such as feature selection based watermarking and support vector based multi-class coefficient selection technique. In feature selection based watermarking technique used wavelet transform function for feature extraction. The extracted feature selected by searching technique such as direct search and heuristic based searching technique. The searched coefficient of wavelet transform used for embedding process.***

***Keywords: - Digital Watermarking, Wavelet Transform, Haar transform and Video Watermarking.***

## I. INTRODUCTION

Digital watermarking came up as a solution for authentication and copyright protection of digital contents. The use of Internet, e-commerce, digital libraries, mobile phones; besides making the dissemination of information easy and fast, have made it difficult to handle security, privacy and copyright protection issues. Copyright protection of digital contents has become a conundrum [8]. The digital watermarking, as a solution to protecting copyright, is attracting more and more attention across the globe. Most of the digital watermarking methods proposed in the past for copyright protection of digital contents were for image, audio and video. The text is a rampantly used medium of exchange of information. The major component of books, newspapers, web pages, advertisement, research papers, legal documents, letters, novels, poetry, etc. is the plain text. Therefore, copyright protection of the plain text is the most significant issue. The copyright protection solutions for text, such as the digital watermarking, are such a need of time as cannot be overlooked. A watermark is a translucent design impressed on paper during manufacture and visible when the paper is held to the light [12]. Its purpose is to stop imitation, by making the watermark near impossible to reproduce. The concept of Digital watermarking considers this process in the digital domain from the ethos of cryptography and steganography. The purpose of a digital watermark is to hide within an image or audio file some data specifically relating to that file. The base requirement of a watermarking technique is that adding a mark to a sound file should not degrade its quality[10]. The watermark should survive altering operations and remain detectable. Section II discusses video watermarking and classification of digital watermarking based applications. Section III discusses related work. Section IV discusses Problem formulation. And Section V discusses comparative result analysis. Finally, concluded in section VI.

### *CLASSIFICATION OF IMAGE WATERMARKING TECHNIQUES*

The frequency sensitivity refers to the eye's response to spatial, spectral, or time frequency changes. Spatial frequencies are perceived as patterns or textures, and spatial frequency sensitivity is usually described as the eye's sensitivity to luminance changes. It has been shown that an eye is the most sensitive to luminance changes in the mid-range spatial frequencies, and that sensitivity decreases at lower and higher spatial frequencies. Digital image watermarking schemes mainly fall into two broad categories:

1. Spatial-domain techniques.
2. Frequency-domain techniques.

### 1 Spatial Domain Techniques

Spatial watermarking can also be applied using color separation. In this way, the watermark appears in only one of the color bands. This renders the watermark visibly subtle such that it is difficult to detect under regular viewing. However, the mark appears immediately when the colors are separated for printing. This renders the document useless for the printer; the watermark can be removed from the color band. This approach is used commercially for journalists to inspect digital pictures from a photo stock house before buying unmarked versions.

 

### 1.1 Least Significant Bit (LSB) :

The earliest work of digital image watermarking schemes
embeds watermarks in the LSB of the pixels. Given an image with pixels, and each pixel being represented by an 8-bit sequence, the watermarks are embedded in the last (i.e., least significant) bit, of selected pixels of the image. This method is easy to implement and does not generate serious distortion to the image; however, it is not very robust against attacks. For instance, an attacker could simply randomize all LSBs, which effectively destroys the hidden information .

### 1.2 SSM Modulation Based Technique

Spread-spectrum techniques are methods in which energy generated at one or more discrete frequencies is deliberately spread or distributed in time. This is done for a variety of reasons, including the establishment of secure communications, increasing resistance to natural interference and jamming, and to prevent detection. When applied to the context of image watermarking, SSM based watermarking algorithms embed information by linearly combining the host image with a small pseudo noise signal that is modulated by the embedded watermark.

### 1.3 Frequency Domain Techniques

Compared to spatial-domain methods, frequency-domain methods are more widely applied. The aim is to embed the watermarks in the spectral coefficients of the image. The most commonly used transforms are the Discrete Cosine Transform (DCT), Discrete Fourier Transform (DFT), Discrete Wavelet Transform (DWT), The reason for watermarking in the frequency domain is that the characteristics of the human visual system (HVS) are better captured by the spectral coefficients. For example, the HVS is more sensitive to low-frequency coefficients, and less sensitive to high-frequency coefficients. In other words, low-frequency coefficients are perceptually significant, which means alterations to those components might cause distortion to the original image. On the other hand, high-frequency coefficients are considered insignificant; thus, processing techniques, such as compression, tend to remove high-frequency coefficients aggressively. To obtain a balance between imperceptibility and robustness, most algorithms embed watermarks in the midrange frequencies.

### 1.4 Discrete Cosine Transformation (DCT)

DCT like a Fourier Transform, it represents data in terms of frequency space rather than an amplitude space. This is useful because that corresponds more to the way humans perceive light, so that the part that are not perceived can be identified and thrown away. 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. Embedding in the perceptually significant portion of the image has its own advantages because most compression schemes remove the perceptually insignificant portion of the image.

### 1.5 Discrete Wavelet Transformation (DWT)

The Discrete Wavelet Transform (DWT) is currently used in a wide variety of signal processing applications, such as in audio and video compression, removal of noise in audio, and the simulation of wireless antenna distribution. Wavelets have their energy concentrated in time and are well suited for the analysis of transient, time-varying signals. Since most of the real life signals encountered are time varying in nature, the Wavelet Transform suits many applications very well. One of the main challenges of the watermarking problem is to achieve a better tradeoff between robustness and perceptivity. Robustness can be achieved by increasing the strength of the embedded watermark, but the visible distortion would be increased as well. However, DWT is much preferred because it provides both a simultaneous spatial localization and a frequency spread of the watermark within the host image. The basic idea of discrete wavelet transform in image process is to multi-differentiated decompose the image into sub-image of different spatial domain and independent frequencies.

## II. VIDEO WATERMARKING

Video watermarking embeds data in the video for the purpose of identification, annotation and copyright. A number of video watermarking techniques have been proposed. These techniques exploit different ways in order to embed a robust watermark and to maintain original video fidelity. Conventional encryption algorithms permit only authorized users to access encrypted digital data. Once such data are decrypted, however, there is no way in prohibiting its illegal copying and distribution [7]. The two categories are: Spatial domain watermarking where embedding and detection of watermark are performed by directly manipulating the pixel intensity values of the video frame. Transform domain techniques, on the other hand, alter spatial pixel values of the host video according to a predetermined transform and are more robust than spatial domain techniques since they disperse the watermark in the spatial domain of the video frame making it difficult to remove the watermark through malicious attacks like cropping, scaling, rotations and geometrical attacks[8]. The commonly used transform domain techniques are Discrete Fourier Transform (DFT), the Discrete Cosine Transform (DCT), and the Discrete Wavelet Transform (DWT). The following aspects are important for the design of video watermarking systems [4].
Imperceptibility: The watermark embedding should cause as little degradation to the host video as possible.

 

Robustness: The watermark must be robust to common signal processing manipulations and attempts to remove or impair the watermark.
Security: The embedded information must be secure against tampering.
Capacity: The amount of embedded information must be large enough to uniquely identify the owner of the video.

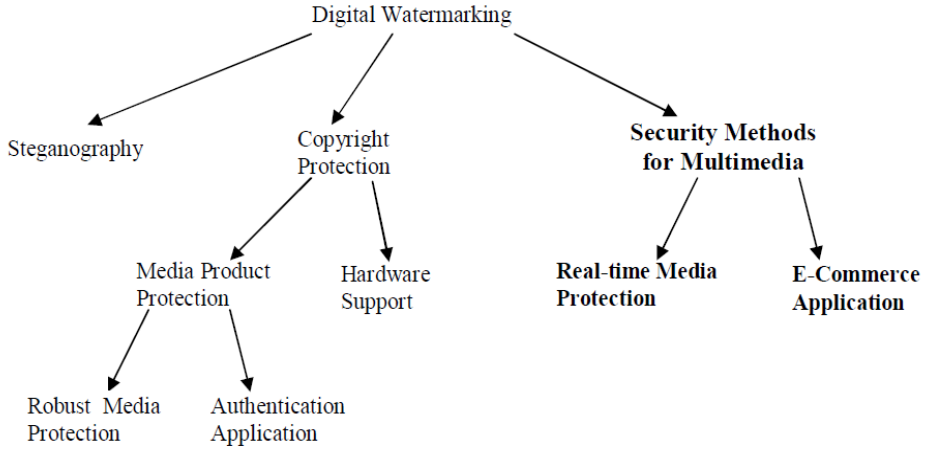


Figure 1: Classification of Digital Watermarking Applications.

## III. RELATED WORK

In this section discuss the related work to digital watermarking based technique which include audio, video, text finger print etc. The watermarking techniques based on wavelet transform, haar transform, Neural network and some other optimization technique.

[1] In this paper Author presents a robust watermarking scheme of digital videos using YCbCr color space and Wavelet based techniques The proposed scheme divides the given watermark in two parts. One smaller part is embedded in Y channel with lesser embedding strength, while other larger part is embedded in Cr channel with higher embedding strength to achieve good balance of imperceptibility and robustness. Embedding in the Y channel provides robustness against compression attacks while embedding in Cr channel provides robustness against other types of attacks. Spread Spectrum Technique of watermarking is used. In the proposed scheme, the watermark is embedded in a plane which is specifically prepared by the temporal information of the video to achieve maximum imperceptibility.

[3] In our algorithm, a watermark is embedded by applying a quantization-index-modulation r process on the singular values in the SVD of the wavelet domain blocks. The data embedding rate of the proposed scheme is 45.9 bps. In the literature, several watermarking techniques have already been proposed for image and video watermarking, these techniques can also be applied to audio watermarking. Hover, audio watermarking algorithms are not easy to develop because of the sensitivity of human auditory system. Experimental results show that the hidden watermark data is robust to additive noise, re-sampling, low-pass filtering, re-quantization, MP3 compression, cropping, echo addition, and denoising.

[4] The aim of this is to focus on the various domains of video watermarking techniques. The majority of the revised methods based on video watermarking emphasize on the notion of robustness of the algorithm. The requirement of secure communication and digital data transfer has potentially increased with the development of multimedia systems. Data integrity is not secure in image transfers. The main technique used for protection of Intellectual Property rights and copyright protection is digital watermarking. The copyright data may be in the form of text, image, audio, video .Watermarking may be visible or invisible. Invisible watermarking implies that the presence of the watermark is barely discernible when the watermarked signal is displayed.

[5] Author proposed a hybrid digital video watermarking scheme based on Discrete Wavelet Transform and Principal Component Analysis. The video frames are first decomposed using DWT and the binary watermark is embedded in the principal components of the low frequency wavelet coefficients [5]. The imperceptible high bit rate watermark embedded is robust against various attacks that can be carried out on the watermarked video, such as filtering, contrast adjustment, noise addition and geometric attacks. The algorithm implemented using DWT-PCA is robust and imperceptible in nature and embedding the binary watermark in the low LL sub band helps in increasing the robustness of the embedding procedure without much degradation in the video quality.

[7] In This paper author presents two blind video watermarking techniques in the spatial and wavelet domain proposed by the authors and compares the two approaches. The original watermark and the original, un watermarked videos are not required for the watermark extraction process. The two methods are combinations of spread-spectrum and quantization based techniques. The watermarks used are binary images, containing the copyright information.

[8] In this paper author propose a novel method for watermarking and ciphering color images, based on the joint use of a key-dependent wavelet transform with a secure cryptographic scheme, is presented [8]. The system allows to watermark encrypted data without requiring the knowledge of the original data and also to cipher watermarked data without damaging the embedded signal. Since deferent areas of the proposed transform domain are used for encryption and watermarking, the extraction of the hidden information can be performed without deciphering the cover data and it is also possible to decipher watermarked data without removing the watermark.

 

[9] Authors proposed a robust watermarking method with the blind extraction process for compressed video streams like H.264/AVC. The method embeds invisible watermark bits into the P-frames. Appropriate block selection and the embedding algorithm restrict the increase in video bit rate. The security of the method lies in selecting candidate blocks using a pseudo random key from set of previously selected blocks. The simulation results show that the proposed method is robust against common image and video watermarking attacks. A robust watermark is generated in order to withstand frame drop and insert attacks, which increases the overall robustness of the proposed method.

[10] Authors developed an image and video unified data embedding technique. The algorithm is capable of accurately retrieving hidden data after the embedded signals are subjected to JPEG/MPEG compression as long as its compression degree is above the pre denied one. Embedding strategy is to integrate data hiding into the JPEG/MPEG coding structures and to combine the adjustment factor of the strength and quantity of data hiding with the control parameter of lossy compression, according to the constraint of human visual system, the demand of hiding capacity and distortion impact of lossy compression.

## IV. PROBLEM FORMULATION

In the process of review we found that some performance affected problem related to the security threats. Digital water marking play a vital role in the field of image data hiding and privacy preserving. Now in current scenario copyright and protection of digital media and data are throated by illegal person for broking of copyright and protection of digital data. Digital watermarking allows the user to add a layer of protection to the images by identifying copyright ownership and delivering a tracking capability that monitors and reports where the user's images are being used. Copyright protection of owner is becoming more elusive as computer networks such as the global Internet are increasingly used to deliver electronic documents. we found some problem in our review work and will focus in future try to remove or overcome all the problems.

1. Some ad-hoc method and scattered tools available for copyright protection, but the dipper study is required to frame set of necessary tools.
2. A proposed novel method will be watermarking for protection of copyright digital media.
3. The quality of digital media in process of embedded of water marking will be improved.
4. Reduce the loss of data in process of transformation.
5. Improve the value of PSNR.

## V. EXPERIMENTAL ANALYSIS

In this section discuss the comparative result analysis of pervious algorithm. The result analysis of Digital image Watermarking based on various image based on two methods DWT and WBRF. Both methods apply with the various images such as Lena image, Baby image and Family image etc. and we find the value of PSNR, NC and Recover time.

Table 1: shows the comparative PSNR, NC and Recover Time for Executive director image for Digital image Watermarking.

| Digital Image | Method of Watermarking | Types of Attack | PSNR | NC | RC |
|---|---|---|---|---|---|
| Lena Image | DWT | Cropping | 19.52 | 0.3879 | 15.13 |
| | | Shear | 19.86 | 0.5827 | 14.94 |
| | | Noise | 20.06 | 0.3128 | 12.21 |
| | Feature based | Cropping | 21.36 | 0.9749 | 3.806 |
| | | Shear | 23.32 | 0.8885 | 4.352 |
| | | Noise | 23.51 | 0.8129 | 3.868 |

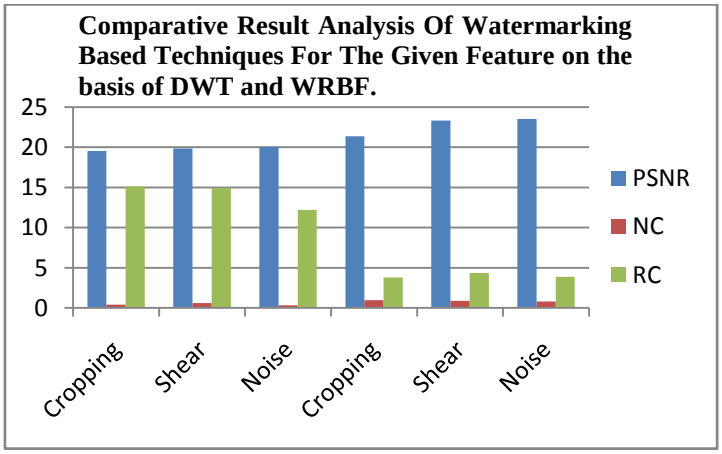


Figure 2: Shows that the Comparative result analysis of Lena Image data set for different methods.

 

## VI. CONCLUSION AND FUTURE WORK

In this paper study of watermarking technique using wavelet, Haar transform, neural network and optimization technique for the improvement of watermarking based classification technique. Process of experimental task discus two watermarking classification algorithm such as DWT and SVM. In all these algorithm SVM have better performance in compression of all. In future improve the value of PSNR and other aspects using some optimization and other neural network based algorithm.

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