A Review on Hybrid Image Watermarking Techniques

Mudit Jain1 Kamal Niwaria2 Dr. Manish Jain3
1M. Tech. Scholar2Research Guide 3Associate Professor
1,2,3Department of Electronics & Communication Engineering
1,2,3RKDF Institute of Science &Technology, Bhopal, India

Abstract— in present days, digitization of data becomes increasingly popular. Along with the digitization, the problem must be faced that is the shortage of storage space and the security of the data. Information handled on internet and multimedia network system is in digital form. The copying of digital content without quality loss is not so difficult. Due to this, there are more chances of copying of such digital information. So, there is great need of prohibiting such illegal copyright of digital media. Digital watermarking is the powerful solution to this problem. It has been an active and fast advancing research area since the 1990s. During the past decade, remarkable progress has been made in both theoretical research and system development. However, there remain many challenging research problems that continue to attract researchers from multiple disciplines. This paper presents a brief review about the different hybrid image watermarking techniques and approaches.

Key words: Image Processing, Image Watermarking, Transformation, Peak Signal to Noise Ratio (PSNR), Normalized Correlation (NC)

I. INTRODUCTION

Digital watermarking is procedure of inserting data such as image, video audio etc., into the host data which may also in any multimedia form [1]. This implanted data can shortly after can be extracted from, or detected in, the multimedia for shelter purposes [2].

First time the watermarking like present days was appeared to have in 1954 [3]. The Muzak Corporation register a patent for watermarking musical Work. An identification Work was introduced in music by erratically applying a narrow notch filter. In 1987 a method to embed the identification code into the audio was introduced by the Holt. However, the term Digital watermarking was introducing first in the 1988 by Komastu [4]. After the that in late 1990 the term digital watermark was come into the vogue. In 1995 the interest in digital watermarking research was increased considerably. Figure bellow shows the number of paper published in field of watermarking from 1990 to 1999 annually.

Watermarking can be systematizing into two categories: Spatial domain watermarking, and transform-domain watermarking. Watermark can be embedded in the spatial domain of an image by revising the pixel values. Spatial-domain techniques are easy to implement. On the other hand, watermarking in the frequency domain is more efficient than the spatial domain against number of image processing attacks in terms of information hiding capacity, perceptual transparency, and robustness [5]. The transform domain schemes embed the watermark by modulating the frequency coefficients in a transformed domain such as, Discrete Cosine Transform (DCT), Discrete Fourier Transform (DFT) and Discrete Wavelet Transformation (DWT). Transformed domain schemes are more robust when compared to spatial domain schemes [6].

Watermarking algorithm has two types. One type is non-blind scheme, the extraction of watermark needed the original image. Other type of watermarking is blind scheme in which the watermark is separate out without using the original data. If watermarking is pooled with encryption algorithm to guard the content in the digital domain, watermarking can help to efficiently match piracy in modern media allotment systems [7].

So, spotlight in this research effort will be to present a small time overriding, highly invisible & vigorous image watermark embedding and extraction system with the mixture of an encryption type method to enhance the safety of existing predictable watermarking techniques.

II. PERFORMANCE MEASURES OF IMAGE WATERMARKING

The performance of watermarking technique is examined in terms of robustness and imperceptibility. Robustness measure the ability of watermark to sustain against the various attack done on the watermarked image. Imperceptibility meaning is how invisible is the watermark in the watermarked image. These two features measure the performance of watermarking technique. Imperceptibility and robustness both should be high for watermarking technique. Imperceptibility is measure in the terms of PSNR [8]. If the value of PSNR is high, then the imperceptibility is also high. PSNR can be given as

$$PSNR = 10 \log \frac{255^2}{MSE}$$ (1)

In above equation (1), the Mean Square (MSE) can be define as

$$MSE = \frac{1}{X \times Y} \sum_{a=1}^{X} \sum_{b=1}^{Y} (H_{ab} - W_{ab})^2$$ (2)

Where the $H_{ab}$ and $W_{ab}$ is the pixel for the host image and watermark image respectively. The minimum acceptable value of PSNR is greater than 28 dB [9]. When we talk about the robustness it means that how tough is the watermark against the various attacks. Robustness of the watermarking scheme is measured in terms of Normalized Correlation (NC). Normalized correlation measures the similarity between the extracted watermark from the attacked image and the original watermark image [10]. Mathematically NC can be given as

$$NC = \frac{\sum_{a=1}^{X} \sum_{b=1}^{Y} (W_{original \; ab} \times W_{recovered \; ab})}{\sum_{a=1}^{X} \sum_{b=1}^{Y} W_{original \; ab}}$$ (3)

Where $W_{original \; ab}$ and $W_{recovered \; ab}$ is the pixel value for original and recovered watermark of size XxY respectively. The ideal value of NC should be 1 but practically .7is acceptable.
III. BACKGROUND AND LITERATURE SURVEY

There is various method has been proposed for image watermarking. In this paper, various algorithms of image watermarking which are available in literature are discussed.

G. Singh et al. (2016) presented a paper which proposed an algorithm about the improvement of imperceptibility and robustness of watermarked image. In such technique, transform domain techniques like DCT and SVD are used. The most important work in this paper is the use of entropy concept which is used for the purpose of making blocks. Because of entropy concept, this technique proves very useful because it embeds the data only in particular selected blocks. So, the capacity of watermark is increased. PSNR of proposed approach for both colored and grey scale image is up to great extent, but after reviewing this paper, it can have said that the security is necessary in watermarking which is not used in this paper [11].

C. Song et al. (2014) presented a paper which proposed an algorithm about watermarking. This algorithm was proposed for grey scale images. It uses two grey scale watermark images. In this, host image was divided into blocks using image segmentation. Watermark also divided into blocks. PSNR, Correlation coefficients (CR) and robustness is calculated [8]. C.H. Chen et al. (2014) presented a paper which proposed an algorithm about authentication of watermark. Such algorithm used various transformed techniques DWT, DCT and SVD. DCT is set transformed. After getting the transformation, encoding with different patterns takes place. The watermark image is used as four coding pattern in which watermark get coded in the form of a pattern. PSNR is calculated for different images for both coloured as well as grey scale images. The results obtained from this technique shows good efficiency of watermark but the values of PSNR are still not good [9].

J. Geirge et al. (2014) presented a paper which proposed an algorithm about authentication of watermark. This algorithm used various transformed techniques DWT, DCT and SVD. DCT is set transformed. After getting the transformation, encoding with different patterns takes place. The watermark image is used as four coding pattern in which watermark get coded in the form of a pattern. PSNR is calculated for different images for both coloured as well as grey scale images. The results obtained from this technique shows good efficiency of watermark but the values of PSNR are still not good [9].

C. Lai et al. (2010) presented a paper which proposed an algorithm about watermarking which satisfies both necessary conditions for watermarking i.e. imperceptibility and robustness. To make both conditions true, a technique which is combination of DWT and SVD as proposed technique is implemented. In proposed algorithm, watermark embeds directly to the cover image’s singular values not to directly on wavelet coefficients [15].

M. K. Bhagyashiri et al (2010) presented a paper. Robustness against geometric distortions one of the crucial important issues in watermarking. In this paper, a new SVD-DWT composite image watermarking algorithm that is robust against watermarking algorithm that is robust against processing is presented. It uses DWT and IDWT transform to obtain four different frequency images. Watermarking is embedded in high frequency image by singular value decomposition. This is unlike traditional view point that assumes watermarking should be embeds watermarking in low or middle frequency to have good robustness. Experimental evaluation demonstrates that the proposed algorithm is able to withstand a variety of attacks including common geometric attacks [16].

T. D. Hien et al. (2006) presented a paper in which the RDWT was used. In this algorithm image encryption technique was also used for the watermark security purpose. Watermark was changed into random noise signal and embedded into the middle frequency bands i.e. LH and HL bands of host image after applying RDWT. According to author of this paper, experimental result shown that this scheme was robust against some geometrical attacks as well as the JPEG 2000 standard [17].

IV. DISCUSSION AND FUTURE RESEARCH

The main goal of the researchers is to make the watermarking scheme more robust and imperceptible. Makbol et al [14] presented a technique in which RDWT was used along with SVD. In this paper RDWT was used instead of the DWT which is commonly used transform. Capacity and Robustness of this scheme was high but if we were talk about the imperceptibility, it does not have much difference with other schemes. Imperceptibility of existing scheme is sufficient but there is still scope of increasing the imperceptibility of watermarked image so that one can get high quality image after watermarking. Robustness is other important parameter of image watermarking. Some existing schemes used hybrid techniques to increase the robustness of the system. In the existing hybrid techniques, mainly two transformation were used. We can increase robustness of system by using more
complex techniques. From the previous literature review, it can be said that the capacity of watermark is one of the biggest limitations. The capacity of watermark must be enough that the host image can be embed easily with in the watermark. Lai et al [15] represented a paper in which researcher split the watermark into two parts and embedded it into the singular values of LH and HL band of the host image. Capacity of this scheme was bit low. For the sake of capacity, entropy concept can be used which is mainly used to increase the capacity of watermark by selecting some blocks. So the aim goal of future research will be to develop the watermarking scheme which should be more robust, imperceptible and have a high capacity.

REFERENCES


