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Review of Robust Video Watermarking Using DWT, SVD and DCT

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Abstract: ***Due to increase in growth of internet, users of networks are increasing rapidly. Owners of the digital products are concerned about illegal copying of their products. Security and copyright protection are becoming important issues in multimedia applications and services. Digital watermarking is a technology used for copyright protection of digital media. Here ownership information data called watermark is embedded into the digital media without affecting its perceptual quality. In case of any dispute, the watermark data can be detected or extracted from the media and use as a proof of ownership. Digital video watermarking scheme based on Discrete Wavelet Transform and Singular Value Decomposition. Design of this scheme using Matlab is proposed. Embedded watermark is robust against various attacks that can be carried out on the watermarked video.***

Keywords: Digital watermarking, Matlab, DWT,SVD,DCT

I. INTRODUCTION

Recently, the Internet becomes the most important media for information and data communication such as image, audio and video. However, some safety tools should be used to protect the transmission of critical data over the Internet. There has been growing interest in developing techniques to protect data transmission such as encryption and data hiding. An importance sub-discipline of data hiding is called digital watermarking. Digital watermarking is the process of embedding a watermark in a multimedia object. This object may be image, audio, video and any digital content for the purpose of information hiding. Many applications such as E-commerce, E-voting, copyright protection, content authentication, medical safety, broadcasting monitoring, military and indexing can be protected by digital watermarking. Several algorithms have been proposed for watermarking, especially for image watermarking. A robust blind digital image watermarking method based on singular value decomposition in wavelet domain to proof of ownership. A multi-watermarking scheme is proposed by embedding three independent binary watermarks in a grayscale digital image. In block based digital image watermarking algorithm is developed based on Singular Value Decomposition (SVD) mathematical technique[1]. In multiple watermarking technique for e-commerce is introduced based on Discrete Wavelet Transform (DWT). Although several algorithms are developed for digital image watermarking to achieve data hiding, a problem arises is that as the capacity of embedded information increases, The quality of the watermarked image and the robustness against attacks are decreased. Therefore, many challenges to design a robust watermarking algorithm are posed due to conflicting of watermarking algorithm characteristics as imperceptibility, robustness, capacity and security. Hence, there is a need for developing a robust video watermarking algorithm with ability to embed multiple watermarks without affecting the perceptual quality of the original image.

DWT: The DWT processes the image by dividing it into four non overlapping multi-resolution sub-bands LL, LH, HL and HH. The sub-band LL represents the coarse-scale DWT coefficients (the approximation) while other sub-bands represent the fine-scale of WT coefficients (the details).diagrammatic [4]

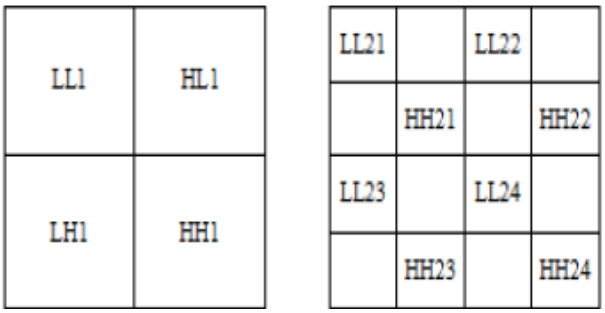

Figure 1. Two Level DWT Decomposition.

SVD: SVD-based Watermarking The singular value decomposition (SVD) of m×n real valued matrix A with m less than or equal to n, performs orthogonal row and column operations on A in such a way that the resulting matrix is diagonal and diagonal values (singular values) are arranged in decreasing value and coincide with the square root of the Eigen values of ATA[6]. The column of the m×m, U has mutually orthogonal unit vectors, as are the columns of the n×n, V matrix. U and V are orthogonal matrices i.e.

$$UTU = VTV = VVT = I$$

S is a pseudo-diagonal matrix, having diagonal elements as singular values. We can get the matrix A again by using following approach:

$$A=USVT \text{ [1]}$$

DCT: Wavelet based coding provides substantial improvement in picture quality at high compression ratios mainly due to better energy compaction property of wavelet transforms. Wavelets are functions which allow data analysis of signals or images, according to scales or resolutions. The DWT represents an image as a sum of wavelet functions, known as *wavelets*, with different location and scale.

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It represents the data into a set of high pass (detail) and low pass (approximate) coefficients. The input data is passed through set of low pass and high pass filters. The output of high pass and low pass filters. The output from low pass filter is an approximate coefficient and the output from the high pass filter is a detail coefficient. This procedure is one dimensional (1-D) DWT. In case of in two directions, both rows and columns. Output is obtained in set of four coefficients LL, HL, LH 2-D DWT[3], the input data is passed through set of both low pass and high pass filter and HH. The first alphabet represents the transform in row where as the second alphabet represents transform in column. The alphabet L means low pass signal and H means high pass signal. LH signal is a low pass signal in row and a high pass in column. Hence, LH signal contain horizontal elements. Similarly, HL and HH contains vertical and diagonal elements, respectively.

II. COMPARISON BETWEEN DCT AND DWT

Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) that DWT provides higher compression ratios & avoids blocking artifacts, allows good localization both in spatial & frequency domain. Transformation of the whole image introduces inherent scaling. Better identification of which data is relevant to human perception higher compression ratio and that DCT takes more time than DWT.

III. QUALITY MEASURE

The watermarking technique has two main objectives; hiding the fused image in the original image and maintaining the perceptual quality of the watermarked image. Here, are used Peak Signal to Noise Ratio (PSNR) and Correlation Coefficient (Cr) to measure the quality of images.

IV. PEAK SIGNAL TO NOISE RATIO (PSNR)

The quality of watermarked image is measured in terms of PSNR (Peak Signal to Noise Ratio) and MSE (Mean Square Error). In ideal case, PSNR should be infinite and MSE should be zero. But this is not possible for watermarked image, so large PSNR and small MSE is desirable[1].

V. CONCLUSION

Here studying of robust digital video watermarking scheme based on DWT, SVD and DCT are proposed. Due to multiresolution characteristics of DWT this scheme is robust against several attacks. Software model is design by using MATLAB. There is no noticeable difference between the watermarked video frames and the original frames.

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