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Digital Watermarking In Video for Secure Communication

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ABSTRACT: In today's life need of security is require in digital media, Since success of the Internet, cost-effective and popular digital recording and storage devices, and the promise of higher bandwidth and quality of service (QoS) for both wired and wireless networks has made it possible to create, replicate, transmit, and distribute digital content in an effortless way. Hence, use of digital media applications, broadcast monitoring, owner identification, multimedia security and copyright protection has gained tremendous importance. The protection and enforcement of intellectual property rights for digital media has become an important issue. Digital watermarking technique is becoming more important in this developing society of internet. There should be no perceptible difference between the digitally watermarked signal and original signal, and the watermark should be difficult to remove or alter without damaging the host signal. Digital watermarking is technology used for various applications and plays an important role in privacy protection and is used as a key solution to make the data transferring secure from illegal interferences. In this paper, a comprehensive approach for watermarking digital video is introduced. We propose a hybrid digital video watermarking scheme based on 3-level 2D Discrete Wavelet Transform (DWT) and Singular Value Decomposition (SVD). SVD image watermarking scheme, in which the watermark is added to the SVs of the whole image or to an apart of it. The video frames are first decomposed using DWT and the binary, gray scale or colour watermark is embedded in the principal components of the low frequency wavelet coefficients. 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.

KEYWORDS: Digital watermarking, digital video, Discrete Wavelet Transform, Secure Communication, Singular Value Decomposition, Secret information.

I. INTRODUCTION

Due to the rapid and extensive growth of network technology, the rapidly growing field of the digitized images, video and audio has urged the need of security, digital information can now be distributed much faster and easier. Multimedia content protection has recently become an important issue because of insufficient cognizance of intellectual property which can used to produce evidence against any illegal attempt to either reproduce or manipulate them in order to change their identity. One way to discourage illegal duplication is to insert one or more items of information, collectively called a watermark into potentially vulnerable images in such a way that the watermarks are inseparable from the images themselves. Watermarking is one possible method to protect digital assets, and the technology of watermarking has extended its applications from copyright protection to content indexing, secret communication, fingerprinting, and many others. Presently information hiding is a technique in the field of information security. Watermarking is technique use to hide information in video and that used for secure communication. In Digital watermarking system, information carrying the watermark is embedded in an original image. The watermarked image is transmitted or stored, and then decoded to be resolved by the receiver. Cryptography scrambles the image so that it cannot be understood. Watermarking techniques can be divided into four categories according to the types of document to be watermarked as Text, Image, Audio and Video Watermarking.

II. RELATED WORK

Jadhav, A. and Kolhekar M. [1] described specific application of digital watermarking: Video watermarking for Copyright protection. Literature survey suggests that most Video watermarking techniques use static 3D Discrete

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Cosine Transform technique. They show the result of implementation of static 3 D DCT. We observe that this scheme works well on correlated Videos. But it does not take care of scene change in the video. Hence they propose dynamic size 3D-DCT technique (by "scene change detection") for embedding binary/ gray scale/ color watermark on a color digital video and compare their results with existing fixed length 3D-DCT technique. In [2]Raval K. and Zafar S.,Suggested that, the advancing world of digital multimedia communication is faces problems related to security and authenticity of digital data. In the context of multimedia communication, digital images and videos have numerous applications in entertainment world like TV channel broadcasting. Digital watermarking Algorithms used to protect the copyright of digital images and to verify multimedia data security. Most watermarking algorithms transform the host image and embedding of the watermark information by robust way. Uncompressed digital images need a lot storage capacity and bandwidth so efficient image transmission need image compression. The solution is becoming more complex with the growth of data. We propose Digital watermarking by proposed transform Algorithm based on DCT-DWT Watermarking. Kumar, M. and Hensman, A. [3] Proposed to develop and implement an improved layered approach to Video watermarking. The traditional watermarking approach tends to embed an entire watermark image within each video frame or within random video frames to give the appearance of a hidden watermark to the casual observer. This work proposes a more efficient and secured approach to perform watermarking, by using sub image classification. That is to say, selected frames only will contain a fractional number of total bits from the watermark image. Pallavi Patil and D.S. Bormane [4] given a scheme which is a lossless data hiding scheme is presented based on quantized coefficients of discrete wavelet transform (DWT) in the frequency domain to embed secret message. Using the quantized DWT based method; we embed secret data into the successive zero coefficients of the medium-high frequency components in each reconstructed block for 3-level 2-D DWT of cover image. The procedures of the proposed system mainly include embedding & extracting. The original image can be recovered losslessly when the secret data had been extracted from stego-image. The proposed method embeds secret message into DWT coefficients in medium high frequency components and restores the original image coefficients after the secret messages have been extracted.

III. PROPOSED WORK

A lot of techniques are available for protecting the copyrighted material. We mainly discussed about two methods via spatial domain and frequency domain. In The first method for hiding watermarking is spatial domain in this type directly changing original cover-media means spatial (pixel) domain, watermark is inserted directly by modifying the pixel values of host image. Such algorithms are very easy at the time of implementation. However they have some problems like Low hiding capacity of watermark information, less PSNR, less correlation between original and extracted watermark and less security, so anyone can detect such algorithms. The advantages are simple and fast calculated but cannot protect itself from varied signal processing attacking. In frequency domain such as DCT, DFT, DWT, SVD etc, the watermark is inserted into transformed coefficients of image giving more information hiding capacity and more robustness against watermarking attacks because information can be spread out to entire image.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. 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 like LL, LH, HL, HH on every decomposition level. 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. Singular value decomposition is The SVD technique is exploited in image watermarking, due to its sophisticated properties. This technique provides an efficient way for extracting algebraic features from a 2-D matrix. The main properties of the matrix of the SVs can be exploited in video watermarking. When a small perturbation happens to the original video, no large variations occur in the matrix of the SVs, which makes this technique robust against attacks. Using this property, the watermark can be embedded to this matrix without large variations in the obtained video. DWT is more computationally efficient than other transform methods like DFT and DCT. Due to its excellent spatio-frequency localization properties, the DWT is very suitable to identify areas in the host video frame where a watermark can be embedded imperceptibly. We have performed a complete survey on the current watermarking technologies. It is indicated that none of the current watermarking schemes can resist all attacks. From this point of view, this we proposes 3D DWT-based SVD video watermarking method in which the DWT is combined with the SVD method to hide the data.

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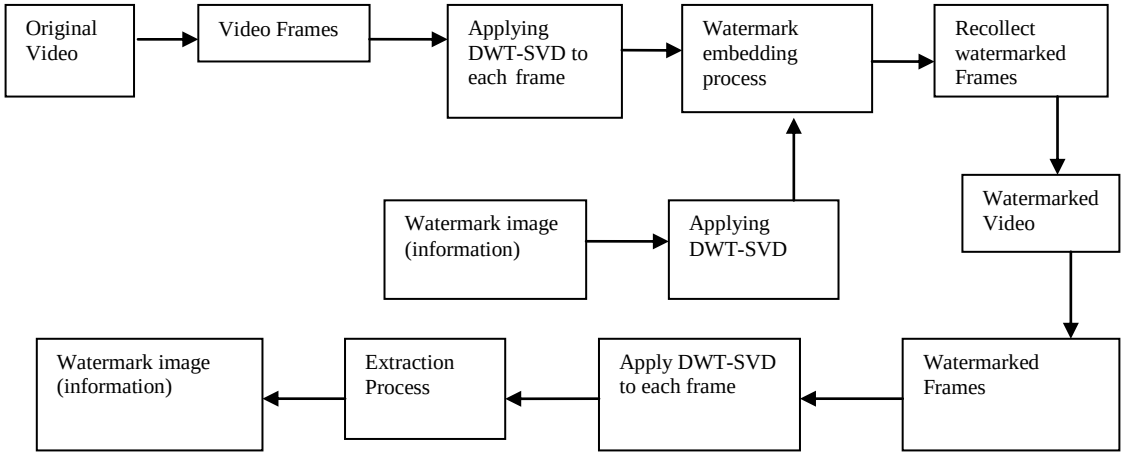

Fig. 1 Proposed System Block Diagram

By considering Block diagram of our proposed video watermarking systems is as given above. At sender side we carried out embedding process in that we, Firstly read video file in MATLAB, here we consider a file in which we have to hide secret information in MATLAB only .AVI file are run. Converting complete video in number of frames since we are getting number of images as many the number of frames in video and apply pre processing Operations on every frame. Now, applying 3-level 2-D DWT (Discrete Wavelet Transform) to frames. Adding information in form of image using SVD (Singular Value Decomposition) this Process is known as watermark embedding process. The DWT can be implemented as a multi-stage transformation. The singular value decomposition (SVD) is a powerful matrix decomposition technique. Performing inverse transform recollect watermark frames and create video having hidden information. After receiving the watermark video extraction process is undertaken. To extract information convert video which having information in form of watermark into Frames. Apply same transform used for watermarking to frames. Performing watermark extraction process to retrieve information. Finally; we get the secrete information which we have hide in the video. The video having watermark looks like simple video to unauthorized user but at destination original information can retrieve we are making our system more robust against noise and attacks.

IV. RESULTS & DISCUSSION

After embedding process and in between extraction process we are applying noise attack like Gaussian, Histogram, Average, Median or no attack on the watermarked video and analyze for the value of PSNR and correlation factor or similarity factor which are given as,

Peak Signal to Noise Ratio (PSNR):- PSNR is the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel (dB) scale.

$$PSNR = 10\log_{10}\left(\frac{255^2}{MSE}\right) \text{ Db}$$

Where MSE (mean squared error) between the original and distorted frames (size m x n).Higher values of PSNR indicate more imperceptibility of watermarking. It is expressed in decibels (dB).

$$MSE = \frac{1}{M \times N}\sum_{i=1}^{N}\sum_{j=1}^{M}\left[f(i,j) - f'^{(i,j)}\right]^2$$

Correlation Factor: - Computes the correlation coefficient between watermarked image and Extracted image, where watermarked image and Extracted image are matrices or vectors of the same size. This helps us to calculate the changes in the perceptual quality of the image more precisely. The formula is shown below:

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$$r = \frac{\sum_m \sum_n (A_{mn} - \bar{A})(B_{mn} - \bar{B})}{\sqrt{\left(\sum_m \sum_n (A_{mn} - \bar{A})^2\right)\left(\sum_m \sum_n (B_{mn} - \bar{B})^2\right)}}$$

Where A_{mn} is the watermarked image and B_{mn} is the extracted image. The Correlation factor should be equal to 1. Fig. 2 shows that the input video frame of video in which we have to hide information or secret message, Fig. 3 shows that the watermark image which we are hiding in the video also we can hide the message in form of image. Fig. 4 having a frame of watermark video after an embedding process showing that there is no effect seen by unauthenticated user after adding message or image in video, while Fig. 5 showing a image after extraction process called as extracted image, Here image shown is extracted when Gaussian noise type attack are on video are done, Below table having value of the PSNR and Correlation factor for different noise type attack applying to watermarked video.

Fig.2 Input Video Frame

Fig. 3 Watermark Image

Fig. 4 Watermark Video Frame

Fig 5 Extracted Image

Watermark Image	Noise Type	PSNR	Correlation Factor
" Lena.jpg"	Gaussian	41.5975	0.955536
	Histogram	38.7128	0.623796
	Average	42.7263	0.986429
	Median	44.2748	0.996885
	None	44.2122	0.997823
"Cameramen.tif"	Gaussian	41.8739	0.970855
	Histogram	39.1509	0.470693
	Average	42.7748	0.992513
	Median	44.2569	0.998266
	None	44.2943	0.998926

Table 1 Analysis of PSNR and Correlation factor.

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V. CONCLUSION AND FUTURE WORK

Digital watermarking is a technique providing embedded secure information in images, digital watermarking is the process of inserting data into an image in a such way that it can be used to make an assertion about the image, The goal of watermarking is not to restrict access to the original image, to ensure that embedded data remain recoverable. We have performed a complete survey on the current watermarking technologies. We propose 3D DWT-based SVD video watermarking method. More specifically, embedding the watermark in low frequency components increases the robustness to the attacks that have low frequency characteristics. From above result we can conclude that for various noise type value of PSNR and Correlation Factor are different for the extracted image, and having some distortion after extraction process to original watermark, maximum value of correlation or Similarity Factor if there are no noise attack, but this condition is ideal and it is not possible.If we perform more attacks and make system robust against geometric attack and minimize the distortion the system can be used for defense sector to share the information secretly and protect from unauthenticated user so that secret communication is carried out.

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BIOGRAPHY

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