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REVIEW ARTICLE

Review on Different Video Watermarking Techniques

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Abstract- Today's life internet offers great convenience in transmitting large amount of data in different parts of the world. However, the safety and security of long distance communication remains an issue. In order to solve this problem has led to the increase in the need of copyright protection. The application of video watermarking in copy control, broadcast monitoring, copyright protection, video authentication, finger printing, annotation etc. is immensely rising. The main objectives of video watermarking are undetectability, robustness, and capacity of hidden data. Video watermarking algorithms normally prefers robustness. In this paper, techniques used in video watermarking are discussed with the literature survey and then the shortcoming are analyzed and as conclusion proposal for new points for hiding watermark in video is given.

Keyboards- Discrete wavelet transform, Discrete cosine transform, copyright protection, Robust Techniques, Principal component analysis

1. Introduction

In recent times, with the development of network technology, protection of multimedia data becomes increasingly prominent. Because of their digital nature, multimedia data can be duplicated, modified, transformed and diffused very easily. The faster distribution of data over the network via images, audio, and video become a common resource so that any data can be easily transferred to the other person in just a single click. Due to its portability, the trend of piracy and duplicity rapidly approaches to Everest now days. The original producer of the file even doesn't know that the file created by him/her is available for free through internet and even if knows, nothing can be done. So, recent development of digital watermarking technology can solve this problem. Watermarking is the process to hide some data which is called watermark or label into the original data. Similar video watermarking embeds data in the video for the purpose of identification, annotation and copyright.

There are several techniques for information hiding into digital media. They are used for several purpose as well as copyright protection. The techniques are spatial domain, transformed domain, cryptography and steganography.

The spatial domain method involves an algorithm that directly operates on the pixel value of the host image.

In transform domain method, the pixel values are transformed into another domain by applying appropriate transform technique like discrete cosine transform (DCT) and discrete wavelet transform (DWT).

Generally, frequency domain watermarking is more robust than the spatial domain.

Cryptography means "secret writing". Cryptography is a widely used method for protecting the digital content of the media. The message is encrypted before transmission and decrypted at the receiver end with the help of a key. No one can be access the content without having the true key.

Steganography means "cover writing". Steganography is the science that involves communicating secret data in an appropriate multimedia carrier, e.g., image, audio and video files. It is always non visible. In steganography, the message is embedded into the digital media rather than encrypting it in such a way that nobody except the sender and the intended recipient an even realize that there is a hidden message. The message hidden in the cover can be detected by only the person having the actual key. Thus steganography relates to covering to point-to-point communication between two parities. That's why steganography methods are usually not robust against modification of data, or have only limited robustness.

2. Characteristics of Digital Watermarking

Watermarking is a technique of embedding hidden data in multimedia system information observably, like image, video, audio and text information for the purpose of identification and copyright. So the main characteristics of digital watermark are required to design a robust watermarked video which are:

i) Robustness: The watermark should be able to withstand after normal signal processing operations such as image cropping, transformation, compression etc.

ii) Imperceptibility: The watermarked image should look like same as the original image to the normal eye. The viewer cannot detect that watermark is embedded in it.

iii) Security: An unauthorized person cannot detect, retrieve or modified the embedded watermark.

iv) Capacity: The amount of embedded information must be large enough to uniquely identify the owner of the video.

3. Applications of Video Watermarking

Digital watermarking is used in a variety of application, some of them are:

i) Content identification and digital watermarking: In this technique, digital watermarking enables effective content identification by providing a unique digital identity to all form of media content in a way that persists with the content wherever it may travel. Digital watermark easily embedded into content without interfering with the consumer's enjoyment of it. It is imperceptible to humans, but easily detected and understood by computers, networks and a wide range of common digital devices.

ii) Copyright protection: In the recent years, copyright protection of digital became a serious problem due to rapid development in technology. Watermarking is one of the alternatives to copyright protection problem. In this technique, a watermark is added to the video signal that carries information about sender and receiver.

iii) Broadcast monitoring (television news often contains watermarked video from international agencies): In this technique, the content owner embeds the watermark prior to transmission. The watermark is extracted by the monitoring site that is set up within the transmission area.

iv) Copy control: watermarking in copy control

-combining every content recorder with a watermark detector.

-when a copy-prohibit watermark is detected, the recording device will refuse to copy.

v) Tampering with images: Another application is the authentication of image content. The goal of this application is to detect any alternatives and modifications made to an image.

4. Literature Survey

Ashish M. Kothari (2012): In this paper, we emphasized on the transform domain method for the digital watermarking of video for embedding invisible watermarks behind the video. It is used for the copyright protection as well as proof of ownership. In this paper we have specifically used the characteristics of 2-D Discrete wavelet Transform and discrete cosine transform for the watermarking. In this work we first extracted the frames from the video and then used Frequency domain characteristics of the frames for watermarking. We calculated different parameters for the sake of comparison between the two methods.

Yujie Zhang (2012): This paper presents a video watermarking algorithm in detail based on DCT, DWT and neural network technology and digital watermarking was proposed and a professional video copyright protection platform was built using the above algorithm. This algorithm effectively enhances the robustness of the video stream. The platform includes video watermark embedding, watermark detection and video piracy tracking and other functions. It doesn't only achieve the prevention beforehand but also the piracy tracking afterwards. The simulation results show that the platform can effectively implement the copyright protection of digital video works.

Nisreen I. Yassin (2012): In this paper, a comprehensive approach for digital video watermarking is introduced, where a binary watermark image is embedded into the video frames. Each video frame is decomposed into sub-images using 2 level discrete wavelet transform then the Principle Component Analysis (PCA) transformation is applied for each block in the two bands LL and HH. The watermark is embedded into the maximum coefficient of the PCA block of the two bands. The proposed scheme is tested using a number of video sequences. Experimental results show high imperceptibility where there is no noticeable difference between the watermarked video frames and the original frames. The computed PSNR achieves high score which is 44.097 db. The proposed scheme shows high robustness against several attacks such as JPEG coding, Gaussian noise addition, histogram equalization, gamma correction, and contrast adjustment.

Prachi V. Powar (2013): Objectives of this scheme is to develop low power, robust and secure watermarking system for authentication of video. Here we present an FPGA based implementation of an invisible watermarking encoder. It consists of a watermark generator module and watermark insertion module. The system is initially simulated and tested for various attacks in MATLAB/Simulink and then prototyped on VERTEX-6 FPGA using VHDL. The watermarked video is same as that of original video with an average Peak-Signal-to-Noise Ratio (PSNR) of 46 db.

5. Techniques in Video Watermarking

Watermark can be either directly inserted in the video data or integrated during encoding process or implemented after compressing on the video data. Now we shall briefly discuss some common video watermarking techniques.

First, the necessary steps to embed the watermark into an input video data for the copyright protection purpose are as follows:
i) Extract loaded color video into frames.
ii) Apply block matching motion estimation techniques on the subsequent frames.
iii) Select only those frames that have sufficient number of motion blocks which is compatible with the watermark size.
iv) From the selected frames use a given threshold to select the best blocks during the matching process.
v) Perform the wavelet transformations or different operation on the selected best blocks.
vi) Embed a random Gaussian distribution as a proposed watermark into the selected blocks.
vii) Extract the embedded watermark.
viii) Apply some attacks on the watermarked frames in the video.
ix) Evaluate the conducted results using PSNR for embedding and similarity for extracting process before and after attacks.

5.1 Frequency Domain Video Watermarking Techniques

5.1.1 The DWT transform: Multiresolution property of DWT helps in decomposition of images. The image gets divided into four non-overlapping multiresolution sub-bands. These sub-bands are LL, LH, HL, HH i.e. approximation, horizontal details, vertical details and diagonal details as shown in Fig. 5(a). This is called first level decomposition of an image. The second level of decomposition, e.g., is carried out on first level LL sub-band of the image which results into another level of decomposition as shown in Fig. 5(b).

LL1	LH1
HL1	HH1

(a)

LL2	LH2	LL2	LH2
HL2	HH2	HL2	HH2
LL2	LH2	LL2	LH2
HL2	HH2	HL2	HH2

(b)

Fig. 5 Wavelet Decomposition (a) First level decomposition (b) Second level decomposition.

Therefore watermark is embedded in high frequency sub-bands to avoid degradation of the host video and make it invisible. But embedding watermark in high frequency sub-bands may reduce robustness. To get best tradeoff between performance and robustness, watermark is embedded into LH and HL sub-bands. In the proposed algorithm, a second level DWT decomposition on the LH and HL planes before embedding the watermark. The watermark is in the LH2 and HL2 sub-bands of LH and HL sub-bands of the first level decomposition. It proves the robustness of the algorithm and it helps in increased capacity of embedding data.

5.1.2 The DCT transform: The DCT provides a good compromise between information packing ability and computational complexity. The most important energy compaction property of DCT is extensively used to represent an image.

DCT is faster and can be implemented in O (n log n) operations. The DCT allows an image to be broken up into different frequency bands, making it much easier to embed watermarking information into the middle frequency bands of an image. The middle frequency bands are chosen such that they avoid the most visual important parts of the image (low frequencies) without over-exposing themselves to removal though compression and noise attacks (high Frequency). The DCT transforms a signal or image from the

spatial domain to the frequency domain. DCT-based watermarking scheme is the most robust to lossy compression.

5.1.3 PCA Based Video Watermarking Technique: Principal component analysis (PCA) is a mathematical procedure that uses an orthogonal transformation to concert a set of observations of correlated variable into a set of values of uncorrelated variables called principal components. PCA plots the data into a new coordinate system where the data with maximum covariance are plotted together and is known as the first principal component. Similarly, there are the second and third principal components and so on. Given a data set, the principal component analysis reduces the dimensionality of the data set. Embedding of the watermark is done in the three color channels RGB of an input video file.

5.1.4 Discrete Fourier Transform Video Watermarking Technique: This approach first extracts the brightness of watermarked frame, computing its full-frame DET taking the magnitude of the coefficients. The watermark is composed of two alphanumerical strings. The DET coefficient is altered, then IDFT. Only the first frame of each GOP is watermarked, which was composed of twelve frames, leaving the other ones uncorrupted. It is good robustness to the usual image processing as linear/non-linear filtering, sharpening, JPEG compression and resist to geometric transformations as scaling, rotation and cropping. The watermark design and the watermark insertion procedures do not involve any transforms. DFT- based watermarking scheme with template matching can resist a number of attacks, including pixel removal, rotation and shearing. The purpose of the template is to enable resynchronization of the watermark payload spreading sequence. It is a key dependent pattern of peaks, which is also embedded into DFT magnitude representation of the frame.

6. Conclusion

This paper is study of various video watermarking techniques given by researcher till now but after study it is concluded that the previously techniques are not that much efficient to provide security and these techniques are very common in the field so can be detected very easily by hackers for extraction of watermark inserted in videos. So there is need for new robust technique which will be able to hide watermark at such place in frames so cannot be extracted easily and provide more security over video watermarking old techniques. For this as a new research in same field an algorithm with efficient point finding will be proposed to hide watermark in video to provide robust and secured watermarking.

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