

Video and Audio Hybrid Watermarking: A Literature Review

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Abstract- Watermarking is used widely to secure and authenticate the digital data. Different watermarking techniques are used to protect the data from unauthorized attackers. Some are discussed the audio watermarking and some about video watermarking, But meanwhile, these methods only protect the data for some geometric attacks only. To reduce piracy and these attacks we apply a watermark to data. Most recently hybrid techniques are more robust to attacks. These hybrid techniques are DCT-DWT, DWT-SVD. In most recent techniques DWT- SVD is more robust technique so far.

Keywords- watermarking; hybrid; robustness.

I. INTRODUCTION

This paper discusses the different techniques used for the watermarking. Watermarking plays an important part in digital data security. Watermarking gives authenticity and privacy to appropriate owner. As digital data can be easily downloaded and uploaded again to some changes with a different owner. To provide security for the ownership watermarking is widely used.

II. LITERATURE SURVEY

The different audio and video hybrid watermarking techniques are studied for checking the robustness. These techniques are very impressive against the several geometric and external attacks. Watermarking has mostly calculated the robustness, more the robust technique provide strong copyright protection. Here, discussing both video and audio watermark which separately watermark to each signal and then combine to get the most robust signal. This technique is more robust than any other techniques. Let's discuss the watermarking of video and audio techniques.

A. Watermarking techniques

- Least Significant Bit

The very first method of watermark embedding would be to embed the watermark into the least-significant-bits to cover object. It gives the high channel capacity. For each pixel matrix, the lowest significant bit is replaced with another watermark bit. It gives watermark to data but it is low robust.

- Discrete Cosine Transform

The DCT sequence of data converted into the spatial domain. It is converted to the sum of sine and cosine with different amplitude and different frequency bands. It is much easier to embed watermarking information into the middle-frequency bands of an image. Middle-frequency bands are minimized. It avoids the visual parts of the image without exposing them. It is robust for blurring, contrast, adjusting and brightness.

- Discrete Wavelet Transform

Discrete wavelet uses different wavelet filters such as haar filter, *Daubechies* bi-orthogonal filters. This filter decomposes images in several frequencies such as lower resolution image (LL), horizontal (HL), vertical (LH) and diagonal (HH). It is efficient and uses simple filter convolution. LL is chosen as it has larger and smaller for other (LH, HL HH). As large magnitude it is more significant.

- Singular Value Decomposition

Each singular value specifies the luminance of an image and corresponding pair of singular vectors specifies the geometry of that image. In SVD-based watermarking, different types of approaches are possible. A common approach is to apply SVD to the image, and modify all the singular values to the watermark data. An important property of SVD based watermarking is that for most types of attacks the modified singular values change very little. It is most stable and has no effect on the image after watermarking. It is one way and non-symmetrical in nature which is not found in DCT and DWT. It is best robust when hybrid with other techniques.

B. Types of Watermarking attacks

- Removal attack

Removal attacks aim at the complete removal of the watermark information without cracking the security. This category includes de-noising, quantization re-modulation, and collision attacks. Not all of these methods do complete watermark removal, but they may possibly damage the watermark.

- Geometric attack

Geometric attacks do not actually remove the embedded watermark itself, also distort the watermark information. Pixels are locally shifted, scaled, and rotated without significant visual distortion.

- Cryptography attack

Cryptographic attacks aim at cracking the security in watermarking schemes and using a key or another method to remove the embedded watermark information or to embed different watermarks. These attacks are most complex one.

- Protocol attack

These attacks also term as an inversion attacks. The idea behind inversion is that the attacker changes or deleted the watermark from the original data and claims to be the owner of the watermarked data with some changes in original data.

C. Techniques and robustness

These are some techniques to avoid such attacks and the robustness of that technique after watermarking.

TABLE I

Sr. No.	Techniques	Robustness	Security
1	LSB [LEAST SIGNIFICANT BIT]	Least Robust Against Geometry	Low
2	DCT [DISCRETE COSINE TRANSFORM]	High Robust Against Filters	Medium
3	DWT [DISCRETE WAVELET TRANSFORM]	High Robust Against Geometric Disturbance	Medium
4	SVD [SINGULAR VALUE DECOMPOSITION]	High Robust Against Geometric Disturbance	High

D. Comparison Of different Methodologies in Watermarking

TABLE II

Name of paper	Method	Author	Parameter for robustness
Hardware Implementation of a Digital Watermarking System for Video Authentication	DCT	Sonjoy Deb Roy, Xin Li, Yonatan Shoshan, Alexander Fish(2013)	low power consumption, low cost implementation, high Speed, and reliability
A Digital Video Watermarking Technique Based on Identical Frame Extraction in 3-Level DWT	3-Level (DWT)	Tamanna Tabassum, S.M.Mohid ul Islam (2012)	Strong robustness against cropping Gaussian noise, Salt & pepper noise adding, frame dropping and adding
Implementation and performance analysis of DCT-DWT-SVD based Watermarking algorithms for color images	DCT-DWT-SVD	Nidhi Divecha, Dr. N. N. Jani	Check effectiveness of both techniques for Imperceptibility and robustness PSNR and NCC
A Robust Scheme for Digital Video Watermarking based on Scrambling of Watermark	(2D) DWT	Mahesh R. Sanghavi, Dr. Archana M.Rajurkar Prof.Dr. Rajeev Kotecha	watermarking scheme to make scheme robust against various attacks video attacks Frame dropping.

Comparison of different watermarking techniques

TABLE III

Name of paper	Method	Author	Parameter for robustness
A Novel Audio Watermarking Algorithm for Copyright Protection Based on DCT Domain.	DCT	Yang, Yan	More Robust
Audio Watermarking by Hybridization of DWT DCT	DCT-DWT	Ghulam Ali Muhammad Tahir azir Ahmad Zunaira Saleem Sohail	good results against different external attacks
Audio watermarking using combination of multilevel wavelet decomposition, DCT, and SVD.	DCT-SVD	Singhal, Achintya, Anurag Narayan Chaubey, Prakash.	robustness and inaudibility Results are not up to mark
Improved Audio Watermarking Using DWT-SVD.	DWT-SVD	N.V. Lalitha, Suresh, Dr. Sailaja	DWT-SVD algorithm proves to be more robust than DCT-SVD

III. CONCLUSION

Audio and video watermarking techniques are discussed. These different techniques have different robustness. For video and audio the best possible technique is chosen and among them best hybrid technique set for audio and video watermarking. This can make a data more secure and robust to attacks to more extent. Video watermark is mostly targeted data over the digital network.

IV. FUTURE SCOPE

The overall conclusion shows that hybrid techniques of audio and video watermarking can be combining to make a more robust watermark. This watermark could give more security and authenticity to the video and audio data. For furthermore robustness, each frame could be differently watermarked.

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