

A Hybrid technique of Video Watermarking in Wavelet domain and Scan based Encryption Method

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Abstract - Security of digital products (audio, video, image, and text) on the internet is very essential these days, for these digital watermarking techniques are used. Digital watermarking is the process of embedding data into digital multimedia content. This is used to validate the reliability of the content or to recognize the identity of the digital content's owner. Sophisticated watermarking techniques have recently been developed, and they can be used to embed in printed text, graphics, or images as well as in digital images, graphics, audio, or video. This present survey is on DWT (Discrete Wavelet Transform) technique used in watermark. DWT transform more computationally efficient than other transform methods, because of its outstanding localization properties which offer the compatibility with the Human Visual System (HVS).

Keywords - Digital Video Watermarking, DWT (Discrete Wavelet Transform), Inverse DWT, Pseudo-random number

I. INTRODUCTION

In modern year, the prevalent function of digital products makes unauthorized user can obtain easily the copy of genuine digital products and spread digital products illegally, therefore it is imperative for the owner to develop some skill for the sentry of the content. Digital Watermark is an identification code that carries information regarding the patent owner, inventor of the work, certified consumer. Digital watermarking was first founded in the year 1979 & become popular in 1990 [8]. Digital watermarking has so many applications such as copyright protection, content identification & management, document & image security, protection of audio & video content, forensic & privacy deterrence, source tracking, broadcast monitoring etc.

In digital watermark the trouncing process has to be such that the modifications of the media are unnoticeable. For images, this means that the modifications of the pixel values have to be invisible. Furthermore, the watermark must be either robust or fragile, depending on the application. Digital video watermarking can be achieved by also applying still image technology to each framework or by means of fanatical methods that exploit inherent features of the video sequence.

In general watermarks are of two types visible & invisible. Visible watermark is a conservatory of the notion of logos. An Invisible watermark is the well-established watermark which is able to be visually experiential. Invisible is secreted in the content. It can be detected by a sanctioned organization only. Video watermark is a superset of regular image watermark or an anthology of successive still images. Now a day's rising attractiveness of the video based function has increased the demand for a protected sharing of video content [1]. Today's, digital video watermarking techniques are broadly used in a variety of video applications, for video certification watermark can make sure that the original content has not been distorted.

There are different techniques which were used for watermarking. Fundamentally, there are two techniques: spatial domain & frequency domain. In spatial domain it is simple to insert watermark in the host image by altering the gravel level of some pixel, but it can be effortlessly detected. Hence this technique is not robust to attacks. In contrast, another technique is more robust, while adding a watermark in the frequency domain. In this watermark is embedded by modifying the transform coefficient of the frames of the video. There are different techniques DWT (Discrete wavelet transforms), DCT (Discrete Fourier Transform) and FFT (Fast Fourier transform).

Several techniques have been implemented for embedding and extraction process in watermark. DWT is used more widely in the watermarking process [5]. DWT technique is used to decompose a signal into high and low frequency [6] [12]. Wavelets are a arithmetic tool that can be used to take out information from many kinds of data including audio, signal, images [9] [10]. There are many more techniques which uses the combination of DWT technique with other technique such as PCA (Principal Component Analysis) [1] which is used to

convert the set of correlated variable into uncorrelated variables [7]. DWT with SVD (Singular value decomposition) approach [8]. SVD is a numerical technique based in linear algebra and it is used to diagonalize the matrices in numerical analysis. It is an algorithm developed for variety of applications [4]. A hybrid approach of DCT and DWT. Result of this method suggests that watermark algorithm can be robust against many common different types of attacks such as filtering, sharp enhancing, adding salt noise, image compression, image cutting and rotation [15]. The discrete cosine transform (DCT) helps separate the image into parts (or spectral sub-bands) of differing importance (with respect to the image's visual quality) [3]. For watermarking a hybrid approach of DCT (Discrete cosine transform) and QIM (Quantization Index Modulation is used to embed the watermark into quantized region. This technique can effectively resist compression, noises, filtering attacks. Maintain good performance in transparency and robustness [13]. Another approach for a video watermarking algorithm based on shot segmentation & block classification to enhance the robustness imperceptibility and real- time performance method of selecting host coefficient is based on block

classification in DCT compressed domain. A simple Quantization index modulation is applied to embed the watermark. The result has a good performance in maintaining real-time performance [2] [13].

In this paper we proposed a new approach of video watermarking in wavelet domain with scan based encryption method. DWT is more proficient than other transform methods because of its excellent localization properties providing compatibility with human visual system (HVS). In a section 2 discusses about the discrete wavelet transform scheme, section 3 discusses about Scan based Encryption method, section 4 includes a methodology, section 5 is a discussion of the present work and section 6 present conclusions of the paper.

II. DISCRETE WAVELET TRANSFORM

The DWT (Discrete Wavelet Transform) separates an image into a lower resolution approximation image (LL) as well as horizontal (HL), vertical (LH) and diagonal (HH) detail components. The process can then be repeated to calculate multiple scale wavelet decomposition [1]. The basic idea of the DWT may be understood by taking one dimensional signal which is first split into two parts, usually high frequencies and low frequencies. The low frequency part is further divided into two parts of high and low frequency. This process is continued until the signal has been entirely decomposed. Furthermore, from DWT coefficients, the original signal can be reconstructed. The reconstruction process is called the inverse DWT (IDWT). It is the transform based on frequency domain [16].

The benefit of the wavelet transform is its compatibility with the model aspects of the human visual system as compared to DCT & FFT. Allow good localization in both time domain and frequency domain. Wavelet function can be freely chosen for higher flexibility.

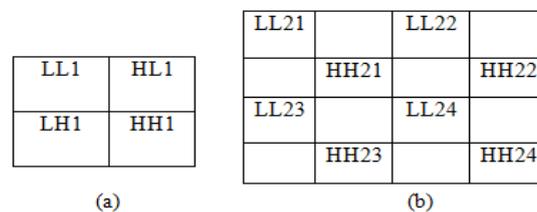


Fig 1- DWT sub bands in (a) Level 1 (b) Level 2

III. SCAN BASED ENCRYPTION METHOD

A scanning of a two dimensional array is an arrangement in which each element of the array is accessed accurately once. The SCAN is a formal language-based two dimensional spatial accessing method which is able to represent and generate a large number of wide varieties of scanning paths [4]. SCAN language uses four basic scan patterns This Scan pattern is named as continuous raster C, continuous orthogonal O, continuous diagonal D and spiral S [19]. Each basic pattern has eight transformations numbered from 0 to 7 [18]. For each basic scan pattern, the reverse transformations are 0, 2, 4, 6 and other transformations 1, 3, 5, 7 respectively. The basic scan patterns are shown in the Figure 2.

The scan method includes image encryption and decryption process, in which image encryption is to reshuffle the pixel of the image and change the pixel value [21]. The pixel arrangement is based on scan key.

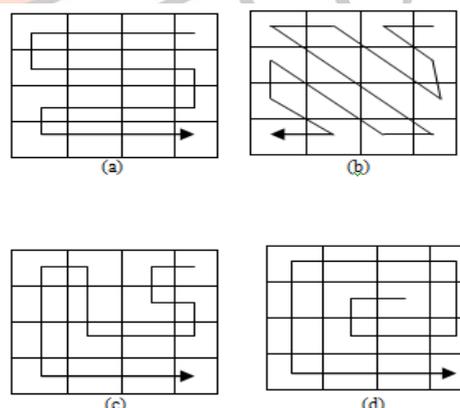


Fig-2 (a) Continous Raster C (b) Continous Diagonal D (c) Orthogonal O (d) Spiral S

IV. METHODOLOGY

In the present work DWT and Scan Based Encryption technique is used following shows step by step procedure

- 1) Here first of all video data is taken as an input, after that separation of video data into frames, say N numbers of frames. From these N-no of frames one of the frames is selected.
- 2) Following that frame of the video is encrypted by using Scanning based Encryption method.
- 3) The blue channel from the encrypted frame is taken and decomposed it into DWT coefficient.
- 4) Now select the mid frequency coefficient of these frames for embedding the watermark using Pseudo-random noise.
- 5) Once the watermarking embedding is accomplished then apply the reverse scanning operation to get back the original frame.

- 6) Constitutes these frames to rebuild the video (Watermark video).
- 7) Then Extraction Process is applied. Extraction process is just reverse operation of embedding process.
- 8) Then get the watermark video and divide it into frame.
- 9) Encrypt each frame using scanning based encryption method.
- 10) Select the blue channel of each frame decompose this using DWT and get the Extracted watermark video.

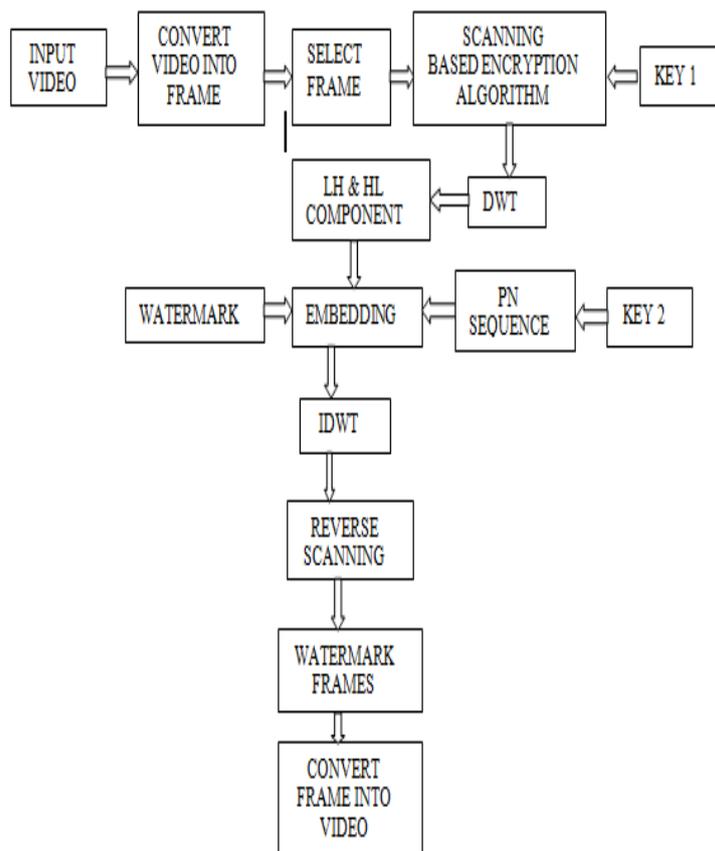


Fig-3 Block diagram of Methodology

V. DISCUSSION

A thorough and detailed analysis of various watermark algorithm based research papers, it is concluded that, to defend the video content & to enrich its security to almost double of the original security various watermarking techniques has been implemented. Combined technique of watermarking & Encryption based on scanning algorithm is mended. The DWT technique avoids intentionally attacks on video such as frame Swapping, frame dropping. As per the previous review on watermark algorithm it has been proved that the wavelet technique stands as a wall against unintentional attacks like lossy compression caused of multi-resolution characteristics & also won't affect the quality of video enabling it with improved security level.

The result as compared to other transformation techniques DWT technique is more efficient & beneficial. Simultaneously, provides robust protection of video content. Also, as compared with DCT or DFT performance and fidelity aspects are enhanced in DWT technique is proves itself to be effective. Hence, hybrid technique of DWT & scanning based encryption method enhance the speed & level of security. According to the analyzed technique till now, watermark is embedded in DCT transform that reduces the computational complexity but proves less active against some geometric attacks like scaling & rotational. While in some other approaches the DWT technique is used with, DWT with PCA, DWT with DCT, DWT and SVD.

Table 1: Video Watermarking algorithm

S. No	Author	Year	Insertion Domain	PSNR
1.	Ankita A. Hood	2013	Wavelet Domain & PCA	37.4694 dB
2.	Jiang Xuemei	2013	Shot Segmentation	46.18 dB
3.	Mriganka Gogoi	2013	DCT	62.52 dB
4.	Daushun Wang	2013	SVD	69.97 dB
5.	Ying Lan Fang	2013	Wavelet Domain	33.5788dB
6.	Ms. Snehlal Shah	2013	DWT Domain	33.4150 dB
7.	Nisreen I Yassin	2012	DWT & PCA	44.09 dB
8.	A.M. Kothari	2012	DWT & SVD	36.35dB
9.	Radu Ovidui Preda	2012	Wavelet domain	40dB

10.	Yubo Zhang	2011	3-D-DCT Domain	46.19 dB
11.	Maher AL Arbi	2010	Wavelet domain	55 dB
12.	Hui-Yu-Huang	2010	DCT & QIM	50dB
13.	Mei- Jiansheng	2009	DWT & DCT	50.02 dB

In the mentioned approaches 4- level DWT approaches possess best of the above mentioned approach, that fight against severe & several attacks.

PSNR is compared according to this table with DWT and other transformation technique, and then it will infringe that result is better than the previous methods. Hence, the comparison gives a different value of PSNR for a different insertion domain.

VI. CONCLUSION

This paper studies a complete overview on wavelet based watermarking techniques, with the combination of different other method such as PCA, DCT, SVD, QIM and Encryption method. So, it can be inferred that the combine technique of the DWT and scan methodology gives a potential approach for authentication of the video content.

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