JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

DIGITAL WATERMARKING USING DWT OPTIMIZATION TECHNIQUES

[1]Mr.N.S.Limkar, [2]Prof.M.N.Karanjkar, [3]Dr.N.D.Pergad

[1]P.G. Student, [2]Assistant Professor, [3]I/C Principal,
[1] Electronics Department, Shri Tulja Bhavani College of Engineering, Tuljapur,
Osmanabad, India.

Abstract : Digital watermarking is an enabling technology for e-commerce strategies: conditional and user-specific access to services and resources. Digital watermarking offers several advantages. The details of a good digital watermarking algorithm can be made public knowledge. Digital watermarking provides the owner of a piece of digital data the means to mark the data invisibly. The mark could be used to serialize a piece of data as it is sold or used as a method to mark a valuable image. For example, this marking allows an owner to safely post an image for viewing but legally provides an embedded copyright to prohibit others from posting the same image. Watermarks and attacks on watermarks are two sides of the same coin. The goal of both is to preserve the value of the digital data. Digital video watermarking scheme based on Discrete Wavelet Transform is addressed in this paper. Design of this scheme using Matlab programming is proposed.

Index Terms: Digital video, Discrete Wavelet Transform, Binary watermark.

I. INTRODUCTION

The watermarking technique is used for data hiding. Video watermarking algorithms normally prefers robustness. Most of the proposed video watermarking schemes are based on the techniques of image watermarking. But video watermarking introduces some issues not present in image watermarking. Watermarking techniques can be classified into spatial or frequency domain by place of application. Spatial domain watermarking is performed by modifying values of pixel color samples of a video frame whereas watermarks of frequency domain techniques are applied to coefficients obtained as the result of a frequency transform of either a whole frame or single block-shaped regions of a frame[6]. The specialty of watermark is that it remains intact to the cover work even if it is copied. So to prove ownership or copyrights of data watermark is extracted and tested. It is very difficult for counterfeiters to remove or alter watermark. As such the real owner can always have his data safe and secure. Watermarking is defined as the practice of imperceptibly altering a work to embed a message about the work. The different watermarking techniques are the spatial domain techniques, e.g. Least significant Bit (LSB) and transform domain techniques e.g. Discrete Fourier Transform (DFT), Discrete Cosine Transform (DCT), Discrete Wavelength Transform (DWT), Spread spectrum. If we embed more than one watermark in the cover image to increase the robustness, then it is also termed as multiple watermarking techniques. These are broadly classified as composite, segmented and successive (Re- watermarking). In composite watermarking, all watermarks are combined into a single watermark which is subsequently embedded in one single embedding step whereas in successive watermarking the watermarks are embedded one after the other. In segmented watermarking, the host data is partitioned into disjoint segments a priori and each watermark is embedded into its specific share. In this case, the textured regions are of high interest for the task of segment watermarking. The watermarking technique is used for data hiding. Video watermarking algorithms normally prefers robustness. Most of the proposed video watermarking schemes are based on the techniques of image watermarking. But video watermarking introduces some issues not present in image watermarking. [2] Watermarking techniques can be classified into spatial or frequency domain by place of application. Spatial domain watermarking is performed by modifying values of pixel color samples of a video frame whereas watermarks of frequency domain techniques are applied to coefficients obtained as the result of a frequency transform of either a whole frame or single block-shaped regions of a frame[6]. Most commonly used transforms are

1. Discrete Fourier Transform (DFT),
2. Discrete Cosine Transform (DCT),
3. Discrete Wavelet Transform (DWT).

Here we propose an implementation of robust video watermarking scheme using Discrete Wavelet Transform.

1.1 Video Watermarking

Maximum occurrences of copyright violation and distribution happen for video media content. So Video Watermarking is one of the most accepted techniques among the various Watermarking techniques currently in use.

1.2 Requirements for video water marking

Requirements for video Watermarking are as follows:
1. Video data is subject to increased attacks than any other media.
2. Video content is sensitive to distortions and Watermarking may degrade the quality.
3. Video compression algorithms are computationally rigorous.
4. Video require large bandwidth that is why it is mostly carried in compressed domain. So Watermarking algorithm is also adaptable for compress area processing.

II. SCHEME OF IMPLEMENTATION

2.1 Discrete Wavelet Transform (DWT)

The Discrete Wavelet Transform (DWT) is used in a wide variety of signal processing applications. 2-D discrete wavelet transform (DWT) decomposes an image or a video frame into sub-images, 3 details and 1 approximation. The 2-D DWT is an application of the 1-D DWT in both the horizontal and the vertical directions. DWT separates the frequency band of an image into a lower resolution approximation sub-band (LL) as well as horizontal (HL), vertical (LH) and diagonal (HH) detail components. Watermark is embedded in low frequencies obtained by Wavelet decomposition which increases the robustness. So that resultant watermark video become susceptible to different attacks that have low pass characteristics like filtering, loss compression and geometric distortions.

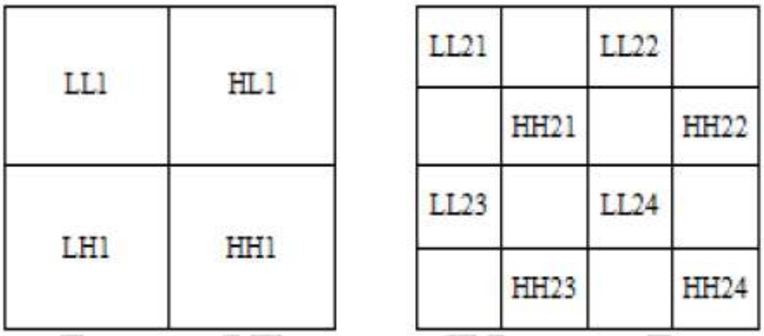


Fig-1: DWT sub-bands in (a) level 1, (b) level 2.

2.2 Watermark embedding process

The Watermark embedding process consists of the following steps:
1. Video is divided into frames RGB frames are converted to YUV frames.
2. 2-DWT is applied on it. .
3. RGB watermark image is converted into a vector P= {p1, p2... p32x32} of zeros and ones.
4. This vector P is again divided into n parts. Then each part is embedded into each of the corresponding LL and HH sub bands. The watermark pixels are embedded with strength x into the maximum coefficient Mi of each PC block Yi. The embedding equation is:

$$Mi = Mi + xW \qquad (1)$$

Where, x is the watermark embedding strength.
5. Inverse DWT is applied to obtain the watermarked luminance component of the frame. Finally watermarked frame is reconstructed and watermarked video is obtained.

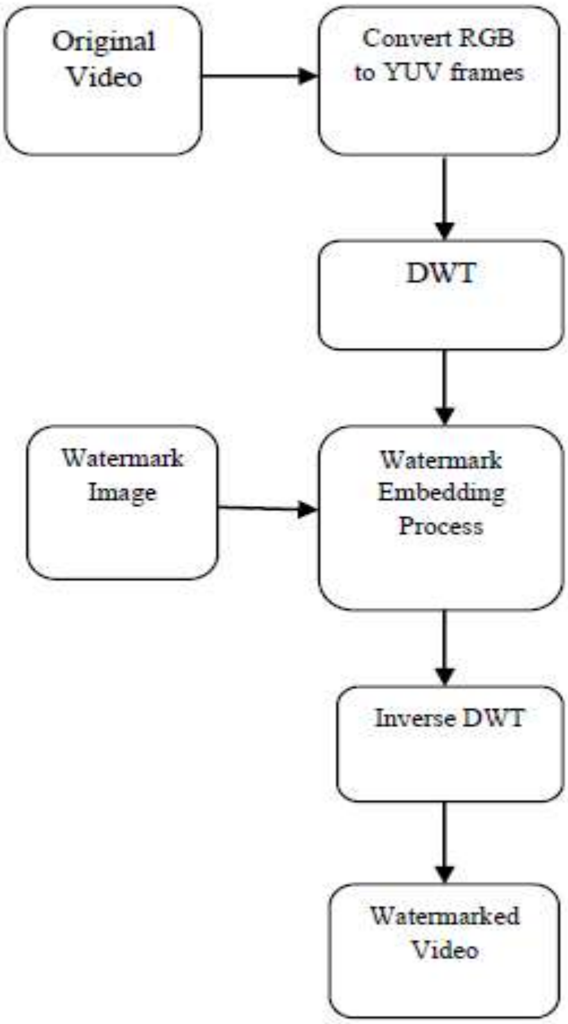


Fig-2: Watermark embedding process.

2.3. Watermark Extraction Process

The steps used for watermark extraction is the same as the steps in the embedding but in the reverse direction. As follows

1. Watermarked video is converted into frames. Each RGB frame is converted to YUV representation.
2. DWT is applied. LL and HH sub-bands divided into nxn non-overlapping blocks.
3. Following equation is used to extract watermark

$$W = \frac{M_i^1 - M_i}{x} \qquad (2)$$

$$NC = \frac{\sum_i \sum_j W(i,j).W'(i,j)}{\sum_i \sum_j W(i,j)^2} \qquad (3)$$

Where, NC is the normalized correlation. NC value is 1 when the watermark and the extracted watermark are identical and zero if the two are different from each other.

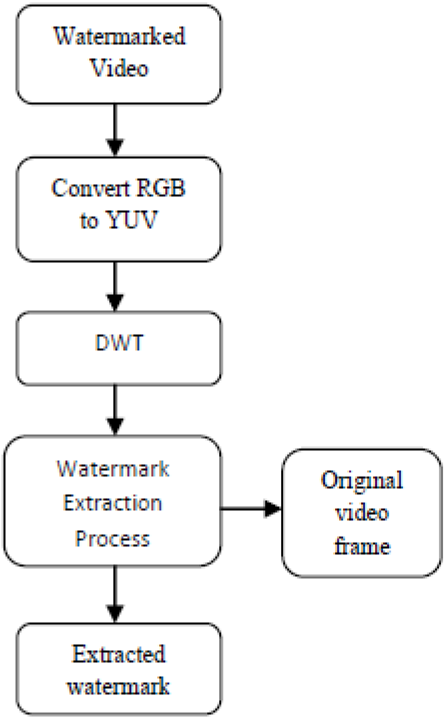


Fig-3: Watermark extraction process.

III. RESULTS AND DISCUSSION

Above algorithm is applied to a sample video sequence Vipmen.avi using binary watermark logo. The original sampled frame and its corresponding watermarked frame are shown in Fig. Watermarked frame appears visually identical to the original. The performance of algorithm can be measured in terms of its imperceptibility and robustness against the possible attacks. Watermarked frame is subjected to a variety of attacks such as Gamma correction, Contrast adjustment, Histogram equalization etc. In case of geometric attacks scheme is tested against Frame resizing, Frame rotation, Frame cropping. To evaluate the performance of any watermarking system, Peak Signal to Noise Ratio (PSNR) is used as a general measure of the visual quality of the watermarking system. PSNR: The Peak-Signal-To-Noise Ratio (PSNR) is used to measure deviation of the watermarked and attacked frames from the original video frames and is defined as:

$$\mathrm{PSNR} = 10\log_{10}(255^2/\mathrm{MSE}) \qquad (4)$$

Where MSE (mean squared error) between the original and distorted frames (size m x n) is defined as:

$$\mathrm{MSE} = (1/mn)\sum_{i=1}^{m}\sum_{j=1}^{n}[I(i,j) - I'(i,j)] \qquad (5)$$

Where I and I′ are the pixel values at location (i, j) of the original and the distorted frame respectively. Higher values of PSNR indicate more imperceptibility of watermarking. It is expressed in decibels (dB).

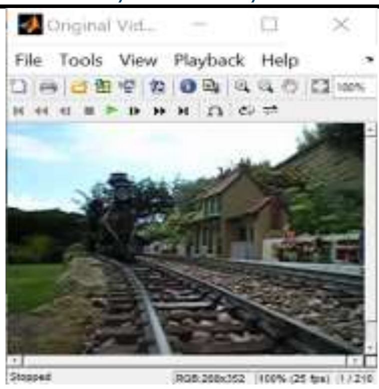
NC: The normalized coefficient (NC) gives a measure of the robustness of watermarking and its peak value is 1**.**

$$\mathrm{NC} = \frac{\sum_i \sum_j W(i,j).W'(i,j)}{\sqrt{\sum_i \sum_j W(i,j)}\sqrt{\sum_i \sum_j W'(i,j)}} \qquad (6)$$

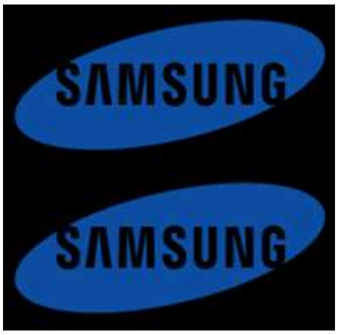
Where W and W′ represent the original and extracted watermark respectively.

IV. RESULT

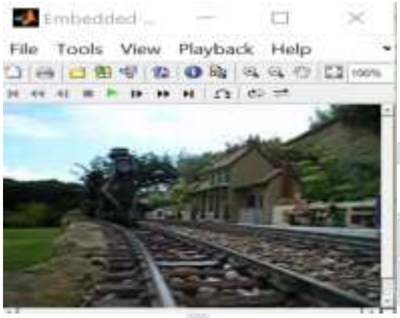
Following screens show the process of embedding, extracting of watermark into video and framing of the video
In this screen the PSNR value, MSE value and optimizations displayed in the form of graphical representation



Original video



original watermark



Embedded video

Extracted watermark

Table 1 Output Values:

Iteration	PSNR	MSE	NC
1	147.7141	0.0250	1
2	164.9190	0.0045	1
3	147.7299	0.0250	1

IV. CONCLUSION

Conclusion of this method is that there are many type of watermark techniques which are helpful to protect the data in the form of image, audio, text and video. So we can use these techniques of watermark in video where video is combination of sequence of frames. And we can create some different type of equation to hide data or image data in frames of video. The existing color image watermarking schemes were always designed to mark the image luminance component only, which are sensitive to color attacks and geometric distortion. We have proposed a blind color watermarking method in quaternion Fourier transform domain with Bees algorithm optimization. The method embeds the watermark information into original color image by adaptively modulating the real coefficients of quaternion Fourier transform and then the section and optimization is done with the help of Bees algorithm..

REFERENCES

[1] Nisreen I. Yassin, Nan cy M. Salem, and Mohamed I. El Adawy "Block Based Video Watermarking Scheme Using Wavelet Transform and Principle Component Analysis"IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 1, No 3, January 2012.

[2] HananeH.Mirza, HienD.Thai, Yasunori Nagata and ZenshoNakao" Digital Video Watermarking Based on Principal Component Analysis" in Department of Electrical and Electronics Engineering, University of the Ryukyus Okinawa 9030213,Japan, 2011.

[3] Sanjana Sinha, Prajnat Bardhan, Swarnali Pramanick, AnkulJagatramka, Dipak K. Kole, ArunaChakraborty.."Digital Video Watermarking using Discrete Wavelet Transform and Principal Component Analysis"International Journal of Wisdom Based Computing, Vol. 1 (2), August 2011

[4] Snehal V. Patel, Prof. Arvind R. Yadav "Invisible Digital Video Watermarking Using 4-level DWT" National Conference on Recent Trends in Engineering & Technology, 14 May 2011

[5] KesavanGopal, Dr. M. MadhaviLatha"Watermarking of Digital Video Stream for Source Authentication" IJCSI International Journal of Computer Science Issues,Vol. 7,Issue 4, No 1, July 2010.

[6] Salwa A.K Mostafa, A. S. Tolba, F. M. Abdelkader, Hisham M. Elhindy, „"Video Watermarking Scheme Based on Principal Component Analysis and Wavelet Transform"" IJCSNS International Journal of Computer Science and Network Security, VOL.9 No.8, August 2009.
[7] Mandeep Singh Saini, VenkataKranthi B, Gursharanjeet Singh Kalra., "Comparative Analysis of Digital Image Watermarking Techniques in Frequency Domain using MATLAB SIMULINK", International Journal of Engineering Research and Applications (IJERA)ISSN: 2248-9622 Vol. 2, Issue 4, May-Jun 2012.
[8] Keshav S Rawat, Dheerendra S Tomar,"Digital watermarking schemes for authorization against copying or piracy of color images" Indian Journal of Computer Science and Engineering Vol. 1 No. 4 295-300
[9] HananeMirza, Hien Thai, and ZenshoNakao,"Digital Video Watermarking Based on RGB Color Channels and Principal Component Analysis", KES 2008, Part II, LNAI 5178, pp. 125–132, 2008.
[10] Yavuz E., Telatar Z., "Digital Watermarking with PCA Based Reference Images",ACIVS 2007, Springer-Verlag Lecture Notes in Computer Science, 4678, pp.1014-1023, 2007.
[11] S.Bhargav Kumar, K.Esther Rani,"FPGA Implementation of 4-D DWT and BPS based Digital Image Watermarking"International Journal of Engineering Trends and Technology- Volume3Issue2-2012.
[12] Saraju P. Mohanty, Renuka Kumara C, and Sridhara Nayak "FPGA Based Implementation of an Invisible-Robust ImageWatermarking Encoder" CIT 2004, LNCS 3356, pp. 344–353, 2004.
[13] Keshav s rawat "digital watermarking schemes for authorization against copying or piracy of color images" Indian Journal of Computer Science and Engineering Vol. 1 No. 4 295-300.c