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Efficient Approach of Digital Video Watermarking Using LDPC

S. Anjaneyulu, Dr. T. Ramashri
Lecturer in ECE Dept , SKU College of Engg and Tech Anantapuram and Research scholar in S.V.U.Engineering College S.V.University,Tirupati,A.P-India
Professor in ECE Dept, S.V.University Engineering College, S.V.University, Tirupati,A.P-India

Abstract: *The most important issues in video watermarking are invisibility of the watermark and the resilience of watermarking to attacks. The area of video watermarking has focused primarily on the problem of robustness to geometric attacks, while discounting the problem of more sophisticated attackers. So to improve the robustness of watermark for A new digital watermarking algorithm, for based on LDPC coding ,to embedded the watermark in videos that insert information in the side view, unlike the regular approaches that insert on the frames. Video watermarking technology has applied image watermarking technology to individual frames of a video. The implemented watermarking system operates in the spectrum domain where a subset of the discrete wavelet transform (DWT) coefficients is modified by the watermark without using the original image during watermark extraction. The quality of watermark is evaluated by taking into account the trade-off between the chip-rate and the rate of LDPC codes.*
Keywords: *Digital Video watermarking, LDPCEncoder and LDPC Decoder, Robust watermarking, DWT*

I. Introduction

Watermark signal is transmitted over the watermark channel while the host data together with possible external attacks acts as part of the channel noise and also robust to noise and attacks, watermarks are also required to be imperceptible and carry an adequate capacity of information. This not only makes the watermark vulnerable to noise and attacks but also limits severely the amount of information the watermark can carry. Under certain conditions the channel capacity as well as the error rate can be improved by applying optimum decoding principles and error correcting codes.

With great development of information technology and computer network, digital multimedia such as image, video and speech, is being transmitted, duplicated and stored over the Internet conveniently. These days video media is the center of attentions with regard to the high volume of its products. Information watermarking is the embedment of a hidden message within another signal. The most important issues in video watermarking are invisibility of the watermark and the resilience of watermarking to attacks. A lot of watermarking methods have been proposed to improve both of these aspects. the watermark data embedded in the different domains, video digital watermarking algorithm can be divided into two categories of the original domain and compressed domain watermarking.

Video watermarking approaches can be classified into two main categories based on the method of hiding watermark bits in the host video. The two categories are: Spatial domain watermarking where embedding and detection of watermark are performed by directly manipulating the pixel intensity values of the video frame. The advantage of the method of embedding the watermark in the original domain is the simple of the idea and low complexity. Its disadvantage is the poor performance of the robustness and invisibility. LDPC, improving the robustness of video watermarking algorithm in the original domain. Video watermarking scheme based on DWT, using the DWT coefficients to embed watermark. The H.264 standard represents an evolution of the existing video coding standards. It has been jointly developed by the ITU-T Video Coding Experts Group and the ISO/IEC Moving Picture Experts Group in response to the growing need for higher compression of moving pictures.

II. Watermark Generation

The design of a watermarking system is the generation of the watermark signal to be embedded within the host video. Besides the watermark information, i.e. the information which is to be embedded within the original video, watermarking technique improves the robustness of watermarks to geometric attacks without sacrificing the security of the mark.

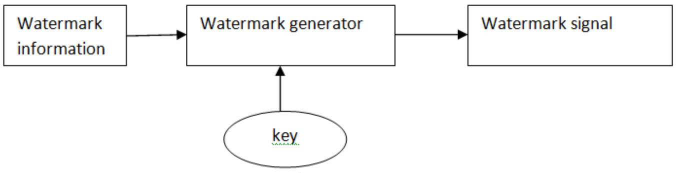

Fig1.Watermark Generation

III. Discrete Wavelet Transform

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 approximation sub-image resembles the original on 1/4 the scale of the original. The 2-D DWT (Fig. 2) 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. Embedding the watermark in low frequencies obtained by wavelet decomposition increases the robustness with respect to attacks that have low pass characteristics like filtering, lossy compression and geometric distortions

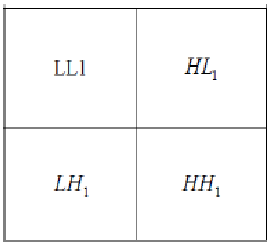

Fig2. DWT sub bands

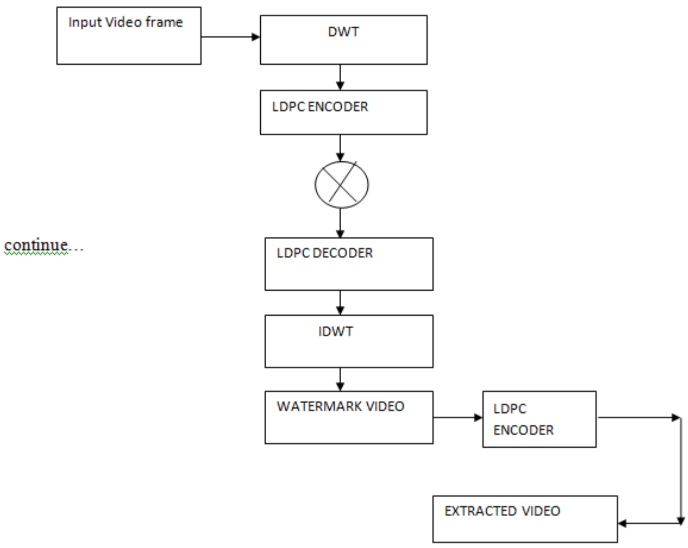

Fig3. block diagram of watermarking

IV. Low Density Parity Check

In this paper we investigate error correction for watermark channels using low-density parity- check (LDPC) codes. It is not only theoretically shown that LDPC codes are very good when decoded with an optimal decoder but also empirically demonstrated that these codes have excellent performance with a practical decoder. the implementation of watermarking system there is a trade-off between the chip rate and the communication rate of the code. Essentially any error-correction scheme relies on introducing redundancy to the transmitted information. the chip-rate was defined as the ratio M=N, where a total of M DWT coefficients were available for the embedding of N bits of watermark information. the chip-rate indicates the number of DWT coefficients an information bit is embedded onto and can be measured in coefficients/bits Obviously, the energy per bit is closely related to the chip-rate: an increase in the chip rate translates into an equivalent increase in the bit energy.

Algorithms for watermarking using DWT and LDPC

a) Embedding Procedure

Step 1: Convert the n × n binary watermark logo into a vector W = { w1, w2 , ……, wn × n } of '0's and '1's.
Step 2: Divide the video (2N × 2N) into distinct frames.
Step 3: Convert each frame from RGB to YUV colour format.
Step 4: Apply 1-level DWT to the luminance (Y component) of each video frame to obtain four sub-bands LL, LH , HL and HH of size N x N .
Step 5: Divide the LL sub-band into k non-overlapping sub-blocks each of dimension n × n (of the same size asthe watermark logo).
Step 6: The watermark bits are embedded with strength α into each sub-block by first obtaining the principal component scores by Algorithm 2. The embedding is carried out as equation 1.
score W = +α (1) where *i score* represents the parity matrix of the ith sub-block.
Step 7: Apply LDPC Decoder on the modified ldpc components of the sub-blocks of the LL sub-band to obtain the modified wavelet coefficients.
Step 8: Apply inverse DWT to obtain the watermarked luminance component of the frame. Then convert the video frame back to its RGB components.

b) Extraction Procedure

Step 1: Divide the watermarked (and possibly attacked) video into distinct frames and convert them from RGB to YUV format.
Step 2: Choose the luminance (Y) component of a frame and apply the DWT to decompose the Y component into the four sub-bands LL , HL , LH , and HH of size N×N.
Step 3: Divide the LL sub-band into n × n non overlapping sub-blocks.
Step 4: Apply PCA to each block in the chosen sub band LL by using Algorithm 2.
Step 5: From the LL sub-band, the watermark bits are extracted from the principal components of each sub-block

$$w = \frac{(i-j)}{\alpha}$$

where 'W is the watermark extracted from the ith sub block.

V. Experimental Results

The proposed algorithm is applied to a sample video sequence using a 32 × 32 watermark logo. Fig. 5(a) and 5(b) show the original and the watermarked video frames respectively. Fig. 5(c) is the video frame and Fig. 5(d) is the extracted binary watermark image. The performance of the algorithm has been measured in terms of its imperceptibility and robustness against the possible attacks like noise addition, filtering, geometric attacks etc.

Fig.5(a) original video frame

Fig.5(b) watermarked video frame

Fig.5(c)original video frame2

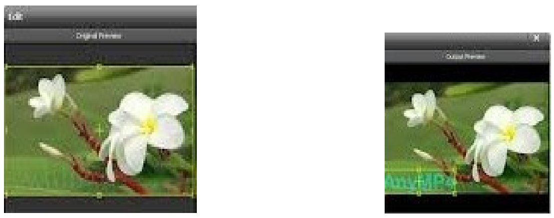

Fig.5(d) extracted binary watermark image.

VI. Conclusion

The implemented watermarking system operates in the spectrum domain where a subset of the discrete wavelet transform (DWT) coefficients is modified by the watermark without using the original image during watermark extraction. low-density parity-check codes improve the error rate significantly. We have shown that the capacity of the watermark can be increased significantly. when applying LDPC coding prior to embedding. The quality of watermark is evaluated by taking into account the trade-off between the chip-rate and the rate of LDPC codes.

References

[1]. Wolfgang, R.B., Delp, E.J.: Overview of image security techniques with applications in multimedia systems. In: Proceedings of the SPIE International Conference on Multimedia Networks: Security, Displays, Terminals, and Gateways, Dallas, Texas, November 4–5, vol. 3228, pp. 297–308 (1997)
[2]. Swanson, M.D., Kobayashi, M., Tewfik, A.H.: Multimedia data-embedding and watermarking technologies. Proceedings of the IEEE 86, 1064–1087 (1998)
[3]. Smith, J.R., Comiskey, B.O.: Modulation and information hiding in images. In: Anderson, R. (ed.) IH 1996. LNCS, vol. 1174, pp. 207–226. Springer, Heidelberg (1996)
[4]. Cox, J.I., Kilian, J., Leighton, F.T., Shammon, T.: Secure Spread Spectrum Watermarking for multimedia. IEEE Transactions on Image Processing 6, 1673–1686 (1997)
[5]. George, M., Chouinard, J.-Y., Georganas, N.: Digital Watermarking of Images and Video using Direct Sequence Spread Spectrum Techniques. In: ICEIC (1999)
[6]. Piva, A., Barni, M., Bartolini, F., Cappellini, V., De Rosa, A.: Improving the Robustness of Non-additive Watermarks Through Optimum Detection Theory. In: Proceedings of SPIE, vol. 3971 (2000)
[7]. Gallager, R.G.: Low Density Parity Check Codes. MIT Press, Cambridge (1963)
[8]. Mackay, D.J.C.: Good error-correcting codes based on very sparse matrices. IEEE Transaction on Information Theory 45, 399–431 (1999)

AUTHOR'S PROFILE

S.Anjaneyulu is Research Scholar in Electronics and Communication Engineering, S.V University Engineering College,S.V.University,Thirupati. He received his B.Tech degree in Electronics and Communication Engineering from G.Pullareddy Engg college, Kurnool and M.Tech degree in Digital Systems and Computer Electronics from JNT University, Anathapur.

Dr.T.RamaShri, is working as Professor in ECE Department S.V University Engineering College,S.V.University, Thirupati. She is having more than 16 years Teaching Experience. She published ten International conferences and three National Conference and interested in Digital Image Processing. Guest lecturers delivered membership of Professional bodies.Life member of ISTE, Life member of IETE.