ISSN:0975-9646

A Secure File Transfer based on Discrete Wavelet Transformation and Audio Watermarking Techniques

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Abstract:In this proposed paper, we introduced an improved discrete wavelet transformation, called Parallel Discrete Wavelet Transformation, PDWT for short. It is applied to audio protection such that the security and robustness of the embedded watermarking can be enhanced. With the PDWT, the hidden watermarking information can be retrieved in full even with the most seriously dam- aged audio signals. Applying the proposed scheme on audios with a variety of simulate attacks have proven that the proposed scheme not only can diversify embedded information but also can sustain more serious attack to the embedded stego audio file..

INTRODUCTION :

Many effective watermarking algorithms have been proposed and implemented for digital images and digital video, however, few algorithms have been proposed for audio watermarking. This is due to the fact that, the human audio system is far more complex and sensitive than the human visual system. In the information age, computer technology brought us convenience on information exchange also brought us concerns on the security of information. Computer users can illegally modify or use the information without authorization. Thus copyright protection is an urgent sub- ject today and digital watermarking is developed to protect the intellectual properties [1,2]. The implementation of watermarking schemes to media generally emphasis on taking advantages of the characteristics of the watermarks and on enhancing the security of watermarking. Digital watermarks usually need to have three characteristics [3]: Imperceptibility, Security, and Robustness [4]. In this paper, we propose a watermarking scheme based
on Haar's wavelet transformation [7,8]. Discrete Wavelet Transformation (DWT) scheme emphasis on coping with Audio compression standards but sacrifices the basic requirement of watermarking security. Thus, we propose Parallel Discrete Wavelet Transformation (PDWT) scheme to solve the problem. The experimental results show that based on PDWT the digital watermarking not only obtains the operational efficiency but also enhances the robustness.

LITERATURE SURVEY:

By virtue of the new advancements in computer and telecommunication networks, multimedia files are produced, stored and parallel easily across the globe. However, the ownership and copyright of multimedia files are not usually protected. Digital watermarking has been proposed in recent years as a means of protecting multimedia contents from intellectual piracy. This is achieved by modifying the original content, by inserting a signature which can be extracted, when necessary, as a proof of ownership. Indeed, many effective digital image and video watermarking algorithms have been proposed and implemented at a commercial scale [9]. However, and due to the fact that the human audio system is far more complex and sensitive than the human visual system, few algorithms have been proposed for audio watermarking [4].
Audio watermarking techniques reported in literature can be grouped into two types; time-domain techniques and frequency-transform domain techniques [1, 3]. The two domains have different characteristics, and thus performances of their techniques may vary with respect to the robustness and imperceptibility (inaudibility) requirements of audio watermarking. Inaudibility refers to the condition that the embedded watermark should not produce audible distortion to the sound quality of the original audio, in such a way that the watermarked marked version of the file is indistinguishable from the original one. Robustness determines the resistance of the watermark against removal or degradation. The watermark should survive malicious attacks such as random cropping and noise adding, and its removal should be impossible without perceptible signal alterations. Time-domain techniques include the Least Significant Bit substitution (LSB) and echo hiding techniques, among many others [5, 7]. LSB embeds the watermark information in the least significant bits of the audio sample values by overwriting the original bits [7, 10]. It takes advantage of the quantization error that usually derives from the task of digitizing the audio signal. On the other hand, echo watermarking attempts to embed information into the original discrete audio signal by introducing a repeated version of a component of the audio

signal with small offset, initial amplitude and decay rate to make it imperceptible. In general, time-domain audio watermarking is relatively easy to implement, and requires few computing resources, however, it is weak against signal processing attacks such as compression and filtering. Frequency domain audio watermarking techniques employ human perceptual properties and frequency masking characteristics of the human auditory system for effective watermarking In these techniques, the phase and amplitude of the transform domain coefficients are modified in a certain way to carry the desired watermark information. Popular transforms include the Discrete Fourier Transform (DFT), the Discrete Cosine Transform (DCT), and the Discrete Wavelets Transform (DWT). In [12], the Fourier transform magnitude coefficients over the frequency range from 2.4 KHz to 6.4 KHz are replaced with the watermark sequence since human sensitivity declines compared to its peak around 1 KHz . Moreover, human ears are relatively insensitive to phase distortion, and especially lack the ability to perceive the absolute phase value, therefore the watermark is represented by the relative phase between selected coefficients and their neighbors. The problem with these watermarking schemes that they are less robust to signal processing and malicious attacks, such as audio compression. Other than time-domain and frequency domain techniques, spread-spectrum watermarking methods are becoming popular. These methods embed a narrow-band signal (the watermark) into a wide-band channel (the audio file) to spread the watermark data across the large frequency band, namely the audible spectrum [8, 10]. Watermark detection is done by calculating the correlation between the watermarked audio signal and the watermark signal. Finally, Patchwork methods use pseudorandom processes to embed a certain statistics into a data set which is detected in the reading process with the help of numerical indexes, like the mean, describing the specific distribution. Computational complexity of these methods is very high, and synchronization is difficult to implement.

PROPOSED APPROACH:

Based on the concept of Parallel Discrete Wavelet Transformation (PDWT), the proposed watermarking scheme is to distribute concentrated and related s. Ordinary application of wavelet transformation [5,6] is for compression purpose, such that the operations are done at Samples . But for watermarking purpose, security and imperceptibility is the primary concern, concentrate hidden information will not meet the security requirement. Thus we propose the DWT method that distributes the information to be hidden in the coefficients, The process of the Multi-scale(K-scale) PDWT transform is as follows. With the original audio file in separate the original Audio file S(M × M) horizontally into two equal sub band signals, then get left block L and right block H. The length of row of L is M and the length of column of L is M 2. The size of H is the same as L and we reconstruct the coordinates of H, for example, H(0,0) = S(0,M2), H(M−1,0) = S(M−1,M2),etc

Input : $L_{(I,j)}$,$H_{(I,j)}$ th signal sample values of L,H
Output :$L^{|}$,$H^{|}$ are the results of process with L,H
For i=:0 to M-1 do
Begin
For j=:0 to M/2 -- 1 do
Begin
$L^{|}_{(I,j)}$=$L_{(I,j)}$ +$H_{(I,j)}$;
$H^{|}_{(I,j)}$=$L_{(I,j)}$-$H_{(I,j)}$;
End
End

L′ containing summedd sub band signals represent low-pass sub band coefficients; H′ containing subtracted sub band signals represent high-pass sub band coefficients. The combination of the L′ and H′ forms S′

Embedding process :

Based on the above multi-scale PDWT transform, we propose a digital watermarking scheme for intellectual property. The algorithms for embedding and extracting watermark are shown below.

Embedding Algorithm :

The process of the embedding algorithm is as follows:

STEP 1 : Input the original Audio file S(M ×M) to be embedded and watermark audio W(N × N).

STEP 2 : With S, perform K-scale PDWT transform, where K represents the number of scale and t the strength coefficient.

STEP 3 :Take the Subband signal samples LH and HL of the last scale PDWT transform result and process the embedding signals in the frequency domain:

IF (W(i,j) = 0) then HL(i,j) = HL(i,j) + (2K)2t; (1)
IF (W(i,j) = 1) then LH(i,j) = LH(i,j) + (2K)2t; (2)

STEP 4 : Repeat the STEP3 until all the watermark information are processed.

STEP 5 : Inverse PDWT to obtain the stego-file E

Extraction Algorithm :

The process of the extracting algorithm is as follows:

STEP 1 Input the stego-Audio E and the original Audio S(M ×M).

STEP 2 Calculate the sample data for a single extracting process l, l = M(2K−1) .

STEP 3 Divide E and S with block length l into sub- blocks signal samples. Each Signal can be divided into p sub signal samples p = ((2K−1)2).

STEP 4 Subtract the corresponding sample values of the sub-blocks from E and S and set the results to an element of array V .

STEP 5 With the array V , divide it into four square sub band signal samples with length of l2 . The sub-blocks are named from left to right, top to bottom as LL, HL, LH, HH.

STEP 6 Extract the individual signal of the embedded watermark.

IF (LL(i,j) > 0 and LH(i,j) > 0) then W(i,j) = 1; (3)
IF (LL(i,j) > 0 and HL(i,j) > 0) then W(i,j) = 0; (4)

STEP 7 Repeat the STEP6 until the sub-blocks of the K-scale are processed.

We conduct several types of attacks on the embedded signal samples based on the two methods. The watermarked stego file is measured by computing the peak signal-to-noise-ratio (PSNR). PSNR = 10log102552 Mse dB (5)

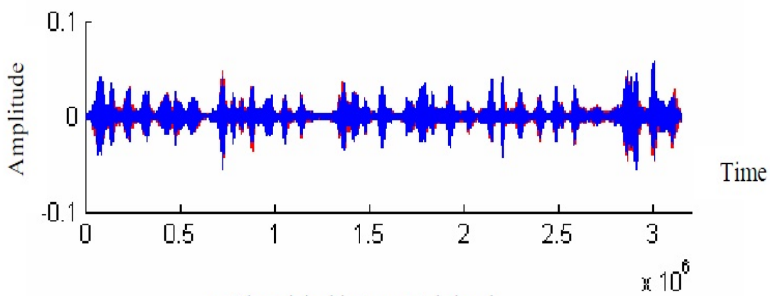
Where MSE denotes the mean square error between the original audio sample and the corresponding watermarked audio signal samples. The performance of the PDWT-based and DWT-based watermarking technique for three different parameters, expressed in terms of Gaussian Noise on audio samples Lena. The results show that the PDWT-based method quality of the watermarked image is better than DWT-based method under Gaus- sian Noise attack.

EXPERIMENTAL RESULTS :

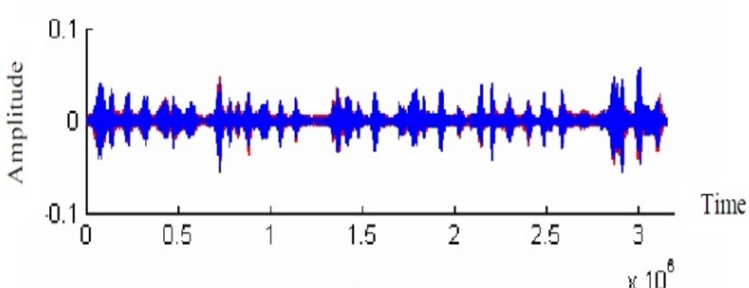
The experimental results of PDWT shows an efficient results comparing to the traditional DWT , The experimental results show that the distributions of hidden information are very different, the hidden information with DWT encoding appear on the upper sub band embedded signals.

The robustness of the PDWT-based watermarking technique was compared to the DWT-based watermarking technique. In DWT-based technique, watermark is em- bedded into the largest DWT coefficients that will yield the same PSNR for signals watermarked by both DWT and PDWT methods.

The following figure shows the signal and watermarked signal



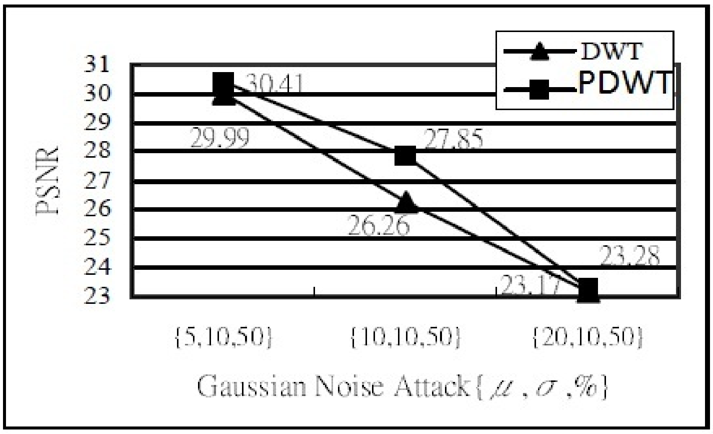
a. The original instrumental signal.



b. Watermarked instrumental signal.

Fig 1.

The Gausian noise results between DWT and PDWT are in the graph 1 shown as below



The Gaussian Noise results of both DWT and PDWT

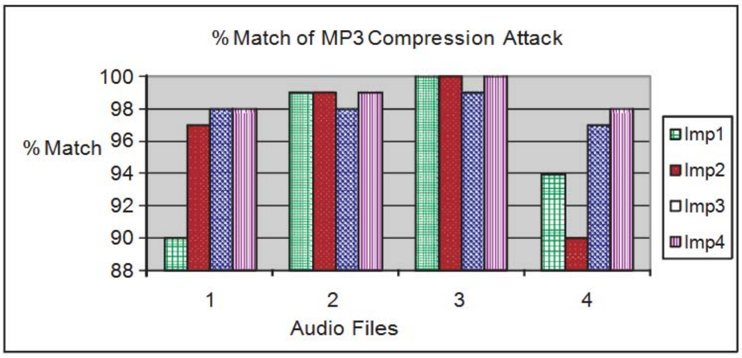


Fig. 2. Comparisons of % match of four implementation for MP3 Compression

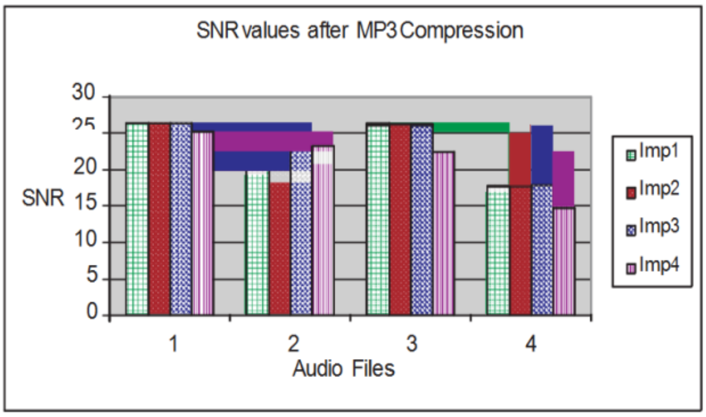


Fig. 3. Comparisons of SNR Values of four implementation for MP3 Compression

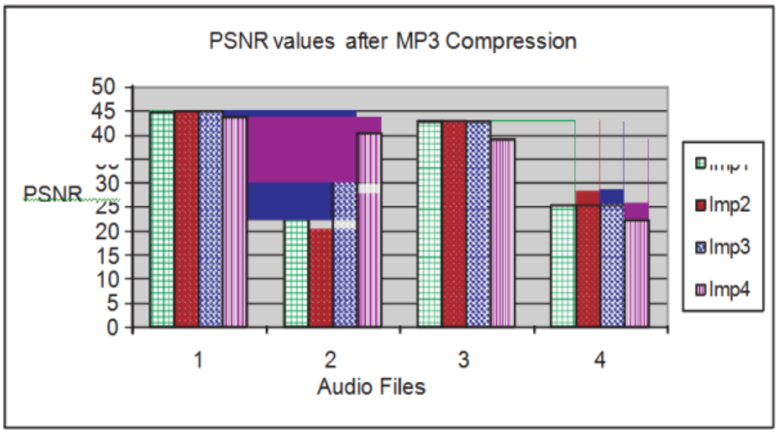


Fig. 4. Comparisons of PSNR Values of four implementation for MP3 Compression

CONCLUSION :

In this paper, we present a transformation scheme on watermarking differs from discrete wavelet transformation; with the purpose that provides a foundation for a more Efficient watermarking scheme. Different from the previously proposed watermarking scheme, that uses discrete wavelet transformation, which emphasis on coping watermark in samples leads redundancy but sacrifices the basic requirement of watermarking security. it can be retained but also obtained the operational efficiency and convenience through the applicationof digital watermarking. By doing so, the information can be used on more applications and legal intellectual properties can also be preserved.

REFERENCES

[1] Acevedo A., *Digital Watermarking for Audio Data in Techniques and Applications of Digital Watermarking and Content Protection*, Artech House, USA, 2003.

[2] ADOBE® Audition, http://www.adobe.com/products/audition/, 2009.

[3] Arnold M., “Audio Watermarking: Features, Applications and algorithms,” *in Processings of the IEEE International Conference on Multimedia and Expo*, pp. 1013-1016, 2000.

[4] Arnold M., Wolthusen S., and Schmucker M., “Techniques and Applications of Digital Watermarking and Content Protection,” *Artech House, Psychoacoustics: Facts and models*, Springer-Verlag, 2003

[5] Bassia P. and Pitas I., “Robust Audio Watermarking in the Time Domain,” *IEEE Transactions on Multimedia*, vol. 3, no. 2, pp. 232-241, 2001.

[6] Beerends J. and Stemerdink J., “A Perceptual Audio Quality Measurement Based on a Psychoacoustic Sound Representation,” *Journal of the Audio Engineering Society*, vol. 40, no. 12, pp. 963-978, 1992.

[7] Bender W., Gruhl D., Morimoto N., and Lu A., “Techniques for Data Hiding,” *IBM System Journal*, vol. 35, pp. 313-336, 1996.

[8] Cox I., Kilian J., Leighton T., and Shamoon T., “Secure Spread Spectrum Watermarking for Multimedia,” *IEEE Transactions on Image Processing*, vol. 6, no. 12, pp. 1673-1687. 1997.

[9] Cox I., Miller M., and Bloom J., “Digital Watermarking,” Academic Pressing, USA, 2002.

[10] Cvejic N. and Seppänen T., “Increasing the Capacity of LSB-Based Audio Steganography,” *in Proceedings of the IEEE International Workshop on Multimedia Signal Processing*, pp. 336-338, 2002.

[11] C. F. Wu, and W. S. Hsieh, ”Digital watermarking Using Zerotree of DCT,” IEEE Transactions on Consumer Electronics, vol. 46. No. 1. pp. 87-94, 2000.

[12]. H. Inoue, A. Miyazaki, and A. Yamamoto, ”A digital watermarking based on the wavelet transform and its robustness on image compression,” Proceeding of IEEE international conference on Image Processing, vol. 2. pp. 391-395, 1998.

[13]. H. Inoue, A. Miyazaki, and T. Katsura, ”Wavelet based watermarking for tampering proofing of still images,” IEEE Int. Conf. on Image Processing, vol. 2. pp. 88-91, 2000.