A Survey on Efficient Audio Watermark Embedding & Extraction DWT Method with Noise Removing Technique

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Abstract:

Digital Audio watermarking is now drawing attention as a new method of protecting multimedia content from unauthorized copying. This paper proposes a new watermarking system using LSB method for copyright protection of digital contents and noise suppression method for watermark recovery. In our proposed watermarking system, the original audio is segmented into non-overlapping frames. Watermarks are then embedded into the highest prominent peak in the magnitude spectrum of each frame. Watermarks are extracted by performing the inverse operation of watermark embedding process. Simulation results indicate that the proposed watermarking system is highly robust against various kinds of attacks such as noise addition, cropping, re-sampling, re-quantization, and MP3 compression, and achieves similarity values ranging from 13 to 20. In addition, our proposed system achieves low SNR

Keyword:

Copyright protection, digital watermarking, multimedia contents, LSB,Noise suppression, Compression & rarefaction region

I. Introduction

The recent growth in computer networks, and more specifically, the World Wide Web, copyright protection of digital audio becomes more and more important. Digital audio watermarking has drawn extensive attention for copyright protection of audio data. A digital audio watermarking is a process of embedding watermarks into audio signal to show authenticity and ownership.

Audio watermarking should meet the following requirements :

(a) Imperceptibility: the digital watermark should not affect the quality of original audio signal after it is watermarked;

(b) Robustness: the embedded watermark data should not be removed or eliminated by unauthorized distributors using common signal processing operations and attacks;

(c) Capacity: capacity refers to the numbers of bits that can be embedded into the audio signal within a unit of time;

(d) Security: security implies that the watermark can only be detectable by the authorized person. All these requirements are often contradictory with each other. However, it should satisfy the important properties such as imperceptibility and robustness.

In this paper, we propose a new watermarking system using LSB for audio copyright protection and extraction with noise

suppression method. The watermarks are embedded into the highest prominent peak of the magnitude spectrum of each non-overlapping frame. Experimental results indicate that the proposed watermarking system provides strong robustness against several kinds of attacks such as noise addition, cropping, re-sampling, re-quantization, and MP3 compression and achieves similarity values ranging from 13 to 20. In addition, our proposed system achieves low SNR.

Noise: Whenever the signal is transmitted there is always noise is present in the signal. Hence, watermarking algorithm has to make the technique robust against the noise attacks. It is commonly used to check the algorithm for this type of noise attacks by adding the host signal by an additive white Gaussian noise (AWGN) to check its robustness.

II. Literature Review

A significant number of watermarking techniques have been reported in recent years in order to create robust and imperceptible audio watermarks. Lie et al.[1] propose a method of embedding watermarks into audio signals in the time domain. The proposed algorithm exploits differential average-of-absolute-amplitude relations within each group of audio samples to represent one-bit information. It also utilizes the low-frequency amplitude modification technique to scale the amplitudes in selected sections of samples so that the time domain waveform envelope can be almost preserved. In [2], authors propose a blind audio watermarking system which embeds watermarks into audio signal in time domain. The strength of the audio signal modifications is limited by the necessity to produce an output signal for watermark detection. The watermark signal is generated using a key, and watermark insertion depends on the amplitude and frequency of audio signal that minimizes the audibility of the watermarked signal. Ling et al.[3] introduce a watermarking scheme based on non uniform discrete Fourier transform (NDFT), in which the frequency points of embedding watermark are selected by the secret key. Zeng et al. [4] describe a blind watermarking system which embeds watermarks into DCT coefficients by utilizing quantization index modulation technique. In [5], the authors propose a watermarking system which embeds synchronization signals in time domain to resist against several attacks. Pooyan et al.[6] introduce an audio watermarking system which embeds watermarks in wavelet domain. The watermarked data is then encrypted and combined with a synchronization code and embedded into low frequency coefficients of the sound in wavelet domain. The magnitude of quantization step and embedding strength is adaptively determined according to the characteristics of human auditory system. Wang et al.[7] proposes a blind audio watermarking scheme using adaptive quantization against synchronization attack. In addition, the multi resolution characteristics of discrete wavelet transform (DWT) and the energy compression characteristics of discrete cosine transform (DCT) are combined in this scheme to improve the transparency of digital watermark. Watermark is then embedded into low frequency components by using adaptive quantization according to human auditory system. In [8], authors propose a watermarking system in cepstrum domain in which a pseudo-random sequence is used as a watermark. The watermark is then weighted in the cestrum domain according to the distribution of cepstral coefficients and the frequency masking characteristics of human auditory system. Liu et al. [9] propose a blind watermarking system which takes the advantages of the attack-invariant feature of the cepstrum domain and the error-correction capability of BCH code to increase the robustness as well as imperceptibility of audio watermarking. In Cox's method [10] watermarks are embedded into the highest m DCT coefficient of the whole sound excluding the DC component by the following equation:

$$v_i' = v_i(1+\alpha x_i) \quad \text{---------- 2.1}$$

Where, m is the length of the watermark sequence, vi is a magnitude coefficient into which a watermark is embedded; xi is a watermark to be inserted into v_i, α is a Scaling factor and vi 'is an adjusted magnitude coefficient. The watermark sequence is extracted by performing the inverse operation of (1) represented by the following equation:

$$x_i^* = (\frac{v_i^*}{v_i} - 1)/\alpha \quad \text{---------- 2.2}$$

III. Conclusion

The level of watermarking increases robustness of the secret information. The watermarks are embedded into non overlapping DWT coefficients of the audio signal which are randomly selected and very hard to detect even with the blind detection. The audio watermarking is relatively new and has wide scope for research. For future, a new algorithm will proposed that taking features of Human Auditory System and the signal processing theories. Proposed algorithm is based on DWT domain while considering the more active components of the signal.

. IV.References

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