Discrete Watermarking Through LSB Technique for Data Authentication

Munna Lal Verma
Dept. of Electronics & Telecommunication
Parthivi College of Engineering &Management
Bhilai-3, India

Tomesh Verma
Dept. of Electronics & Telecommunication
Parthivi College of Engineering &Management
Bhilai-3, India

Prakash Varma
Dept. of Electronics & Telecommunication
Parthivi College of Engineering &Management
Bhilai-3, India

***Abstract*— Nowadays digital multimedia system content (audio or video) can be stale and store with no trouble and without loss in dependability. Original Discrete Audio signal is segmented by Discrete Wavelet transforms and exploitation algorithm is tending to be use that is the least vital bit coding algorithm. Least vital bit coding formula is the finest formula throughout the Watermark information embedded within the least important bit of Discrete Wavelet Transform coefficient. We take samples of rarefaction region and least important bit of the rarefaction region are replacing by Watermark data then it becomes a Watermark signal. On the execution of Extraction methodology is employed to require out the embedded content and novel Discrete Audio Content. Simulation outcome point out the projected method shows strong character against many styles of attack and achieves similarity values ranging from 95 to 99.Additionally; calculate the distorted samples between the novel samples and affected samples and evaluation grid has been revealed the minimal affect on the novel samples.**

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

I. INTRODUCTION

The recent development in computer networks, and more exclusively, the World Wide Web, copyright protection of digital audio becomes more and more essential. Digital audio watermarking has drawn wide attention for copyright protection of audio data. A digital audio watermarking is a method 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 class of original audio signal after it is watermarked.

b) Robustness: the embedded watermark data should not be detached 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 LSB of rarefaction region of original audio sample. Experimental results indicate that the proposed watermarking system provides strong imperceptibility against several kinds of attacks such as noise addition, cropping, re-sampling, re-quantization, and MP3 compression and achieves similarity values ranging from 3 to 6. In addition, our proposed system achieves high SNR.

II. LITERATURE REVIEW

A significant number of watermarking techniques have been reported in recent years in order to create robust and imperceptible audio watermarks. Yang et al. [1] showed that the recording industry is losing money. Privation should be blamed. I will talk about the original and definition of audio watermark. Then the main idea, that is to say, the mechanism behind watermark will be discussed. Thirdly, properties would be elaborated. Then different applications are discussed. The last but not least, a vivid case in real life is presented. Dhār et al. [2] explained that Digital watermarking is now drawing attention as a new method of protecting multimedia content from unauthorized copying. This paper proposes a new watermarking system using discrete Fourier transform (DFT) for copyright protection of digital contents. 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. Patil et al. [3] With digital computers, Internet flexibility promotes an efficient distribution of the digital contents. An Approach of digital watermarking has been proved as an effective approach for

providing the copyright protection of multimedia data for audio, image & video signals. We propose an effective watermarking algorithm based on Discrete Wavelet Transform for audio. This approach embeds the image watermark data into approximate coefficients of the wavelet transform. Embedded watermark can be faithfully recovered under different attacks such as volume scaling, re-Sampling, low pass filtering & re-quantization, etc. The performance evaluation of proposed algorithm indicates improved signal to Noise ratio & peak signal to noise ratio. Mishra et al. [4] An audio watermarking algorithm based on two mathematical functions Discrete Wavelet Transform (DWT) and Singular Value Decomposition (SVD). These algorithms performance is validated in the Presence of the standard watermarking attacks. Naveen et al. [5], we are implementing audio watermarking using discrete wavelet transform (DWT). An audio signal in the form of .wav file is decomposed into multi level DWT coefficients. A watermark signal is embedded in the final level coefficients. The audio signal is reconstructed from the embedded text co-efficient using inverse DWT. Sharma et al. [6] this technique is one of the common techniques in use in signal processing applications. It is based on the replacement of the LSB of the carrier signal with the bit pattern from the watermark noise. The robustness depends on the number of bits that are being replaced in the host signal. This type of technique is usually used in image watermarking because each pixel is represented as an integer hence it will be easy to replace the bits. Nidal et al. [7] We propose a new robust and secure system that is based on the combination between two different transforms Discrete wavelet Transform (DWT) and the Contour let Transform (CT). The proposed algorithm has been designed, implemented and tested successfully .The experimental results showed that selecting the best sub-band for embedding from both transforms will improve the imperceptibility and robustness of the new combined algorithm. 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. Rao et al. [10], The paper describes an audio watermarking method where copyright information is imperceptibly added into the audio signal. The copyright information or watermark could be a binary logo or some unique binary pattern. In this paper we borrowed a cryptographic technique method known as secret sharing method. The secret sharing method along with discrete wavelet transform (DWT) and singular value decomposition (SVD) is used to embed and retrieve the watermark from the audio signal.

III. Problem Identification

Commonly, data embedding technique has two general techniques which are Digital watermarking and the Steganography. Our project in the stream of Digital audio watermarking and according to the novel researcher, data embedding approach have three main limitations, magnitude of the embedded data, Robustness of the watermarking method, Imperceptibility of the watermark gesture.

IV. Proposed Methodology

The Digital Audio Watermarking technique is divided into the two parts embedding and extraction. Embedding block is used to add the additional information into the host signal; whereas, extraction block is used to extract the watermark data in the audio signal.

A. *Watermark Embedding*

a) Select Audio Wave file.

b) Check for PCM encoding of an audio wave file.

c) Divide an input into its compressed & rarefaction region using discrete wavelet Transform.

d) Select Watermark Text

e) Embed Watermark Text into rarefaction region of audio wave file.

f) Analyze noisy audio sample & noise.

g) Generate result audio stream with watermark bits embedded into it.

h) Save result Audio File.

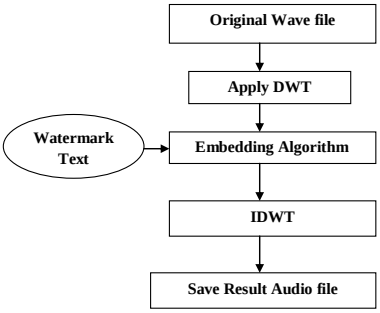

Fig. 1. Flowchart of Watermark Embedding

B. *Watermark Extraction*

a) Select Watermark audio wave file.

b) Divide an audio into compression & rarefaction region using discrete wavelet Transform.

c) Analyze noisy samples of a rarefaction region.

d) Remove noise from noise samples using sample averaging method & passes audio stream from hearing test.

e) Read bit of corrected noisy samples & assemble it.

f) Decode watermark data.

g) Save result & Exit.

In our proposed methodology we are using LSB coding technique and for maintaining the high Imperceptibility, the best available technique we known. So the following advantages and disadvantages of this technique-

Advantages -

a) High watermark data bit rate.

b) Low computational complexity of this technique compared with others techniques.

c) No computationally transformation of the host signal, so, it has very little algorithmic delay.

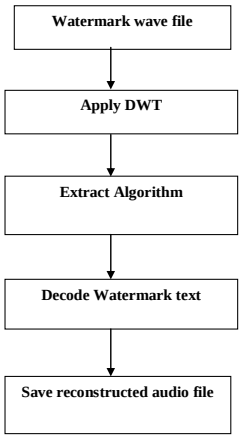

Fig. 2. Flowchart of Watermark Extraction

V. EXPERIMENTAL RESULTS

The proposed algorithm is implemented for different audio signals. Each audio sample is in the WAVE format with 16 bit mono signal sampled at 44100 Hz. According to IFPI (International Federation of Photographic Industry), the algorithm should offer more than 3 similarity factor & it should prevent unauthorized removal unless the quality of the audio becomes very poor. Same attacks are employed on all audio signals. Each audio file contains 89,378 samples (duration 4.679 sec). By considering the frame size of 512 samples, we have 174 frames for each audio sample.So firstly we take a song 'Let it be'.Take an input wave file.

With the simulation process plot the original signal and watermark signal and see the difference and analysis of noise spectrogram how much affect the original signal by various attack. Plot the resultant watermark audio signal.

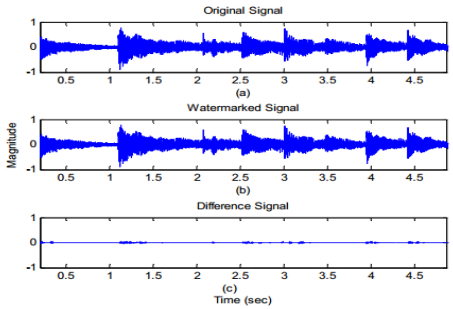

Fig. 3. Interceptibility of watermark audio with original audio

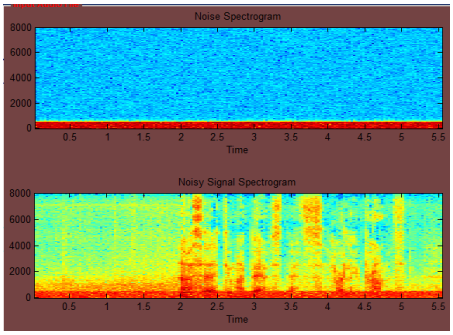

Fig. 4. Noisy spectogram in resultant audio file.

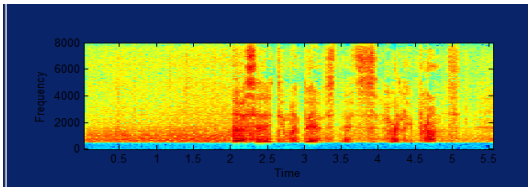

Fig. 5. Audio Spectrum after removing noise

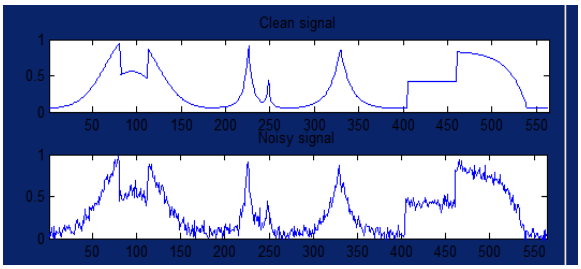

Fig .6. Original & Noisy Signal

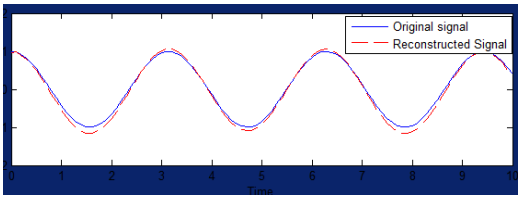

Fig .7. Original & reconstructed signal from watermark text

a) Imperceptibility Test-

Informal listening using head set reveals that the watermark embedded into the original audio using the proposed watermarking system does affect the quality of the sound upto little bit extend, which ensures the imperceptibility of the embedded watermark.

Calculate the no. of similar samples in the original audio samples and watermark audio samples. Simulations show good performance even with more general additive noise, such as MP3 compression. Another measure used

for verification is the Similarity.

$$SIM(X, X*) = \frac{\sum_{i=0}^{N-1} X(i)X*(i)}{\sum_{i=0}^{N-1} X*(i)X*(i)} \qquad (1.1)$$

Whereas X is the original audio signal and X* is the watermark audio signal and the another method to find the similarity factor by using the formula but we take a samples of signal and comparing those samples and Find the similarity factor by using simulation process.

TABLE I. SIMMILARITY FACTOR BETWEEN ORIGINAL SIGNAL AND WATERMARK SIGNAL

S.N.	Original file name	Watermark file name	SIM	Correlation
1	Song	Ccc	99.95	0.9995

So the similarity factor has to be calculated is 99.95.It means 99.95% of the samples are not affected by the watermark text and correlation factor is 0.9995.Correlation factor is calculated between 0 to1.So qualities of the signal.

That is experimental result of one audio signal where we embed a watermark text and get the watermarked signal that shows authenticity of the audio signal or say ownership of the audio signal and check the imperceptibility of audio signal by calculating the similarity factor.

TABLE II. FINAL EXPERIMENTAL RESULT TABLE OF DIFFERENT AUDIO SIGNAL

S.N.	Original file name	Watermark file name	SIM	Correlation
1	song	ccc	99.95	.9995
2	mywork	ddd	99.93	.9993
3	munna	aaa	99.89	.9989
4	mun	bbb	99.75	.9975

I. CONCLUSIONS

In this project, we have presented a new watermarking system "An audio watermarking embedding and extraction through discrete wavelet transform with noise removing technique" using LSB with noise supression for copyright protection of sound contents. Experimental results indicate that our proposed watermarking system shows strong imperceptibility against several kinds of attacks such as noise addition, cropping, re-sampling, re-quantization, and MP3 compression and achieves similarity values ranging from 95 to 99. In addition, our proposed system achieves SNR values above 20 db for different watermarked sounds. These results demonstrate that our proposed watermarking system can be a suitable candidate for audio copyright protection.

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