A Review on Reversible Digital Audio Watermarking Scheme Using Wavelet Transformation

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Abstract-

Currently over the millions of digital audio files such as digital songs are copied illegally during file-sharing over the networks. It has resulted as the loss of revenue for music and broadcasting industries. The traditional protection schemes are no longer useful to protect copyright and ownership of multimedia objects. These challenges have prompted significant research in digital audio watermarking for protection and authentication. Watermarking is a technique, which is used in protecting digital information like images, videos and audio as it provides copyrights and ownership. The identity of the owner of the audio file can be hidden in the audio file which is called Watermark. Therefore, digital audio watermarking is the process of hiding some information into the audio file in such a way that the quality and the audibility of the audio is not affected. It helps to prevent forgery and impersonation of audio signal. Audio watermarking is more challenging than image watermarking due to the dynamic supremacy of hearing capacity over the visual field. This paper presents a novel audio watermarking using wavelet transformation. The proposed method involves Embedding and extraction of audio signal using wavelet transformation. The audio signal which is in .Wave or Mp3 format undergoes segmentation, transformation and embedding the watermarked data and at the last inverse transformation will be carried out. We attempt to develop an efficient method for hiding the information in the audio file such that the copyright information will be protected from illegal copying of the information.

Keywords- Audio watermarking, Digital Watermarking, Wavelet transformation, copyright protection.

I. INTRODUCTION

In the recent information age, with the rapid development of various communication techniques, transferring digital multimedia content becomes more and more usual. However, the illegal copy and distribution of digital multimedia content has also become easier, and a large number of authors' and publishers 'intellectual property copyrights have suffered from violation, which have led to huge damage of their benefits in many applications. Thus, people pay more attention to copyright management and protection nowadays. Embedding secret information, known as watermarks, into multimedia content is considered as a potential solution to copyright infringement. Digital watermarking is a process by which a watermark is hidden or embedded into a media (cover data), for example digital content such as electronic documents, images, audio and video. These embedded data can later be detected or extracted from the marked signal for various applications. There are several applications of audio watermarking including copyright protection, copy protection, content authentication, fingerprinting and broadcast monitoring Security is defined as the degree of protection against danger, damage, loss, and criminal activity. When a sensitive message is to be delivered to a destination, authentication and confidentiality are required. Providing security for electronic documents is an important issue.

Digital watermarking has to embed pieces of information into a digital media for protecting it against copyright infringements and other unauthorized applications. Digital audio watermarking has to do with protecting digital audio file against illegal copying. A lot of works has been done on digital watermarking of various media such as image and video, but this particular review will focus on digital watermarking of audio file. Digital Audio files are particularly the most abused for copyright infringements because they can be downloaded and copied with ease. Audio watermarks are special signals embedded into digital audio. These signals are extracted by detection mechanisms and decoded. Audio watermarking schemes rely on the imperfection of the human auditory system. However, human ear is much more sensitive than other sensory motors. Thus, good audio watermarking schemes are difficult to design. A lot of recent works have proposed solutions to this problem of copyright infringement. Some involves the use of various types of watermarks. Digital watermarking is one of the major breakthroughs at authenticating content, fighting unlawful piracy and verifying ownership. A digital watermark is a hidden signature embedded within some target data that may be later detected or extracted to assert the legitimacy of the data. Watermarks can be used to authenticate image, audio or video files. Trends reveal that the research on image and video watermarking techniques is at an

altogether different level than as compared to audio research. However, with the share of audio material increasing exponentially all over the networking and systems, digital audio watermarking also presents a vast prospect.

II. LITERATURE REVIEW

In literature several watermarking techniques have already been proposed by various authors which give the brief discussion related digital audio watermarking are given as below:

Mehdi Fallahpour and David Megías [1] developed the audio watermarking system to embed data and extract them in a bit-exact manner by changing some of the magnitudes of the FFT spectrum .The key idea is to divide the FFT spectrum into short frames and change the magnitude of the selected FFT samples using Fibonacci numbers. Taking advantage of Fibonacci numbers, it is possible to change the frequency samples adaptively.

Yekta Said CAN [2] proposed that instead of a constant watermark, a biometric watermark that is unique to an individual is embedded into an audio. Keystroke Dynamics is chosen to stamp the ownership of an individual to the audio file. Constructed biometric template is embedded into wavelet domain by using frequency hopping spread spectrum technique. Direct Sequence Spread Spectrum technique is implemented before embedding process. The extraction of the biometric template is a blind process, in other words, original audio carrier is not required to extract the watermark. The experimental results illustrated that the system is robust against the signal processing operations such as low-pass filter, adding white Gaussian noise, shearing, and compression. Furthermore, the audibility of this technique is in plausible values. After extraction of the biometric data, a biometric identification system is constructed. The correct identification rates were presented.

Anshul Atriek [3] focuses on embedding watermark information into a digital host object in an inseparable bond to authenticate the latter. He proposes a high-capacity blind audio watermarking technique within perceptual constraints, i.e., the manipulations performed during the embedding process are imperceptible to unaided human senses. The suggested scheme uses high-frequency wavelet coefficients obtained during the quantization in Discrete Wavelet Transform (DWT) domain since redundant information can be accommodated with more ease in the high-frequency sub-band.

Kais Khaldi [4] introduced adaptive audio watermarking algorithm based on Empirical Mode Decomposition (EMD). The audio signal is divided into frames and each one is decomposed adaptively, by EMD, into intrinsic oscillatory components called Intrinsic Mode Functions (IMFs). The watermark and the synchronization codes are embedded into the extreme of the last IMF, a low frequency mode stable under different attacks and preserving audio perceptual quality of the host signal.

From the above discussion we have proposed that the there is a need of Digital audio watermarking has to do with protecting digital audio file against illegal copying. This proposed a model for digital watermarking of audio signal using wavelet transformation method. Various transformation techniques are available for digital watermarking. Amongst the various techniques used for digital watermarking, proposed project are using the wavelet transformation method. In that two process will undergo, watermark embedding and watermark extraction. By using these technique the audio signal will be protected.

III. PROPOSED WORK

Watermarking is the one of the popular technique to protect the owner copyrights of the multimedia content (audio, image, video or text). Digital audio watermarking is a technique in that, owner information or any digital content as a watermark is embedded without losing the quality of the audio content. The proposed method for audio watermarking has two process
1. Watermark embedding
2. Watermark extraction
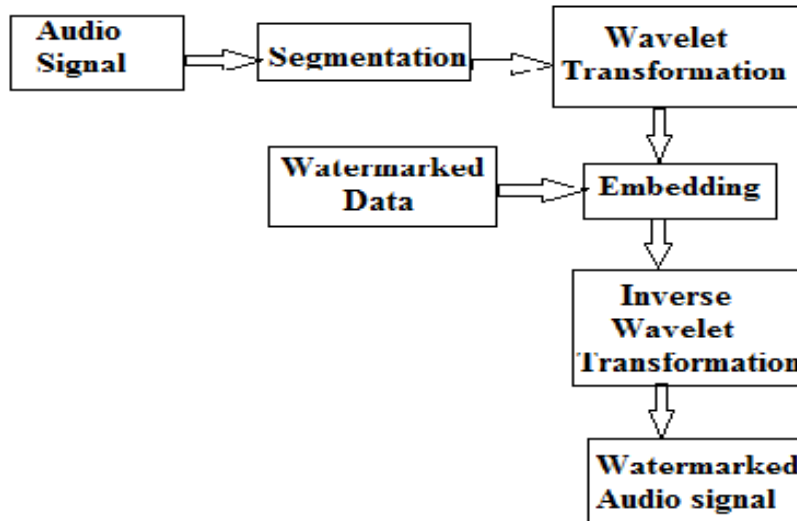- **Block Diagram**
- **Watermark embedding :**

Fig 1.DIGITAL WATERMARK EMBEDDING

The above fig 1.shows the block diagram representation of the embedding process of the watermarked data. The embedding procedure performs three major operations; segmentation of the original audio signal (Mp3 or .Wave), transformation of the audio signal, and watermark embedding. Finally the inverse transformation is applied to generate the watermarked audio signal. The watermarked audio signal at the output of the system is totally secured data. Security is the first parameter of the watermarking. An attacker trying to erase, replace or extract the embedded watermark will not be able to perform these action if he or she does not know the embedding watermark. However, even if an attacker knows or guess these secret value, the embedded watermark can be further protected with cryptography.
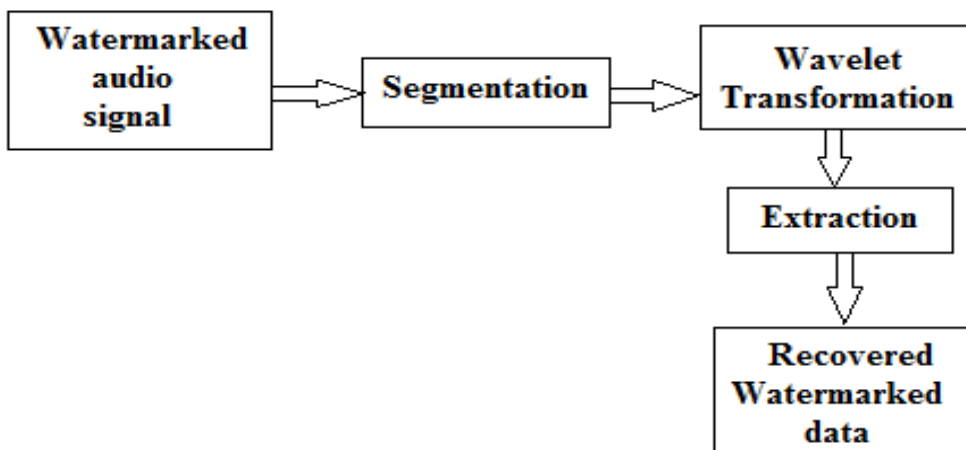
- **Watermark extraction :-**


Fig 2. DIGITAL WATERMARKING EXTRACTION

The above fig 2. Represent the digital audio watermarking extraction process. If user want to retrieve the original data have to extract the watermark from the audio signal. The

watermark extraction procedure enables the owner of the audio clip to extract the embedded watermark. The procedure requires knowledge of the original audio file, the watermark intensity, and the size of the watermark, in order to extract the watermark. The watermark extraction steps are a direct reversal of steps carried out in the embedding procedure. By applying these steps can recover the original audio file.

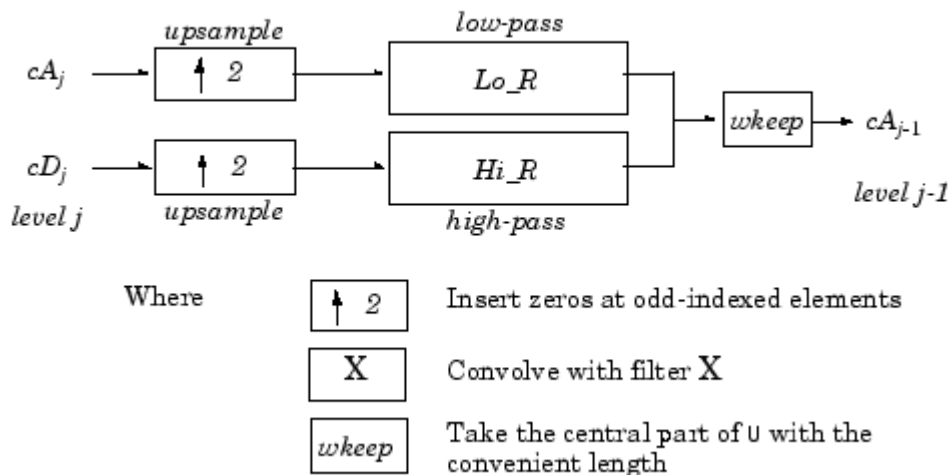The wavelet transformation used undergoes the following algorithm.

Starting from a signal s, two sets of coefficients are computed: approximation coefficients CA1, and detail coefficients CD1. These vectors are obtained by convolving s with the low-pass filter Lo_D for approximation and with the high-pass filter Hi_D for detail. Wavelet of a signal is calculated by passing it through a series of filter. First the signal are passed through the low pass filter, also signal is decomposed simultaneously by high pass filter, output giving detail coefficients CD1and approximation coefficients CA.
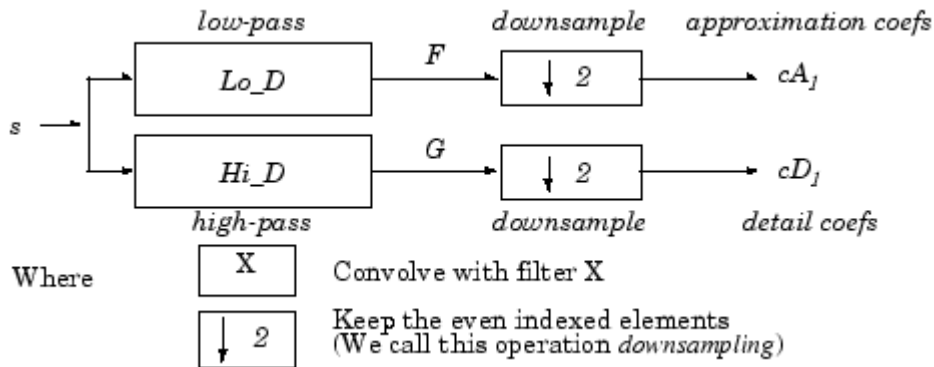
The length of each filter is equal to 2N. If n = length(s), the signals F and G are of length n + 2N − 1, and then the coefficients CA1 and CD1 are of length (n-1/2)+N.

In a similar way inverse wavelet transformation will undergoes the following algorithm.

Reconstruction step

Above description gives the basic idea of the proposed project. Reversible digital audio watermarking by using the wavelet transformation method will be the proposed method in which the embedding and extraction of watermarked data carried out. The above proposed method of wavelet transformation will help for the copyright protection of the audio signal.

IV. CONCLUSION

Audio watermarking is the new concept in the area of watermarking. It is much more difficult as compared to the image watermarking. This is because of the fact that the Human ears are way more sensitive as compared to the Human eyes. This paper presents a review of the proposed Reversible watermarking techniques for digital content protection and authentication where it is possible to retrieve the original content with zero distortion. Reversible digital audio watermarking by using the wavelet transformation method in which the embedding and extraction of watermarked data carried out. The above proposed method of wavelet transformation will help for the copyright protection of the audio signal.

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