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AN AUDIO SIGNAL DATA HIDING SCHEME USING DOUBLE DENSITY DUAL TREE DISCRETE WAVELET TRANSFORM

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ABSTRACT: The essay is organized as follows: Starting with the initial channel bank, we create a discrete wavelet transform (DWT) with a binary tree structure and double thickness. The obtained channels are subsequently improved using nonlinear streamlining, yielding sets of wavelets with analyticality and perfect changing commitments. We present two examples of configurations that are superior to those obtained using a previous methodology. We illustrate the cloaked watermark's capabilities for filtering, altering, confirming, re-quantizing, boosting signal noise, and compressing Mp3 files. The correlation research reveals that our approach prioritizes task execution above previously disclosed watermarking solutions.

***keywords*:**MP3,Audiowatermarking,DD-DWT.

1.INTRODUCTION

Ensuring data security to avoid theft, loss, damage, and unauthorized actions such as hacking is extremely important. When sending sensitive information to its intended recipient, confidentiality and verification are vital. Ensuring the security of electronic documents is critical. Digital watermarking is a critical technique that embeds information in digital files to prevent illegal usage and copyright infringements. This step is necessary to prevent unauthorized duplicating of the audio file. This examination will focus primarily on digital watermarking of audio files, despite the fact that digital watermarking of other media, such as images and movies, has been extensively explored. Because of their rapid download and copying capabilities, digital audio files are especially prone to being routinely utilized in copyright infringement. Watermarks are distinctive signals included in digital audio. These signals are discovered and retrieved by using a detection technique and then decoding them. These deceptive tactics use the inherent faults in the human hearing system. The human ear has more sensitivity than other sensory organs. As a result, establishing effective audio watermarking technologies presents a substantial problem. Nevertheless, a remedy to the issue of copyright infringement has been adopted. Various watermark formats have been used. The authors recommended using embedded data within audio files, such as text, images, or information, to allow for processing and analysis of these files, potentially revealing hidden content. Alternatively, some writers use pseudorandom number generators to create watermarks, while others use a variety of methodologies, including chaotic watermarks, to safeguard audio recordings. Various procedures and tactics have been used so far to ensure copyright protection. However, little progress has been made in the realm of real-time applications. As a result, it is critical to devise a mechanism or strategy to prevent this effort from being exploited. This necessitates a thorough evaluation of the completed work to determine its suitability for achieving this requirement as soon as possible. This work intends to improve the watermarking approach by proposing an audio concealed strategy that effectively tackles the limitations that are impeding its progress.

Digital audio watermarking, the process of embedding a disguised data signal into the original audio signal, has gained a lot of attention in academic literature as an effective way to protect digital assets against copyright infringement. The three primary requirements for digital audio watermarking signals are imperceptibility, resilience, and data capacity. To retain audio quality and resistance to signal distortions affecting the host data, the watermark must be invisible within the original audio data.The characteristics of a digital watermark varies depending on the application situation.Finally, it is simple to erase the watermark to establish ownership. Creating novel watermarking techniques to meet these issues is a tremendously challenging task. Several advanced watermarking techniques have been proposed. A proposed watermarking mechanism with a limited transmission bit rate is recommended, albeit it is not totally secure against all types of assaults. To increase bit rate, it is recommended to use watermarked techniques within the wavelet domain. The predetermined basis functions in this technique limit its ability to accurately represent all real signals.

The dual tree concept can be used to create several sorts of DWTs. The existing body of work on copyright protection for digital content has mostly focused on the installation of digital audio watermarking. This solution efficiently solves the problem by inserting a watermark into the original audio stream.

2.EXISTING METHOD

Several watermarking approaches with varying sophistication have been presented. A robust watermarking strategy is developed to effectively fight various types of attacks, even when data transmission bandwidth is constrained. A method for increasing bit rate has been proposed that uses watermarked designs in the wavelets space. The wavelet approach has a certain threshold at which the fundamental capabilities are changed, rendering them ineffective for all actual signals.

AUDIO WATERMARKING TECHNIQUES

This section looks at the five most effective advanced sound watermarking options. The distinct approaches are analogous to techniques for combining (or embedding) the watermark pattern and scattered data into a single symbol.

Spread spectrum watermarking

Transmit aural information. The hidden scheme correlation approach retrieves hidden data by embedding a pseudorandom sequence and exploiting the relationship between a watermarked audio stream and a pseudorandom noise sequence. The purpose of spread spectrum watermarking techniques is to extract information theory from broadcasts.The watermark, a narrow-band signal, is inserted in a wide-band audio channel. The properties of both the watermark W and the audio signal A appear to be ideal for the model. Using spread spectrum techniques increases the likelihood of protecting the confidentiality of hidden data by controlling the pseudorandom sequence generator with a confidential logic key. Before encoding the message, spread spectrum techniques allow the frequency bands to align. As a result, spread spectrum techniques can be used to construct watermarking systems while also assuring secure transmission. Spread spectrum techniques can be divided into two categories: frequency hopping and direct sequence. Both techniques aim to distribute watermark data over a wide frequency range that covers nearly the whole audible spectrum..

Amplitude modification

Another name for this method is least significant bit (LSB) replacement. This is often used in watermarking and steganography because of its

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ability to exploit quantization errors that occur during the digitization of sound sources.The most important parts of the audio information are extracted from the data and encoded. There are two approaches to accomplishing this: embedding the PN-grouping into the lower request bit stream based on the yield of a capacity that generates a succession focused on both the nth bit of the watermark message and the nth specimen of the sound document, or completely replacing the lower request bits of the digital sound sign with a pseudorandom (PN) arrangement that includes the watermark message. The fundamental shortcoming of this method is its vulnerability to manipulation.Unless relatively advanced processes were used to encode the data, it may become unusable owing to channel noise, re-examination, or other factors.In all honesty, these tactics reduce the rate of information by one, bringing it to the level of one's ordinary quest for perfection. Furthermore, the message can be randomly distributed across the spread using a pseudorandom number generator, increasing the watermark's capacity to survive limited separation.

Replica Method

The original audio signal can be used for data hiding. Echo hiding is a noteworthy example of this form of duplication.In replica modulation, a portion of the initial audio stream is used as a watermark in the frequency domain.Replica modulation uses the original signal, or a correctly modulated signal, as a watermark. It also computes the correlation. In addition, a detector can generate The detector also generates replicas from the watermarked audio.

Dither watermarking

To improve the testing process for that input, especially when it is critical and not in digital format, a dither is added as a noise signal into the audio signal (4). This issue essentially eliminates bending, but at the cost of a higher disturbance floor. Dithering is accomplished by applying a noise signal, such as a Gaussian or triangular signal, to the audio data signal with a preset probability distribution. The watermark is used to manage the dither signal solely for the purpose of inserting the watermark. A dither quantizer, which is related, is used to quantify the host signal, also known as the unique audio file. The procedure is known as quantization list regulation, or QIM. An illustration of this practice. In this case, the focus points evaluated with Xs and Os are sandwiched between two distinct quantizers, each of which has its own record; in other words, each quantizer assigns a unique value. The quantization cells, as shown in the image, control the amount of distortion in the sound files. On the other side, the dmin value can be used as a rough measure of intensity.

3.PROPOSEDMETHOD

Signal processing applications, such as noise reduction and over-complete transforms, provide a better combination of performance and complexity than using only sampled transforms. Figure 1 depicts a filter bank that incorporates the double density (DD) discrete wavelet transformation (DWT), a key component of this family of transformations. The input audio stream is attenuated by a factor of two for each of the three channels. The first channel's signal is evaluated using a comparable filter bank. The DD-DWT costs twice as much as the critically sampled DWT. A dual tree (DT) is generated when a single input audio signal meets certain conditions and is subjected to two wavelet transforms. Wavelets can be utilized to compute an approximate Hilbert transform. The DT-DWT has directional selectivity for large amplitudes and near-shift invariance.

If we choose two filter banks based on the modal in Figure 1, the first filter bank (the primal) would have filters H0(z), H1(z), and H2(z), whereas the

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second filter bank (the dual) would contain filters K0(z), K1(z), and K2(z).Define ψh,i(t) and ψg,i(t) for the values i = 1 and i = 2.

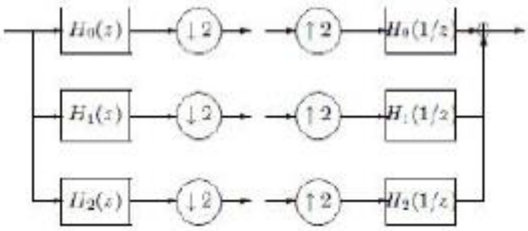

Fig.1Filter bank used for the implementation of theDD-DWT.

The wavelets generated by the filters H0(z), Hi(z), K0(z), and Ki(z) are formed in that order. If the two discrete and dyadic wavelet transformations (ψg,i(t) and ψh,i(t)) have the Hilbert transform property, they can be called a dual-tree. The complex wavelet ψi(t) = ψh,i(t) + jψg,i(t) is analytically complex, which means that its spectrum, i(t),∈R, is almost zero for negative frequencies.

A approach based on allpass was introduced for the dual-tree DD-DWT framework. The system causes a delay of about half the duration of the input signal. Here, we take a different method. The initial DD-DWT is shown, together with the known FIR filters H0(z), H1(z), and H2(z). The initialization of semi-definite programming (SDP) solutions enables the computation of FIR filters K0(z), K1(z), and K2(z), forming a very effective dual filter bank.The infinity norms indicate the filters used to approximate z^(-1/2)H0(z), as well as the Hilbert transformations of z^(1/2)H1(z) and z^(1/2)H2(z).However, these filters do not entirely meet the P2 perfect reconstruction (PR) standards, which are required for the DD filter banks.

$$i=0, K\ i(z)\ Ki(z-1) = 2\ P2$$
$$i=0, K\ i(z)\ Ki(-z-1) = 0$$

To run these situations, we must tune the K0(z), K1(z), and K2(z) filters, as their effectiveness is not immediately apparent. The combination of the dual-tree discrete wavelet transform (DWT) and the double-density DWT (DD-DWT) resulted in the creation of a single transform known as the double-density complex (or DD-dual-tree) DWT, which effectively combines the characteristics and advantages of both. To combine the characteristics of both the DD and dual-tree DWTs, we ensure that: (1) one pair of wavelets is shifted relative to the other pair so that the integer translations of one pair are positioned halfway between the integer translations of the other pair; and one wavelet pair is designed to approximate the Hilbert transforms of the other two wavelets. Using the DD complex wavelet transform, we may create complicated and tailored wavelet transformations.

To improve the performance of the DD dual-treeDWT, it is important to create a filter bank model that integrates both the DD and dual-treeDWT properties.Following our earlier investigation of the filter bank mode associated with the double-density DWT, we will now look at the properties of the dual-tree discrete wavelet transform (DWT). This mode includes two highpass wavelet filters and one lowpass scaling filter. The merger of two DWTs sampled at the critical rate serves as the foundation for the dual-tree discrete wavelet transform (DWT). To accomplish this, we create a filter bank that runs multiple iterations at once.

4.EXPERIMENTAL RESULTS

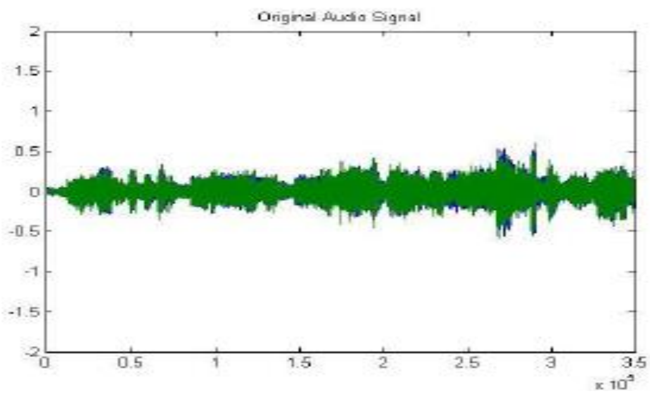

Fig.2OriginalAudioSignal

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Fig.3WatermarkLogo

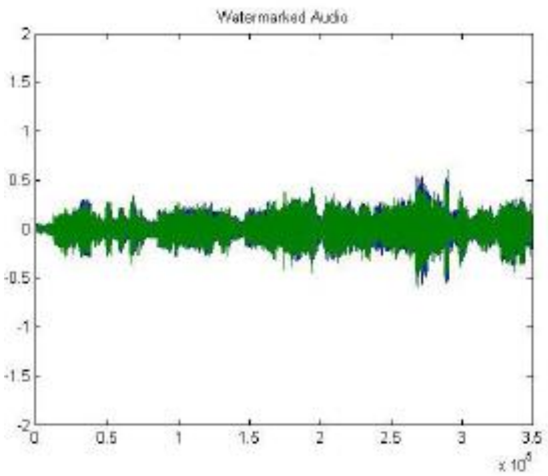

Fig.4AudioWatermarking

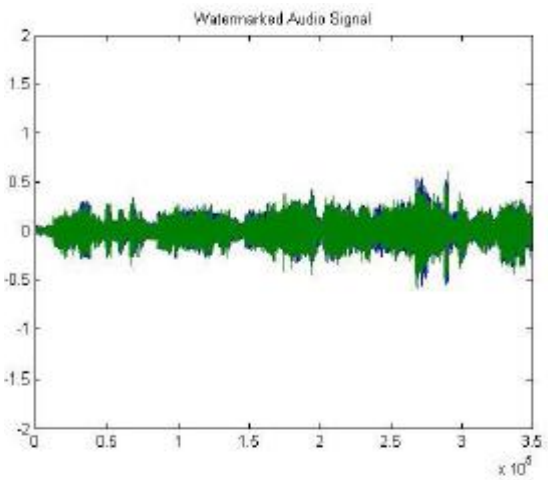

Fig.5 Audio Watermarking signal

Fig. 6 Extracted Logo

5.CONCLUSION

The effectiveness of digital audio watermarking systems in protecting the copyright of digital content has been shown. Audio watermarking has received significantly less research than picture or video watermarking. However, study and analysis of audio watermarking has increased significantly during the last decade. Contributions have facilitated the development of improved audio watermarking techniques. This study examined the aforementioned publications and provided a thorough overview of numerous essential strategies for digital audio watermarking. This study makes two contributions. We provided the necessary algorithm for calculating the second filter bank of a DD-DWT.The offered examples demonstrated the practicality of this method.

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