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"A REVIEW ON AUDIO WATERMARKING TECHNIQUES"

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ABSTRACT

Digital audio watermarking technique is a process of embedding perceptually transparent digital information into an original audio signal. Watermarking can be fragile or non fragile depends upon the user's requirements. The main concern of digital watermarking is to prove ownership as well as protection of the embedded information. This paper gives brief overview of existing audio watermarking techniques, their applications and future prospects of digital watermarking.

Key Words: Non Fragile, MATLAB, Psychoacoustic, DAW, Signal, Embedding.

I. INTRODUCTION

1.1 INTRODUCTION

The creation of steganography and cryptography methods gives secure correspondence condition in this difficult world. Before that protected information transmission was a dull activity to do. A portion of the methods utilized in early days are composing with an undetectable kind ink, drawing some artistic creation with some little changes, mix of two pictures to make another picture, shaving the top of the courier as a message, outlining the message on the scalp, etc Ordinarily an application is created by an individual or a little gathering of individuals and utilized by some other client or gathering of clients. Programmers are the individuals who will in general adjust the first application by altering it or utilize a similar application to make benefits without appropriate authorization of its unique proprietor. Clearly programmers are more in number when contrasted with the individuals who making it. Henceforth, ensuring an application ought to have been the basically work. Assurance procedures must be extremely effective, vigorous and one of a kind to confine programmers. The advancement of innovation has moved towards the extent of steganography and simultaneously diminished its proficiency on the grounds that the medium is gotten moderately unprotected. This watches out for the advancement of the new yet relative innovation called, "Watermarking". A portion of the utilizations of advanced watermarking incorporate proprietorship insurance, confirmation, security, observing, modern and clinical applications .

1.2 BACKGROUND

Globalization and web are the principle explanations behind the development of examination and sharing of data. Notwithstanding, they have become the best instrument for malevolent client to assault and privateer the advanced media. The watermarking procedure during beginning stage was utilized on pictures, and is named as Digital Image Watermarking. Computerized Image watermarking has gotten well known; notwithstanding, the malevolent client has begun to separate the watermark making difficulties for the designers. Along these lines, engineers have discovered another advanced implanting source as sound and named such watermarking as Audio Watermarking. It is hard to make advanced data secure particularly on account of sound and sound watermarking has become a test to designers as a result of the effect it has made in forestalling copyrights of the music. Note that it is important to keep up the copyright of the advanced media, which is one of the necessary prerequisites.

Advanced watermarking is a strategy by which copyright data is inserted into the host signal such that the installed data isn't perceived, and powerful against purposeful and accidental assaults.

1.3 STEGANOGRAPHY AND WATERMARKING

1.3.1 STEGANOGRAPHY

Steganography is developed from the old method known as the "Cryptography". Cryptography secures the substance of the message. Then again, steganography is a strategy to send data by composing on the spread item imperceptibly. Steganography is taken from the Greek word that implies secured composing (stego

= secured and graphy = composing). Here the approved party is just mindful of the presence of the shrouded message. A perfect steganographic procedure covers enormous measure of data guaranteeing that the changed article isn't outwardly or perceptibly discernable from the first item.

The steganography strategy needs a spread article and message that will be communicated from medium. It likewise requires a stego (proprietor) key to recuperate the installed message. Clients having the stego (proprietor) key can be just access for the mystery message. Another significant prerequisite for a productive steganographic method is the spread article is adjusted in a manner with the end goal that the quality isn't corrupted in the wake of installing the message
.

1.3.2 WATERMARKING

Watermarking is a procedure through which the safe data is conveyed without corrupting the nature of the first sign. The method comprises of two significant squares:
1. Embedding square
2. Extraction square

The framework has an installed proprietor key as if there should be an occurrence of a steganography. The key is utilized to build security, which doesn't permit any unapproved access to the clients to control or concentrate information from transporter. The inserted object is known as watermark, the watermark installing medium is named as the transporter or spread article and the adjusted item is named as implanted sign or watermarked information.

The installing square, which is appeared has a watermark, spread article, and watermarking key as the sources of info (makes the inserted signal or watermarked information). In the extraction square, watermarked information, key and now and then watermark signal are inserted. The watermarking strategy that doesn't utilize the watermark during extraction process is named as the "daze watermarking". Daze watermarking is better procedure over the other watermarking which has watermark.

II. CURRENT RESEARCH

Previously proposed audio watermarking techniques have still been a subject in current research. Based on the number of publications, the topic of echo watermarking has gained in importance in the last four years. Xiang et al. presented a dual-channel time spread echo method for additional robustness [34]. It is based on the previously presented time spread echo method by Ko et al. [18] and is enhanced with two time spread echo kernels. In contrast to [18], the PN sequences used for the echo kernels can contain any real value and not merely the two values -1 and +1. In addition, the applied PN sequence can inhere the characteristics of colored noise and not merely white noise.
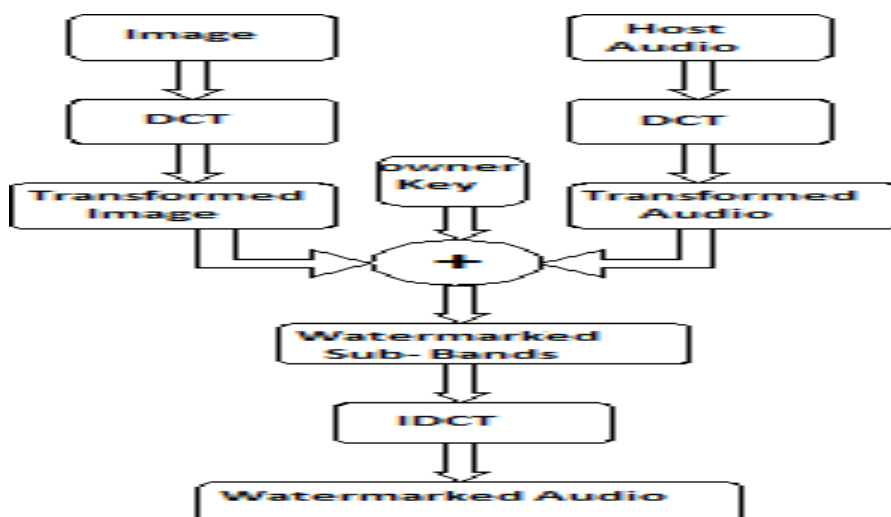

Figure 2.1 Watermark Embedding Algorithm

III. LITERATURE SURVEY

Saravanan Chandran et al [2015] This paper examines in insight concerning the LSB, DCT, and DWT calculations on steganography application. The LSB, DCT, and DWT calculations are executed for steganography application. In this test, execution examination of LSB, DCT, and DWT strategies is effectively finished and exploratory outcomes are talked about. The MSE and PSNR values are analyzed for the LSB, DCT, and DWT calculations. The PSNR esteem shows the nature of picture in the wake of inserting the information. From the investigation results it is seen that the PSNR of DCT is high when contrasted with the other two calculations. Along these lines, the investigation finishes up the DCT calculation is more reasonable for the steganography application contrasted with the LSB and the DWT based calculations. [1]

[**Sha Wang et-al [2014]** In this paper creators proposed a quality estimation strategy dependent on a novel semi-delicate and versatile watermarking plan. The proposed conspire utilizes the inserted watermark to assess the corruption of spread picture under various contortions. The watermarking procedure is actualized in DWT space of the spread picture. The related DWT coefficients over the DWT sub groups are classified into Set Partitioning in Hierarchical Trees (SPIHT). Those SPHIT trees are additionally disintegrated into a lot of bit planes. The watermark is installed into the chose bit planes of the chose DWT coefficients of the chose tree without making critical loyalty misfortune the spread picture. The exactness of the quality estimation is made to move toward that of Full-Reference measurements by alluding to a "Perfect Mapping Curve" figured from the earlier. The trial results show that the proposed plan can assess picture quality as far as PSNR, wPSNR, JND and SSIM with high precision under JPEG pressure, JPEG2000 pressure,

Gaussian low-pass separating and Gaussian commotion bending. [2]

Ms. Komal V et. al   [2012] In this paper creators depict the need of sound watermarking alongside its significant properties. The paper additionally brings to see works done by different on advanced sound watermarking. This paper reviewed those papers and introduced a portion of the significant strategies utilized for advanced sound watermarking. Spread range plot requires psycho-acoustic transformation for indiscernible clamor implanting. This variation is Or maybe tedious. Obviously, the greater part of the sound watermarking plans need psychoacoustic displaying for indiscernibleness. Another drawback of spread-range plans is its trouble of synchronization.[3]

Shweta Sharma et-al [2012] In this paper different procedures for computerized sound watermarking has been given. Sound Watermarking is valuable strategy for sound frameworks. This strategy can take a shot at various spaces like recurrence and time. By utilizing the distinctive plan of watermarking at various degrees of sound, it tends to be secure from numerous kinds of assaults. This paper gives a few strategies which can be utilized to make sure about the sound framework from assaults and study on different change procedures for installing or removing watermark. [4]

Md. Iqbal Hasan Sarker et-al, [2012] In this paper hardly any calculations have been proposed for sound watermarking. In this paper, another strategy for implanting dim picture information into the sound sign and added substance sound watermarking calculation dependent on Fast Fourier Transformation (FFT) space is proposed. Exploratory outcomes exhibit that the watermark is unintelligible and this calculation is hearty to basic tasks of advanced sound sign handling, for example, clamor expansion, re-inspecting, re-quantization, etc. To assess the presentation of the proposed sound watermarking strategy, abstract and target quality tests including Similarity (SIM) and Signal to Noise proportion (SNR) are led. [5]

B.K. Singh et-al, [2013] In this paper advanced watermarking outline has been given. Advanced sound watermarking is a technique to implant or conceal the Watermark (Information signal) into a computerized signal for example Picture, sound, text or video information. The watermark is hard to expel from the sound sign. On the off chance that the sign is duplicated, the data or watermark is likewise conveyed in the duplicate. A sign may convey a few unique watermarks simultaneously. It is accustomed to shielding sight and sound information from unapproved replicating, robbery, proprietorship, innovations, validation and so forth in this paper we present the watermarking techniques and applications .[6]

Dhananjay Yadav et-al [2013] In this paper creators introduced a survey of reversible watermarking procedures and show various strategies that are utilized to get reversible information concealing method with higher inserting limit and imperceptible articles. Reversible information covering up is a method that is utilized to conceal information inside a picture. The information is covered up so that the specific or unique information isn't noticeable. The concealed information can be recovered as and when required. There are a few strategies that are utilized in reversible information concealing methods like Watermarking, Lossless installing and encryption.[7]

In-Kwon Yeo et. al   [2003] First, by using a Bark frequency scale, the strength of psychoacoustically adapted watermark embedding process changed frame by frame. Second, the probable error of misdetection reduced due to modification carried in all index set. The high rate of embedding (up to 43 bps) is achieved by using discrete wavelet packet transform (DWPT) in the algorithm. Insertion of watermark data into a host signal is performed by using DWPT operation on audio, and hence complexity reduces. In this algorithm, it is assumed that the samples average value difference is close to zero and valid only for a K number of samples. For embedding one watermark symbol required K samples of the host signal to reduce the probability of error; otherwise, the probability of error becomes higher. Therefore, the trade-off value of the probability of error and the amount of data embedded need to find. They generate K samples from a signal — first, half samples used for addition and second half samples used for subtraction of incremental level. Embedding operation performed based on the difference between the average value of the first half

and second half sample is not zero else not embedded. It followed a psychoacoustic model by selecting a critical frequency band and their sub-band of frequency by using the Bark scale with their signal energy.[8]

I. Natgunanathan et al. [2017] proposed a new audio watermarking algorithm using a multilayer embedding process. Typically, distribution of multimedia data follows network; data pass through various stages from producer to wholesaler distributor to regional distributor. It is necessary to discover where a multimedia file gets a leak and trace its distribution path whenever a multimedia object is found in the pirated form. In the embedding process, the host signal is segmented in different number with equal length, and then the DFT is applied to its every segment to calculate its coefficients. DCT coefficients of intermediate frequency are further segmented into a different number with equal length and arranged in a specific manner. In the method of embedding bits in layer k (i.e., First layer), initially, two segments of adjacent DCT coefficient considered as a fragment pair.[9]

Z. Liu et al. [2018] proposed a robust work technique against desynchronization and recapturing attacks using the patchwork method based on frequency domain coefficients logarithmic mean (FDLM) concept. They focus their work on robustness improvement against recapturing and desynchronization attack using by analysing frequency domain coefficients logarithmic mean (RFDLM) features of the audio signal. DCT coefficients of the low and middle frequency of samples are used for calculating FDLM feature. Then RFDLM is calculated by taking a difference of two FDLM features of the sample. In the watermark embedding process, they form a watermarked frame consisting of three segments based on the synchronization phenomenon. In watermark recognition process, for extraction of synchronization codes and watermark bits from each segment, each watermarked frame gets separate it into three segments. On the off chance that the synchronization code removed from the first segment is equivalent to the second segment then it shows that the edge is synchronized and that the watermark bits separated from the third segment can be kept. If the entire watermark is too long ever to be installed into a solitary casing.[10]

Y. D. Chincholkar, et. al [2019] The internet technology used to release and distribute multimedia rights requires scruples copyright protection and detection policy. In the current context, the multimedia industry is suffering from multibillion-dollar annual financial loss. The entire music industry is hunting for a concrete solution that undermines the owner's and an artist's work as per International Federation of the Phonographic standards. This paper proposes a review of digital watermarking techniques to enhance and enrich performance characteristics such as piracy, security, and reliable distribution of copyright contents to distributors and retailers through theoretically and by performance analysis. It helps researchers to develop effective encryption and decryption algorithms to trade off performance characteristics such as imperceptibility of digital content, reducing the computational complexity, increasing the security by optimizing the algorithm payload and improving robustness are present challenges. From the survey, it is observed that 95 to 97 % of copyright information gets changed due to the transformation and leads to piracy leakage. Likewise, it surmised the various signal processing attacks that are used for the evaluation of watermarking systems, which supplies guidelines to select substantial patchwork method based watermarking procedures for an option for the specific application area to significant improvement could observe in the audio copyright information.[11]

IV. PROBLEM IDENTIFICATION

Sound watermarking process is more troublesome that picture watermarking, to conceal the information in sound sign has more data transmission. The sign quality is diminished after the pressure of picture. More assault impact the sign quality like clamor, pressure, channel and cutting. These assaults diminish the heartiness of sign. In the LSB, DWT, FFT techniques signal quality are more influenced however DCT strategy is more power. In DCT strategy recurrence (center) segment expelled from sound sign in view of this PSNR is to be low. More assaults are included during watermarking process. In LSB and DWT strategy the PSNR esteem is low and these strategies are not strength. After writing study saw that the PSNR of DCT is high when contrasted with the other two calculations.

V. CONCLUSION

In previous research we have studied that Sound watermarking utilized in non dazzle watermarking strategy where sound sign is required for the at goal point. So along these lines nobody recognized who doesn't have sound sign, it gives security. It is troublesome concentrate picture from sound. To give the best security by the recurrence concealing strategy with the goal that the specific or unique information isn't noticeable.

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