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A Literature Survey of Various Information Embedding Methodologies in Transform Domain

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***Abstract*— The provision of versatile multimedia processing application and the long way achieving coverage plan of the interconnected networks. These targets have facilitated flawless copying, manipulations, and distribution of the digital multimedia (digital video, audio, text, and snapshots). The ever-advancing storage and retrieval technologies have additionally smoothed the way in which for giant-scale multimedia database purposes. Nevertheless, abuses of these amenities and applied sciences pose pressing threats to multimedia security management typically, and multimedia copyright safety and content material integrity verification in particular. Cryptography has an extended historical past of utility to knowledge and multimedia protection, the undesirable attribute of delivering no guard to the media as soon as decrypted has restrained the feasibility of its smart use. In this work, now we have surveyed over more than a few vital systems carried out in the course of information embedding.**

***Keywords*—** Data Transform, Information Hiding, Watermarking.

I. INTRODUCTION

In up to date years, digital multimedia technology has proven a large development. This science presents so many new advantageous approaches compared to the historical analog counterpart. The advantages for the period of the transmission of information. Effortless enhancing any part of the digital content, potential to copy a digital content material without any loss in the best of the content material and lots of different advantages in DSP, VLSI, and verbal exchange applications have made the digital technology advanced to the analog methods. In particular, the growth of digital multimedia science has shown itself on the web and wireless functions. The distribution and use of multimedia information are much less challenging and rapid with the excellent success of the internet. The satisfactory explosion on this technology has also brought some issues beside its benefits. Nonetheless, abuses of these amenities and applied sciences pose urgent threats to multimedia security management traditionally, and multimedia copyright safeguard and content integrity verification in specific. Despite the fact that cryptography has a long history of utility to expertise and multimedia safety, the undesirable attribute of delivering no safety to the media as soon as decrypted has constrained the feasibility of its preferred use. For illustration, an adversary can obtain the decryption key via purchasing an authorized copy of the media however then redistribute the decrypted copies of the fashioned. By these challenges, digital watermarking schemes were proposed within the last decade.

A watermark [1], a secret imperceptible sign, is embedded into the fashioned data in such a manner that it stays present so long as the perceptible satisfactory of the content material is to a suitable degree. The proprietor of the common data proves his/her ownership with the aid of extracting the watermark from the watermarked content material in case of multiple possession claims. Digital watermark could also be constructed from copyright or authentication codes, or a legend predominant for sign interpretation. The existence of these watermarks with in a multimedia sign goes neglected besides when handed via a right detector. Normal types of signals to watermark are still photos, audio, and digital video.

As an illustration of the usefulness of watermarking, allow us to do not forget an easy scenario: Newspaper X publishes an image, for which it claims amazing rights. Newspaper Y, additionally claiming to be the distinctive proprietor, publishes the equal image after copying it from X. With none exact safeguard mechanism, X can not prove that it is the rightful owner of the photograph. However, if X watermarks the photo before publication (that is, X embeds a hidden message that identifies it as its legit owner), and is competent to discover the watermark later in the illegally disbursed reproduction. It will be competent to deliver proof of ownership in a court docket of regulation. Alternatively, to prevent detection of the watermark, Y may attempt to remove it from the picture by way of distorting the photograph. That is, Y may try and assault the watermark so that you can render it undetectable, without vastly degrading the excellent of the photo or affecting its monetary worth. The careful design of the watermarking method can avoid this from taking place. There have been many situations of disputes or litigations on the mental ownership of multimedia knowledge. A copyright violations lawsuit that bought huge publicity in the early 2000's was once that in opposition to Napster.Napster was essentially a centralized database that allowed millions of customers to freely distribute song files in a peer-to-peer network. The track documents were un-watermarked and compressed in any such manner that the great of the reproduced tune was very almost that of a Compact Disc (CD recording). Nevertheless, all copyright information that typically accompanies the music written on a CD used to be misplaced. For this reason, it used to be no longer a useful task for the track firms to prove that unauthorized distribution was certainly taking location by way of Napster. A watermarking scheme strong to compression would have furnished extra ammunition to the track enterprise,

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as the copyright understanding would be inseparable from the music itself. Because of its importance, the watermarking discipline has grown significantly over the last years. There are numerous articles [2, 3, 4, 5, and 6] that explain the fundamentals of watermarking, explore its practical purposes, and assessment the efficiency of various schemes below a variety of assaults.

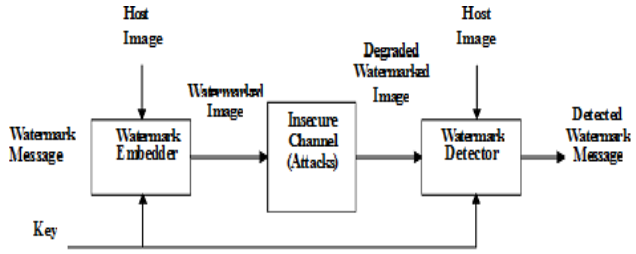

Fig. 1.1 A Digital Watermarking System

II. CHRONOLOGICAL REVIEW

Digital watermarking is a unique area of research and lots of researchers have advised a significant number of algorithms and when compared. The principal thrust on all such algorithms is to hide secret understanding (watermark) in host sign in one of these way that it presents an excellent tradeoff between imperceptibility and robustness towards different attacks. This section offers some forms of digital watermarking strategies located in the academic literature. We do not provide an exhaustive overview of the subject but provide a summary of headquartered procedures. Existing digital watermarking methods are labeled into two categories depending on the domain of watermark insertion: spatial area and frequency domain strategies.

The earlier watermarking techniques are just about spatial headquartered approach. In the spatial area, the watermark is embedded into the host photo by straight modifying the pixel values, i.e.,. The easiest example is to embed the watermark in the slightest degree big bits (LSBs) of photograph pixels [1]. Spatial area watermarking is convenient to enforce and requires no customary photograph for watermark detection. Nonetheless, it almost always fails under signal processing attacks such as filtering and compression and having relative low-bit potential. An easy image cropping operation may just get rid of the watermark. Apart from, the fidelity of the original photograph information may also be severely degraded seeing that the watermark is immediately applied on the pixel values.

Not like the spatial-domain-centered watermarking, frequency-domain based strategies can embed more bits of watermark and are more amazing to assault; consequently, they are more attractive than the spatial-area-centered approaches, because the watermark know-how can also be unfolded out to the complete picture. As to the frequency turn out to be, there are DFT (Discrete Fourier turn into), DCT (Discrete Cosine Transform), and DWT (Discrete Wavelet Transform). J.J.Ok.O'Runaidh et al. [5] use segment of the discrete Fourier turn out to be to embed the watermark. They used the fact that phase is more foremost than the amplitude of the DFT values for the intelligibility of a snapshot. The watermarking system proposed by J.J.Ok.O'Runaidh et al. [5] use DFT amplitude modulation because of its translation or shift invariant property. Since the cyclic translation of the photograph within the spatial domain does now not have an effect on the DFT amplitude, the watermark embedded in this area will likely be translation invariant. Nevertheless, embedding watermark in host picture by DFT is affected by the JPEG attacks. The watermarking process using DCT and DWT presents additional robustness to one-of-a-kind attacks.

I.J. Cox et el. [6] proposed a watermarking process by using taking DCT of the complete photograph. The process involves adding watermark to the N lowest frequency non-dc DCT coefficients of the host picture.

In [7] Jianzhen wu et el. Have proposed a blind wavelet based watermarking scheme utilizing fuzzy clustering idea. The watermarking scheme utilizes the HVS by clustering the nearby image facets, and as a consequence can embed more mighty watermark below a special visible distance. Watermark bits are embedded through a PN sequence. With a purpose to toughen the robustness, we embed watermark a couple of occasions in distinctive position, which might be randomly chosen. In a similar way, on this thesis we recommend a variety spectrum situated blind photograph adaptive watermarking system utilizing wavelet grow to be and a HVS mannequin situated on distinction sensitivity.

In [8] Zhang Guannan et el. Have proposed an adaptive block-founded blind watermarking algorithm utilizing DWT. By means of inspecting the characteristic of detail sub-band coefficients of the picture after discrete wavelet turn out to be, we use the mean and variance of the element sub-bands to change the wavelet coefficients adaptively to embed the watermark. This is a blind watermark algorithm to affirm the copyright with out the long-established photograph and the watermark is a meaningful binary image. The writer record concludes that the algorithm is effective to normal image processing operations.

In [9], S. Burgett et el. uses block situated DCT technique to embed the watermark. The picture is segmented into 8 × 8 non-overlapping blocks and the DCT of each block is bought similar to JPEG. A random subset of the blocks is chosen, and a triplet of midrange frequency coefficients is rather altered to encode a binary sequence. This seems to be an affordable approach for adding some style of perceptual criterion. Watermarks inserted into the excessive frequencies are most prone to attack, whereas the low-frequency components are perceptually huge and very sensitive to transformations; such changes may just make the watermark visible. Bors and Pitas [10] propose a method that modifies DCT coefficients pleasurable a block web page choice constraint. The picture is first divided into blocks of measurement 8 × 8 . Special blocks are then chosen in keeping with a Gaussian community classifier resolution. The core variety frequency DCT coefficients are then modified, utilizing either a linear DCT constraint or a circular DCT detection vicinity, to carry the watermark understanding. In [17, 18], an original image is not required for watermark extraction. This method provides reasonable results on natural, although an other image-based scheme could furnish better fine and robustness. Photograph adaptive watermarking scheme utilizing HVS mannequin improves the efficiency of the watermarking methods.

Swanson et al. [3] suggest a DCT domain watermarking method, based on frequency overlaying of DCT blocks. The input image is break up into rectangular blocks for which the DCT is computed. For each and every DCT block, a frequency mask is computed established on the expertise that a masking

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grating raises the visible threshold for signal gratings across the covering frequency. The ensuing perceptual mask is scaled and extended by using the DCT of a maximal size PN sequence. This watermark is then brought to the corresponding DCT block followed by spatial protecting to verify that the watermark is invisible and to manage the scaling component. Watermark detection requires the original snapshot as well because of the normal watermark and is comprehensive through speculation checking out. The scheme is powerful against JPEG compression, noise, and cropping.

Tao and Dickinson[7] propose an adaptive block established DCT domain watermarking technique situated on a regional perceptual classifier with assigned sensitivity indexes. The watermark is embedded in N AC DCT coefficients. The coefficients are chosen as to have the smallest quantization step sizes in step with the default JPEG compression desk. Various techniques exist to verify the noise sensitivity using efficaciously exploiting the overlaying results of the HVS. The authors advise a regional classification algorithm which classifies the block in considered one of six perceptual classes. The classification algorithm exploits luminance protecting, the area covering, and texture overlaying results of the HVS. Particularly the perceptual block classes from one to six are outlined as the side; uniform; low sensitivity; moderately busy; busy; and busy, in descending order of noise sensitivity. Each and every perceptual classification has a noise-sensitivity index assigned to it. Watermark recovery requires the usual picture as well as the watermark and is headquartered on speculation trying out. The author document shows that the approach is robust to JPEG compression and additive noise.

C. Podilchuk and W. Zeng [1] suggest a watermarking technique for digital pictures that is based on using visible models, which had been developed within the context of snapshot compression. The visual model offers an instantaneous approach to assessing the maximum quantity of watermark signal that each component of a snapshot can tolerate without affecting the visible exceptional of the image. The watermark encoding scheme includes a frequency decomposition headquartered on a 8×8 framework followed by way of simply noticeable difference (JND) calculation and watermark insertion. The watermark scheme is mighty to special assaults akin to JPEG compression, additive noise, scaling and so forth.

J. Wu and J. Xie [9] propose an adaptive watermarking manner in DCT domain using HVS model and fuzzy c-means system (FCM). On this process FCM manner is used to categorize non-overlapping eight × 8 common blocks into classes: one is suitable for watermarking with excessive imperceptibility and robustness, and the opposite is unsuitable. Watermark is inserted in DCT mid-frequency coefficients of chosen blocks. W. Zhang et el. [11] endorse an adaptive digital watermarking strategy. In this procedure, FCM procedure is used to verify the watermark force of each snapshot pixel, after which watermark is inserted adaptively to the N biggest magnitude non-dc DCT coefficients of the host picture. The both the procedure performs better against additive noise, compression and cropping and so forth.

Yifei Pu. Et el. [2,4] proposes a public adaptive watermark algorithm for color snap shots based on main add-ons evaluation of generalized Hebb. The algorithm is headquartered on principal element evaluation of generalized Hebb adaptive algorithm in artificial Neural community and to do adaptive quantitative coding for most important aspect coefficients consistent with the share of marginal or textural expertise of the watermark snapshot. Moreover, it adaptively adjusts the embedding depth in line with the pictures points to make certain the invisibility of the watermark. By way of disporting and stochastic embedding into color photo watermark, it raises the embedding robusticity of the watermark.

Although embedding watermark in host picture with the aid of DCT is extra mighty than that of with the aid of DFT, the DWT has a quantity of benefits over the DCT, on account that the DWT presents each space and frequency localization, and one-of-a-kind decision stages. Hence, DWT headquartered watermarking algorithm can effortlessly utilize the traits of HVS (Human visible system) to achieve the just right trade-off between robustness and imperceptibility. So, DWT based watermarking algorithms have gained more interest among the watermark researchers.

X.-G. Xia et el. [12] proposes a multiresolution watermark for digital snap shots. The technique is carried out in DWT area, and the watermark is inserted into the identical means as described in method [2]. C. Podilchuk and W. Zeng [6] suggest image adaptive watermarking utilizing visual units. The process is applied utilizing DWT and an HVS mannequin and watermark is embedded adaptively by calculating simply visible change (JND) for each block areas. M.-S. Hsieh [27] proposes a hiding digital watermarks were utilising multiresolution wavelet develop into. In this procedure, common snapshot is decomposed into wavelet coefficients. The procedure embeds a visually recognizable binary or gray image using editing the mid frequency part of the image. Watermarking methods is founded on the qualified tremendous wavelet tree which comes from the proposal of embedded zero wavelet tree (EZW). The above methods are mighty to a type of sign distortions and require normal snapshot for watermark extraction. In approaches [5, 6, 7] the watermark embedded linearly to the customary picture.

Deepa Kundur and D. Hatzinakos [8] advocate a digital watermarking utilizing multiresolution wavelet decomposition. On this system, watermark is embedded non-linearly within the fashioned photo by using utilizing scalar quantization, and picture fusion principle suggestion. Usual snapshot is not required for watermark extraction. On this thesis we advocate a fusion founded image adaptive watermarking approach utilizing wavelet become and an HVS mannequin centered on contrast sensitivity.

III. CONCLUSION

This survey article discusses about various strategies carried out in direction of image watermarking and information hiding. Most prominent contributions includes spatial domain embedding, DCT and DFT based watermarking using block based methodology, Hebb based adaptive watermarking method and Hue value saturation based models that gives a promising performance in the direction of art. Thus this article provides a base work outline for any researching conducting experiments in the direction of information embedding using transform based approaches.

REFERENCES

ISSN No: - 2456- 2165

[1] Van Schyndel, R.G., Tirkel, A.Z., and Osborne, C.F., "A digital Watermark." Proc. of the IEEE Int. Conference on Image Processing. Vol. 2, (1994): pp. 86-90.

[2] Swanson, M.D., Kobayashi, M., and Tewfik, A.H., "Multimedia Data-Embedding and Watermarking Technologies." Proc. of the IEEE. Vol. 86, No. 6, (June 1998): pp. 1064– 1087.

[3] Petitcolas, F., Anderson, R., and Kuhn, M., "Information Hiding - a Survey." Proc. of the IEEE. Vol. 87, No. 7, (July 1999): pp. 1062–1078.

[4] Barni, M., Bartolini, F., Cox, I.J., Hernandez, J., and Perez-Gonzalez, F., "Digital Watermarking for Copyright Protection: A communications perspective." IEEE Communications Magazine. Vol. 39, No. 8, (August 2001):pp. 90–133.

[5] Langelaar, Gerhard C., Setyawan, I., and Lagendijk, R.L., "Watermarking Digital Image and Video Data: A state-of-the-art-overview." IEEE Signal Processing Magazine. Vol. 17, No. 5, (September 2000): pp. 20-47.

[6] Voyatzis, G., Mikolaides, N., and Pitas, I., "Digital watermarking: An overview." Proc. of IX European Signal Processing Conference(EUSIPCO), Island of Rhodes, Greece. (September 8-11, 1998): pp. 13-16.

[7] Wolfgang, R.B., Podilchuk, C.I., and Edward J. Delp, "Perceptual Watermarks for Image and Video." Proc. of the IEEE. Vol. 87, No. 7, (July 1998): pp. 1109-1126.

[8] A.K. Jain, *Fundamentals of digital image processing*, Prentice-Hall, Upper Saddle River, NJ, USA, pages 569, 1989.

[9] Gonzalez, Rafael C.; Richard E. Woods, *Digital Image Processing*, Prentice Hall, 2nd ed, pages 793.

[10] Cox, I.J., Miller, M.L., and Bloom, J.A., "Watermarking Applications and their Properties." Proc. of IEEE Int. Conference on Information Technology, Las Vegas. (March 2000): pp. 6-10.

[11] Craver, S., Memon, N., Yeo, B.-L., and Yeung, M.M., "Resolving Rightful Ownerships with Invisible Watermarking Techniques: Limitations, Attacks and Implications." IEEE Journal On Selected Areas in Communications. Vol. 16, No. 4, (May 1998): pp. 573-586.