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A Survey on Transformation Based Techniques in Robust Image Watermarking

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Abstract: **-** Transformation domain based mostly techniques in strong image watermarking increasing attention in field of watermarking. Currently a day's distribution of digital images, movies and music It's simple and quicker using through engineering and mobile apps, on the web the complete worlds. Hence, the content owner's as an images and recording company's knowledge are involved regarding illegal repeating of their message content and knowledge content. Strong image watermarking may be a pattern of bits inserted into digital images that identifies the copyright info. This survey paper defines watermarking technique in digital images and explains main frequency domain based mostly algorithms.

Keywords*:* - Watermarking, Robust, Transformation, DCT, DFT, DWT, Embedding, Detection

I. INTRODUCTION

In the ever ever-changing world of world knowledge communications, cheap internet connections, and fast software system development, security is changing into additional and additional of a difficulty. Security is currently a basic demand because world computing is inherently insecure. On internet, digital images are simply and wide shared among completely different the various users at different geographical places. Each day great amount of digital images is transmitted over the internet in numerous applications. As digital technology permits unauthorized copy of digital images, the protection of the copyrights of digital image may be an important issue. Therefore watermarking may be a technique that supports with possible answer. Digital Watermarking is outlined because the method of activity a bit of digital information within the cover information that is to be protected and extracted later for possession verification. The options of watermarking include hardiness and physical property. With the rapid growth of the net and digital media technologies over the last decade, visual data like images and videos will simply be copied, altered and distributed over the net with none loss in quality. Thus the protection of the possession of transmission knowledge has become a really difficult issue. In watermarking applications, the hardiness of watermarks to attacks is important to the system. Whereas signal process attacks attempt to reduce the watermark energy, geometric attacks could induce synchronization errors between the encoder and also the decoder of the watermark. As a result, the decoder is not any longer ready to sight the watermark. Several digital watermarking schemes are planned for copyright protection and several other watermarking ways are developed to overcome the problem caused by geometric attacks. These ways will be roughly classified into template-based, invariant transform domain-based, moment-based, and histogram-based and have extraction primarily based methodology [1].

II. WATERMARKING TEHNIQUES

Digital watermarking comprise of varied watermarking techniques for the protection of the information. Watermarking techniques are divided into two classes spatial Domain Watermarking and Frequency Domain Watermarking or DWT. Within the spatial domain, the watermark is embedded by modifying the pixel values within the original image. Transform domain watermarking is similar to spatial domain watermarking; during this case, the coefficients are changed. Each strategy have benefits and disadvantages: One disadvantage of spatial domain watermarking is that the cropping attack may remove the watermark [2]. *spatial Domain Watermarking:* during this style of watermarking the knowledge is else by variable the picture element values of the carrier signal .least important bit is one among technique of the spatial domain watermarking. *Least important bit:* The watermark is else within the pixel of the image. The pixel of the pictures is accessed and therefore the info that is to send is inserted within the pixel. This provides security to the information that's to be transmitted. *Frequency Domain watermarking:* during this style of watermarking the knowledge is embedded into the frequency constant of the carrier signal. It's a lot of sturdy, and its capability of hiding the knowledge is a lot of. Fourier transforms (FT), discrete cosine transforms (DCT), discrete wavelet transform (DWT) etc are a number of the technique of frequency Domain watermarking. *Discrete cosine transform (DCT):* In discrete cosine transform a picture is broken into the various frequency bands that are high, medium and low-frequency bands. It transforms a proof from the spatial domain to the frequency domain. The watermark is embedded into this band in step with the selection created. DCT is applied in several fields like knowledge compression, pattern recognition and each field of image process. DCT may be a real transform with higher machine potency and conjointly offers a higher performance within the bit rate reduction [3]. *Discrete wavelet transforms (DWT):* In discrete wavelet, transform a picture is split into sub-bands of various resolutions. On the arrival of the image, the decomposition of a picture are often done at completely different level using series of low pass and high pass filter as a result of its spatial localization and multi-

resolution, technique DWT is employed within the digital watermarking. It offers higher visual image quality, localization and is very sturdy technique [4].

III. APPLICATIONS OF WATERMARKING TEHNIQUES

Digital image watermarking has various applications in form of fields. A number of the appliance fields are mentioned below. The most applications fields of digital image watermarking are [5]. *Content Archiving:* Watermarking will be used to insert digital object symbol or serial variety to assist archive digital contents like pictures, audio or video. *Meta information Insertion:* Meta-data refers to the info the information that describes data. Pictures will be tagged with its content and may be utilized in search engines. Audio files will carry the lyrics or the name of the singer. Medical X-rays might store patient records. ***Copyright Protection:*** Watermarking will be used to shield distribution of copyright material over the un-trusted network like net or peer-to-peer networks. *Broadcast Monitoring:* This application is employed to observe unauthorized broadcast station. It will verify whether or not the content is absolutely broadcasted or not. *Tamper Detection:* Digital content will be detected for tampering by embedding fragile watermarks. If the fragile watermark is destroyed or degraded, it indicates the presence of tampering and thus the digital content cannot be sure. Tamper detection is incredibly necessary for a few applications that involve sensitive information like satellite imaging representational process} or medical imagery. *Authentications and Integrity Verification:* Content authentication is ready to discover any modification in digital content. This will be achieved through the utilization of fragile or semi-fragile watermark that has low lustiness to modification in a picture. *Content Descriptions:* This watermark will contain some detailed data of the host image like labeling and captioning for this kind of application, the capability of watermark ought to be comparatively giant and there is no strict demand of hardiness. *Digital Forensics:* It includes application in forensics science to assure that digital image is doctored or not. *Digital Fingerprinting:* Digital process may be a technique used to discover the owner of the digital content. Fingerprints are exclusive to the owner of the digital content. Thus one digital object will have completely different fingerprints.

IV. CHARACTERISTICS OF WATERMARKING

The factors of the image watermarking are the properties or attribute on that the watermarking depends on necessities of Digital Image Watermarking vary and lead to numerous style problems looking on applications and purpose. The most factors that require being taken in thought whereas planning the watermarking system is mentioned as following: *Impalpability:* The watermark that's embedded within the image ought to cause very little degradation to the image in which it's inserted. *Security:* security is that the ability of the system to resist against the unauthorized access, Embedding and extracting of the watermark ought to be done firmly so the aim of watermarking isn't modified. *Capacity:* it's outlined because the total numbers of bits that are embedded into image. The quantity of bits varied because the size of the watermark varies. Capability defines the number of the information that's embedded because the watermark and is detected throughout the extraction method. *Robustness:* The watermark present within the image shouldn't be affected by doing any kind modification within the image like filtering, scaling, printing etc. The watermark ought to be strong against such modifications. For the hardiness, the watermark is often value-added at quite one place within the image, so if one is the lost or removed the opposite is present there [6].

V. LITERATURE SURVEY

Zeki A.M et al. [7] aimed at replacing the watermarked image pixels by new pixels that can protect the watermark data against attacks and at the same time keeping the new pixels very close to the original pixels in order to protect the quality of watermarked image. The technique is based on testing the value of the watermark pixel according to the range of each bit-plane.

Bamatraf et al. [8] also emphasized the manipulation of least significant bit for watermarking because of the least possible effect on the quality of cover image. They inversed the binary values of the watermark text and shifting the watermark according to the odd or even number of pixel coordinates of image before embedding the watermark. There is a flexibility depending upon the length of the watermark text. If the length of the watermark text is more than ((MxN)/8)-2, there is a way to embed the extra of the watermark text in the second LSB.

Hernandez et al. [9] utilized the usefulness of a spread spectrum like discrete cosine transform domain (DCT domain) watermarking technique for copyright protection of still digital images .Generalized Gaussian distributions were applied to statistically model the DCT coefficients of the original image and show how the resulting detector structures lead to considerable improvements in performance with respect to the correlation receiver.

Yang et al. [10] took the advantage of DCT and DWT coefficients for color image watermarking. Firstly, the green components of an original image are divided into blocks, for each of which DCT is calculated and from each of which DC components are chosen to make up a new image, and new images are transformed with Haar wavelets. Then, a binary image of scrambling chaotic encryption is embedded into a low frequency sub-ban.

N. K. Kalantari [11] proposes a robust image watermarking scheme in the ridge let transform

domain. So sparse representation of an image which contains line singularities is obtained for achieving robustness and transparency, the watermark data is embedded in the selected blocks of the cover image by modifying the amplitude of the ridge let coefficients which represent the most energetic direction. Decoder extracts the watermark data using the variance of the ridge let coefficients of the most energetic direction in each block. A robust noise estimation scheme is proposed to fulfill the requirements of the decoder such as the noise variance to perform decoding. Implementation of error correction codes and analytical derivation of bit error probability is also carried out.

X. Kang [12] proposes, a blind discrete wavelet transform-discrete Fourier transform (DWT-DFT) composite image watermarking algorithm which resists the alteration of image during both affine transformation and JPEG compression. This algorithm improves the robustness by using new embedding strategy, watermark structure, 2-D interleaving, and synchronization technique. A spread-spectrum-based watermark including training sequence embedded in the coefficients of the LL sub band in the DWT domain, also a template is embedded in the middle frequency components in the DFT domain. During watermark extraction, first detect the template of a corrupted watermarked image to obtain the parameters of affine transform for converting the image back to its original shape. Then perform translation registration with training sequence embedded in the DWT domain for finally extracting the informative watermark.

Nilanjan Dey et al. [13] proposed a DWT based Steganographic technique for color image. Cover image is decomposed into four sub bands using DWT. They embed each color plane of the secret image in HH sub bands by alpha blending technique in the corresponding sub bands of the respective color planes of the original image. In this approach the generated stego image is imperceptible and security is high.

Gunjal et al. [14] proposed an overview of transform domain robust digital image watermarking algorithms with DWT-DCT combined approach which can significantly improve PSNR with compared to only DCT based watermarking methods.

Akhil et al. [15] proposed a robust image watermarking technique based on 1-level DWT (Discrete Wavelet Transform). This method embeds invisible watermark into salient features of the original grayscale image using alpha blending technique. Experiment result shows that the embedding and extraction of watermark is depend only on the value of alpha.

Author	Method	Performance
Zeki A.M et al.[7]	A Novel Digital Watermarking Technique based on ISB	Watermarking low quality and Original image can be recovered
Bamatraf et al. [8]	A new digital watermarking algorithm using combination of least significant bit and Inverse Bit	Low robustness
Hernandez et al.[9]	DCT Domain Watermarking Techniques for Still Images: Detector Performance Analysis and a New Structure	Visible based block effect
Yang et al.[10]	An Algorithm for Color Image Watermarking Based On the Combination of DWT and DCT	Embedding time is more and low robustness
N. K. Kalantari [11]	A robust image watermarking in the ridge let domain using universally optimum decoder	Low embedding then low PSNR
X. Kang [12]	A DWT-DFT composite watermarking scheme robust to both affine transform and JPEG compression	developed an algorithm that relies upon adaptive image watermarking in high resolution sub-bands of DWT
Nilanjan Dey et al. [13]	A Novel Approach of Color Image Hiding using RGB Color planes and DWT	Wavelet based image watermarking and low data hiding
Gunjal et al. [14]	An overview of transform domain robust digital image watermarking Algorithms	Time is more and low robustness
Akhil et al. [15]	Wavelet Based Watermarking on Digital Image	DWT based method in watermark was embedded in middle frequency coefficient and 1-level so not good robustness
Proposed Algorithm	Pixel based bit changing in image and embedding	good PSNR then good robust

VI. CONCLUSION

Image watermarking is that the efficient method of sending the info securely. Security is that the major issue that's taken into consideration whereas the information is transferred over the internet. Several watermarking techniques are planned earlier for the secure information transmission. When learning the literature it's ended that the most of the work is finished in embedding the watermark within the image, however, the safety of watermark when it's embedded within the image isn't thought about anyplace. The security of the embedded watermark is additionally a very important issue that's to be considered whereas planning the watermarking system. More implementation may be done on this idea to supply security to the watermark image that is to embed in any media file.

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