Survey Paper on Image Watermarking on Different Methods with its Applications

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Abstract-*Watermarking is process to hide some secret data in a cover file. Watermarking is a notion intently linked to steganography. In this both hide information in an image. The information hide in this is in different forms like an image, song, video within the signal itself. We studied comparative analysis of various approaches that may positive and negative of these techniques. This comparison can further be used to improvise and propose of few new techniques for the same.*

Keywords-Applications, Techniques, Watermarking

I. INTRODUCTION

Present day generation is witness of digital media improvements. Using phone camera capture a photo is a simple example. The usage of Digital media is public in present-day. Text, audio, video are other digital media example.

We know that an internet is the fastest medium of transferring data to every place in a world. This method could be using to every digital media types like as image, audio, video and documents. From many years researchers & developers worked in this zone to gain best results [1].

These are few sections for basic information purpose:

- Overview and history of Image watermarking
- Various types of Image watermarking techniques
- Applications & Classification of watermarking
- Image watermarking Threats

Fig. 1.A watermark image

II. BASIC OF WATERMARKING

Digital Image Watermarking contain two parts:
1. Watermark embedding
2. Watermark extraction.

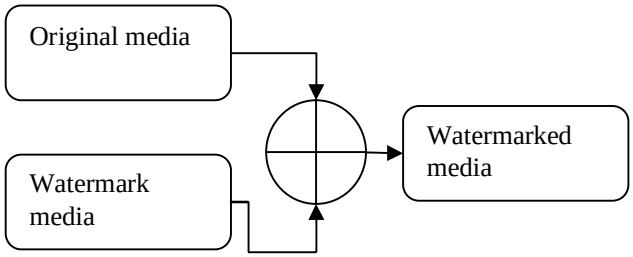

Fig. 2.Watermarking embedding process

The leading procedure is Watermark Implanting that is exposed in Figure 2 and the second procedure is the Watermark Extraction that is exposed in Figure 3.

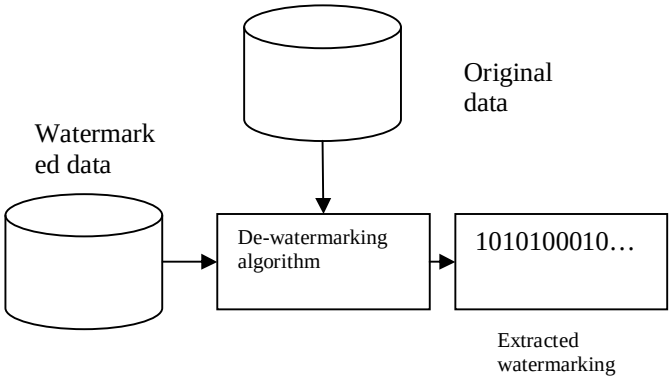

Fig. 3.Watermarking extraction process

Watermark Embedding is the embedding watermark process into the creative image which is the final output of watermark image [2].

III. TYPES OF WATERMARKING

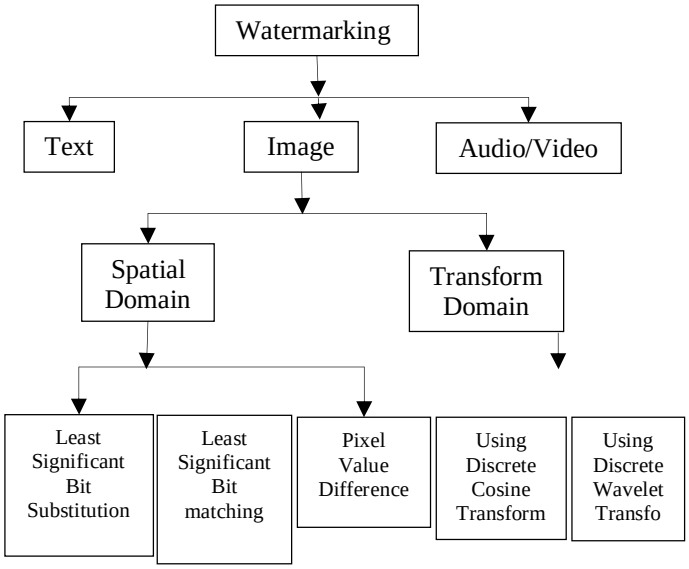

Fig. 4.Watermarking types

Watermarks and watermarking process can be divided into a categories variety in various ways [10].

1) Text Watermarking
2) Image Watermarking
3) Audio Watermarking
4) Video Watermarking [3]

In additional mode, the digital watermarks could be separated into four different types as follows:

I. Visible watermark
II. Invisible watermark
III. Fragile watermark
IV. Robust watermark

IV. WATERMARKING TECHNIQUE

There are some watermarking technique is:

A. Spatial Domain Techniques

Some pixels modifies in spatial domain technique which is selected by image subsets. Modifications might conclude flipping the all pixel low-order bit. However, this procedure will not be reliable for example filtering or lossy compression. Numerous spatial domain techniques are as follows:-

- *Least Significant Bit Coding (LSB)*

LSB coding is one of the most basic techniques. It is substituted with watermark. At the time of encryption first select that pixel which is embedded. It is simple method but it's robustness is too low.

- *Predictive Coding Schemes*

In this technique correlation between the various adjacent pixels are exploited. A cipher key is generated which enables entrenched watermark retrieval at the receiver. This is a lot additional strong as compared to LSB coding.

- *Correlation-Based Techniques*

Here this technique a Pseudo random noise (PN) with a sample W(x, y) is delivered to an image. At the decoder the correlation between random noise and image is discovered and if the value exceeds an exact threshold worth the watermark is notice else it isn't.

- *Patchwork Techniques*

One subset is increased by a factor k, other subset shall be decreased by the similar quantity. When a[i] is the value of sample at I in subset 'A' which is increased and b[i] is value of the sample in the subset 'B' whose value is decreased, after that the difference stuck between two subsets would intuitively result in

$\Sigma(a[i]-b[i]) = 2N$ for watermarked images

$1<=N<=\infty$
$= 0$ otherwise

B. Frequency Domain techniques

In protected image hide some information in lower and middle frequency domain, because unconventional frequency portion is additional probable to be suppressed through compression. But how to select the best image frequency portions for watermark is another important and challenging topic. Numerous frequency domain methods are as follows:-

- *Discrete cosine transform (DCT) based technique*

It is a procedure which converts data points sequence in the spatial domain to sine and cosine waveforms combination with various amplitudes in the frequency domain.

- *Discrete Fourier Transformation (DFT) based technique*

This is translation invariant & rotation resistant, which translates to robust stoutness to geometric assaults. DFT makes use of elaborate numbers, even as DCT uses simply real numbers.

- *Discrete wavelet transform (DWT) based technique*

DWT-based approaches enable better spatial localization and has multiple resolution characteristics, which are related to human visual system. Also this method presents robustness to median filtering and low-pass. Though, This is not strong then geometric transformations.

C. Wavelet Transform based Watermarking

Watermarking method which is based on wavelet transform divides a single image into four sidebands – a low resolution tile module approximation and constituent's horizontal, diagonal & vertical frequency characteristics. The procedure can then be repetitive iteratively to create N scale transform [4].

V. REQUIREMENT OF DIGITAL WATERMARK

The common requirements in digital watermarking are strictly connected to its resolution of applications, dissimilar application have dissimilar demands. In overall, digital watermarking requirements are as per following:

A. Robustness:

Robustness denotes to that watermark entrenched in information has the surviving capability after processing operations variety and attacks. The watermark for copyright protection does need strongest robustness.

B. Non-perceptibility:

Generally invisible watermark cannot be seen through eye but it can be detect by de-watermarking process.

C. Verifiability:

Watermark shall be able to offer complete & reliable evidence of copyright and data products ownership. It is cast-off for data protection purposed and also provide user authentication.

D. Security:

Watermark data process provide user secure authentication by sign in, only authorized users can lawfully detect, extract & even watermark modify, and therefore be able to attain copyright protection determination.

E. Capacity:

*Ca*pacity of image watermarking is estimation that of just how much top-secret data could be hidden in a digital image. Watermarking capacity is define through the statistical model usase for the host image, by means of the distortion constraints on the information hider & attacker, and by the data available to the data hider, to the attacker, and to the decoder [5].

VI. APPLICATION OF DIGITAL WATERMARKING

There are many digital image watermarking applications. In this part, some areas of application for digital watermarking are discussed:

F. *Copy Control:-*

Watermark may include knowledge mandatory through the content proprietor that decided the digital content copying strategy. The data contained through watermark might specify „content may not be copied" or „only one copy" etc..

G. *Digital Signatures:-*

Watermarks might be used to content proprietor identify. With taking this knowledge user might contact the proprietor used aimed at obtaining the lawful rights to copy or applying the content.

H. *Authentication:-*

A secure authentication provide by watermarking process. Providing an incorrect watermarked picture can either break the watermark or results in wrong watermark after extraction.

I. *Broadcast Monitoring:-*

Automatic data owners identification may be need to be complete and utilized in systems accountable for monitoring the proclaims.

J. *Fingerprinting:-*

Once a digital media is dispersed, it could be include hidden & imperceptible knowledge about user, which could be detect using watermark detector. therefore a licensed copy belonging to a particular user can be ascertained. This also resolves possible conflicts as regards to digital or intellectual property ownership. This is referred to as "Fingerprinting".

K. *Secret communication:-*

Numerous public domain & shareware programs are obtainable that usase watermarking for top-secret communication. Looking at the important watermarking applications, it becomes very important to enhance the watermarking techniques for providing better "robustness",

"fidelity", "payload" while preserving the "authenticity" aspect of watermarking [6].

VII. DIFFERENT CRITERIA OF DIGITAL WATERMARKING

Types of watermarking basis of different Criteria [7]

S.no	Criteria	Classification
1	Watermark Type	1. Noise: pseudo noise, Gaussian random and chaotic sequences 2. Image: Any logo, Stamp Image etc.
2	Robustness	1. Fragile: Easily Manipulated 2. Semi-Fragile: Resist from some type of Attacks 3. Robust: not affected from attack
3	Domain	1. Spatial: LSB, Spread Spectrum 2. Frequency: DWT, DCT, DFT, SVD
4	Perceptivity	1. Visible Watermarking: Channel logo 2. Invisible Watermarking: similar to Steganography
5	Host Data	1. Image Watermarking 2. Text Watermarking 3. Audio Watermarking 4. Video Watermarking
6	Data Extraction	1. Blind 2. Semi-Blind 3. Non- Blind

VIII. LITERATURE SURVEY

MANISHA PENDYALA (2016) et al present that Spatial domain technique is applied captivating benefit of it low-slung computational complexity. The early stage of method is skilful by building the algorithm on MATLAB R2014a© stage and then instable the base to ISE Design Suite 14.7© stage. The VLSI implementation of the spatial domain Watermarking algorithm is embattled on device xc5vlx50t-1ff1136 of Virtex-5 family. The robustness of the Watermarking algorithm is confirmed by attacking the Watermarked image with numerous kinds of noise, compression, transformation & geometrical attacks [8].

R. Surya Prakasa Rao (2016) et al present that Proposed GA based scheme of Digital Image watermarking are enhanced through embedding the watermark in original image Third Level DWT, after using SVD to watermark image. The GA is cast-off for superlative SF to alter watermark image SVD coefficients. The NCC and PSNR used as fitness function in GA and it estimate watermarking method Imperceptibility and Robustness. Experimental outcomes are as long as to illustrate that the proposed method is able to survive image processing attacks variety very well and comparison is complete with preceding work [9].

Thottempudi Pardhu (2016) et al present that achieves unnoticeable watermarking of images in frequency domain. In the decoding stage, once watermark is take out from the watermarked image, certain performance measures for example PSNR and correlation are calculated [10].

Tamirat Tagesse Takore (2016) et al present that an improved blind image watermarking algorithm applying DWT, DCT and SVD is planned in this paper. One level DWT operation is achieved on original host image applying Haar wavelet & approximation (LL) sub-band is selected to split it into two sub images. SVD and DCT operations are achieved in both sub images applying 8x8 block size [11].

N. SenthilKumaran (2016) et al present that algorithm is confirmed on dissimilar watermarking images. it's providing strong and protected results. To measure the efficiency of this algorithm is deliver embedding and extracting images. PSNR and MSE also calculated the embedding watermarking images. In this DWT watermarking embedding outcome images proposal the decent, protected and strong. Here planned to how to procedure LSB technique [12].

C. N. Sujatha (2016) et al present that purposes of digital watermarking techniques are capability, toughness & inaudibility. In all the projected watermarking arrangements, inaudibility and toughness are predictable by calculating Peak Signal to Noise Ratio (PSNR) and Correlation Factor (CF). This paper carries the potency of the current algorithms in contradiction of numerous attacks [13].

IX. CONCLUSION

Digital media is the people requirement present days. Watermarking methods have been established to the complete requirement. In this paper, we have extant the survey on digital image watermarking. In Which, we also clarify the watermarking kinds and various watermarking techniques and also we explained the digital watermarking requirements.

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