The Textural Based Watermarking Technique in Image Processing

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Abstract- Digital watermarking is the mechanism by which security is provided to the sensitive data which is stored in the databases in the form images. In this process, all the essential features of an image is extracted and calculated after which this original image is implanted into the watermark image. In this research paper, GLCM and PCA algorithm has been utilized in order to improve the working capability of the neural network based watermarking technique. Therefore, the features of the original images are extracted with the help of GLCM and PCA algorithm. The scaling factor defines the output of the PCA algorithm which is used for implementation. On the basis of simulation results it is concluded that proposed algorithm performs well in terms of PSRN and MSE and MATLAB tool is used for the implementation of the proposed method.

Keywords- GLCM, PCA,PSRN, MSE, Scaling Factor

I. INTRODUCTION

Digital watermarking is a process in which some information is embedded within a digital media so that the inserted data becomes part of the media. This technique serves a number of purposes such as broadcast monitoring, data authentication, data indexing and so forth. A digital watermarking system must successfully satisfy trade-offs between conflicting requirements of perceptual transparency, data capacity and robustness against attacks. These trade-offs are investigated from an information-theoretic perspective [1]. Watermarks have two categories of roles: In the first category, the watermark is considered as a transmission code and the decoder must recover the whole transmitted information correctly. In the second category, the watermark serves as a verification code. In the latter system, the watermark detector must simply determine the presence of a specific pattern [2]. Since the footprint of the verification watermarking, that is, the number of pixels per watermark code bit is typically higher, this case has higher robustness as compared to the subliminal channel (transmission code) case. In watermarking schemes, the watermark message is embedded in the host signal in different ways, for example, additively or multiplicatively. Invisible watermarks, on the other hand, are potentially useful as a means of identifying the source, author, creator, owner, and distributor or authorized consumer of a document or image. For this purpose, the objective is to permanently and unalterably mark the image so that the credit or assignment is beyond dispute. In the event of illicit usage, the watermark would facilitate the claim of ownership, the receipt of copyright revenues, or the success of prosecution. Watermarking has also been proposed to trace images in the event of their illicit redistribution [3]. Whereas past infringement with copyrighted documents was often limited by the unfeasibility of large-scale photocopying and distribution, modern digital networks make large-scale dissemination simple and inexpensive. Digital watermarking makes it possible to uniquely mark each image for every buyer. If that buyer then makes an illicit copy, the illicit duplication may be convincingly demonstrated. Digital watermarks are classified according to their applications. The watermarks are classified as perceptible watermarks and imperceptible watermarks, robust and fragile, public and private. Digital Watermarking software looks for noise in digital media and replaces it with useful information [4]. A digital media file is nothing more than a large list of 0's and 1's. The watermarking software determines which of these 0's and 1's correspond to redundant or irrelevant details. For example, the software might identify details in an image that are too fine for the human eye to see and flag the corresponding 0's and 1's as irrelevant noise. Later the flagged 0's and 1's can be replaced by a digital watermark [5]. A neural network is defined as "...a computing system made up of a number of simple, highly interconnected processing elements, which process information by their dynamic state response to external inputs." The idea of ANNs is based on the belief that working of human brain by making the right connections can be imitated using silicon and wires as living neurons and dendrites. ANNs are composed of multiple nodes, which imitate biological neurons of human brain [6]. The neurons are connected by links and they interact with each other. The nodes can take input data and perform simple operations on the data. The result of these operations is passed to other neurons. The output at each node is called its activation or node value. Each link is associated with weight. ANNs are capable of learning, which takes place by altering weight values.

II. LITERATURE REVIEW

Nikita Kashyap, (2012) introduced about implemented a robust image watermarking technique for the copyright protection based on 3-level discrete wavelet transform (DWT). In this technique a multi-bit watermark is embedded into the low frequency sub-band of a cover image by using alpha blending technique [7]. The insertion and extraction of the watermark in the grayscale cover image is found to be simpler than other transform techniques. The proposed method is compared with the 1-level and 2-level DWT based image watermarking methods by using statistical parameters such as peak-signal-to-noise-ratio (PSNR) and mean square error (MSE). The experimental results demonstrate that the watermarks generated with the proposed algorithm are invisible and the quality of watermarked image and the recovered image are improved.

Navnidhi Chaturvedi, et.al (2012) described about the authenticity & copyright protection are two major problems in handling digital multimedia [8]. The Image watermarking is most popular method for copyright protection by discrete Wavelet Transform (DWT) which performs 2 Level Decomposition of original (cover) image and watermark image is embedded in Lowest Level (LL) sub band of cover image. Inverse Discrete Wavelet Transform (IDWT) is used to recover original image from watermarked image. And Discrete Cosine Transform (DCT) which convert image into Blocks of M bits and then reconstruct using IDCT. In this paper we have compared watermarking using DWT & DWT-DCT methods performance analysis on basis of PSNR, Similarity factor of watermark and recovered watermark.

Surya Pratap Singh, (2012) presented a robust watermarking technique for color and grayscale image. The proposed method involves many techniques to conform a secure and robust watermarking [9]. In the proposed technique the watermark is embedded in 3rd level of DWT (Discrete Wavelet Transform) and before embedding the watermark image is passed through chaotic encryption process for its security, other important thing is that in the proposed method watermark is embedded in the form of DCT (Discrete Cosine Transform) with special coefficient shifting algorithm to minimize the impact on main image. The performance of the proposed watermarking is robust to a variety of image processing techniques, such as JPEG compression, enhancement, resizing, and geometric operations.

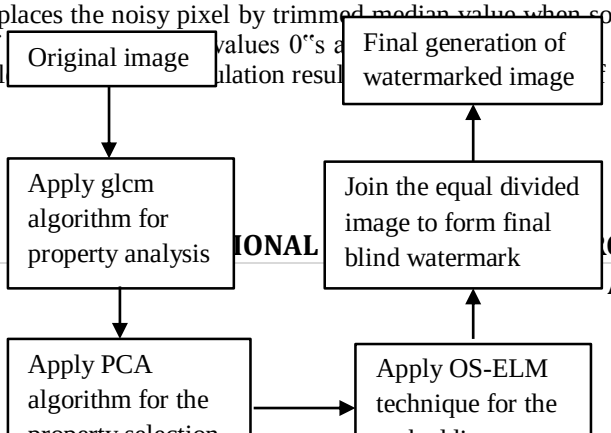
T. Vimala, (2012) proposed a Modified Decision Based Unsymmetrical Trimmed Median Filter (MDBUTMF) followed [10] by Fuzzy Noise Reduction Method (FNRM) for the restoration of color images that are highly corrupted by salt and pepper noise. The proposed filter (MDBUTMF) replaces the noisy pixel by trimmed median value when some of [illegible] values 0's a[illegible] the sel[illegible]ulation resul[illegible] the proposed method. The proposed method is tested against different color images and it gives excellent Peak Signal-to-Noise Ratio (PSNR) than the Median Filter (MF), Switching Median Filter (SMF), Boundary Discriminative Noise Reduction Algorithm (BDNRA), Decision Based Algorithm (DBA), and Decision Based Unsymmetric Trimmed Median Filter (DBUTMF).

A Mansouri et.al, (2009) a new robust method of non-blind image watermarking is proposed [11]. The suggested method is performed by modification on singular value decomposition (SVD) of images in Complex Wavelet Transform (CWT) domain while CWT provides higher capacity than the real wavelet domain. A new non-blind SVD-based watermarking method in CWT domain was introduced. Modifying SVs of the host image in CWT domain provides high robustness against the common attacks. High PSNR of watermarked image is another beneficial point of the algorithm as the result of CWT implementation. In this way, high capacity of CWT domain is applied to embed the watermark information along with preserving the quality of the watermarked image.

Anthony T.S.Ho et.al, (2011) proposed a robust image-in-image watermarking algorithm based on the fast Hadamard transform (FHT) for the copyright protection of digital images [12]. Most current research makes use of a normally distributed random vector as a watermark and where the watermark can only be detected by cross-correlating the received coefficients with the watermark generated by secret key and then comparing an experimental threshold value. The performance of the proposed algorithm is evaluated using Stirmark. The experiment uses container image of size 512×512×8bits and the watermark image of size 64×64×8bits. It survives about 60% of all Stirmark attacks. The simplicity of Hadamard transform offers a significant advantage in shorter processing time and ease of hardware implementation than the commonly used DCT and DWT techniques.

III. RESEARCH METHODOLOGY

The watermarking is the efficient technique to provide security to the image data. The watermarking techniques are broadly classified into blind and semi-blind watermarking techniques. In the base paper, the semi-blind watermarked image is generated using the OS-ELM technique which the machine learning technique. The four levels DWT technique is applied to extract the features of the original and watermark images. The training images which are analyzed with the DWT algorithm is given as input to generate final training sets for the generation of semi-blind watermarks. The DWT algorithm will analyze textual features of the images which can be replaced with the glcm algorithm which has less complexity and easy to generate training sets for the generation of blind watermarks.



Experimental Results

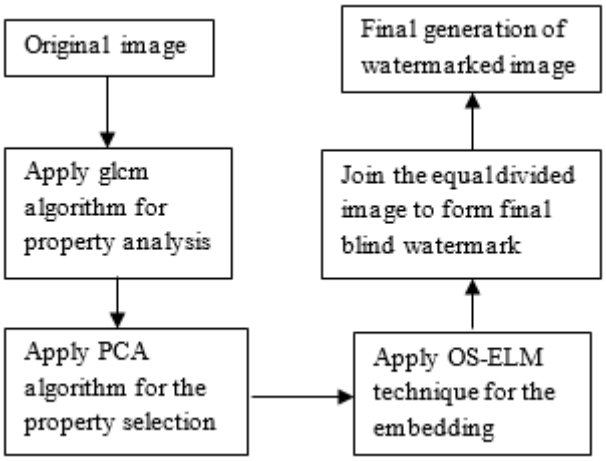


Fig.1: Proposed Flowchart of embedding

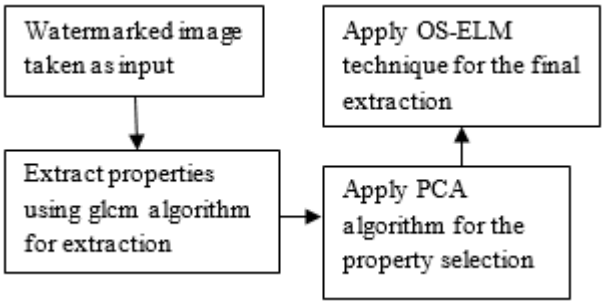


Fig.2: Proposed Flowchart for extraction

As shown in table 1, the results of the proposed and existing schemes are compared and it has been analyzed that proposed method performs well in terms of PSNR, MSE, BER and coefficient correlation.

IV. CONCLUSION

In this paper, the efficiency of the watermarking approach is concluded as it hides all the sensitive information which is stored in the form of images. In this research paper, GLCM and PCA algorithm has been utilized in order to improve the working capability of the neural network based watermarking technique. The extracted features of an image are selected by the PCA algorithm and the features of the original image are extracted by the GLCM algorithm. The scaling factor defines the output of the PCA algorithm which is used for implementation. On the basis of simulation results it is concluded that proposed algorithm performs well in terms of PSRN and MSE.

V. REFERENCES

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Table 1: Result comparison

	Parameter values	Base	Proposed
Watermarked image	PSNR	13.3917	18.0129
	MSE	3001.26	2874.83
	Correlation Coefficient	0.01	0.01
	Entropy	7.9990	7.9989
Contrast Attack	PSNR	20.0542	26.0537
	MSE	647.22	547.30
	Correlation Coefficient	0.96	0.01
	BER	4.2319	4.2200
Sharpened Attack	PSNR	23.6209	29.4842
	MSE	284.70	243.80
	Correlation Coefficient	0.97	0.98
	BER	7.003	6.9047
Salt & pepper Attack	PSNR	22.4476	27.484
	MSE	373.00	293.80
	Correlation Coefficient	0.96	0.91
	BER	7.9012	7.9036
Decrypted image	PSNR	13.3848	18.0130
	MSE	3006.02	3274.75
	Correlation Coefficient	0.01	0.00
	BER	7.6833	3.4237
Elapsed time		0.011795 sec	0.011994 sec