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Digital Watermarking Scheme Using Hybrid Technique

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Abstract: Powerful digital signal processing techniques and the rapid growth of Internet have made the world shift towards digital representation of multimedia signals, such as image, audio and video, however, with a fear in the mind of the originators, of the illegal distribution and violation of copyright protection by malicious users. A great deal of Copyright owners is worried about protecting any kind of illegal repetition of their information. Hence, facing all these kinds of problems development of the techniques is very important. Digital watermarking considered as a solution to prevent the multimedia data. Digital watermarking, more specifically, the hidden digital watermarking technique, however, comes into the rescue, as a powerful solution to such potential problems. Several hidden type watermarking techniques have been proposed with a variety of their usage, complexity and security – which are the primary concerns of such technique. Here we introduce the Digital Watermarking techniques Based on hybrid approach which is expected to give better result against various attacks that performed on watermarked video/image thereby improve NC and PSNR values.

Keywords: Watermarking, SVD, PCA, SWD, PSNR, NC.

I. INTRODUCTION

With the global and wide use of internet and different network topologies, different data and media types have become less protected, and hence, could be easily downloaded and modified, by any malicious user with his/her own accord. People using the internet download the files from various websites and they modify the work as their own copyright. This has become a large issue today in the internet world. The protection is being vanished and the immoral use is done. Because of such threats, several copyright problems appeared lately and different watermarking techniques were proposed.

Watermarks, or digital signatures, provide this ability. These digital stamps allow owners to discretely add marks to their products in such a fashion that they are invisible and still allow the owner the ability to verify the authenticity of the product.

The world is going digital and these files are produced, stored and spread easily across the sphere. Due to easy distribution of data the ownership and copyright of multimedia files are not usually protected. The chief driving force is concern over copyright; as multimedia contents are available in digital form, the ease with which perfect copies can be made may escort to large-scale unauthorized copying, and this is of great concern to the music, film, book, and software publishing industries. Hence, Digital watermarking has been proposed in recent years as a means of shielding digital multimedia contents on the ownership dispute.

Digital watermarking is the method of embedding information into an image that can recognize where the image came from or who is authorized owner of it. Digital watermarks can provide all the functionality of their analogue counterparts and possibly even more. These marks could be applied to all known forms of digital media, and are simple and discrete enough to never be known until it was necessary to verify authenticity.

In some watermarking schemes, a watermarked image has a emblem or some other information embedded into the image so that it is readily visible. However, these watermarks can be easily degraded or removed using simple image processing techniques. Other schemes use invisible watermarking, in which the information is virtually invisible after it is embedded. Watermark embedding can be achieved in a number of different ways as shown in figure 1.

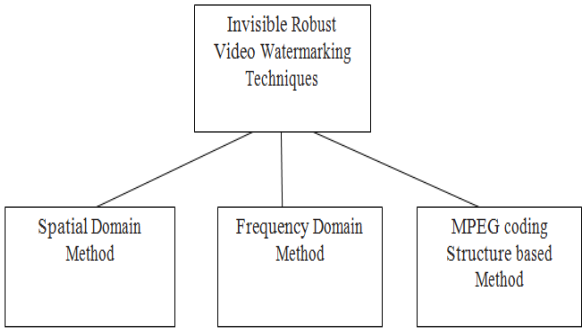

Figure 1:- Classification of Watermarking Scheme

A. Types of Attack on Watermarking

Attacks associated with watermarking and they are as, Median Filter, Gaussian Noise, Threshold attack, Poisson Noise, LV, FD and FA type of Noises.

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B. Properties of Digital Watermarking

a) Capacity: - It refers to the length of the embedded message.

b) Perceptible: - If the presence of the mark is visible then it is called Perceptible Watermarking.

c) Robustness: - If watermark is highly robust then it means it is having high resistance against attack. High robustness means watermark can preserve its quality under worst conditions.

d) Invisibility: - In this watermark is invisible to naked eyes ad to see it we need to apply some algorithm to it.

II. IMPLEMENTATION

In the proposed methodology it identifies that digital watermarking is important in terms of privacy but the research shows that the single technique used to protect the data is not that much efficient since technology changes very fast, So there is a need to combine different algorithms to make the scheme robust against various types of attacks and it is also necessary to improve certain parameters like Normalized Correlation Value (NC) and Peak Signal to Noise Ratio (PSNR). The proposed Scheme combines different existing algorithms and shows robustness against several attacks.

The proposed system contain following algorithms.

- Principal Component Analysis (PCA)
- Singular Value Decomposition (SVD)
- Stationary Wavelet Transform 2-D (SWT)

I) Principle Component Analysis (PCA)

It is very powerful tool to examine the data. It is the process or method which uses orthogonal transformation procedure to change a set of observation possible correlated variables into the sets of values of uncorrelated variables. It focuses the similarity and dissimilarities of data. It plots the data in new co ordinate system where the data with maximum covariance are plotted together and called as First Principle Component.

II) Singular Value Decomposition (SVD)

The singular value decomposition (SVD) matrix is very useful in computer vision as a decomposition matrix and it is an efficient tool for image transformations. The SVD of a given image F in the form of a matrix is defined as

$$\mathbf{F = USV^T}$$

Where U is a a X a complex unitary matrix, V is a b X b real Or complex unitary matrix and generally denoted as

$$U^T U = V^T V = I$$

And S is the diagonal matrix that is

$$S = \begin{bmatrix} s_1 & 0 & . & 0 & 0 \\ 0 & s_2 & . & 0 & 0 \\ . & . & . & . & . \\ 0 & 0 & . & s_{n-1} & 0 \\ 0 & 0 & . & 0 & s_n \end{bmatrix}$$

$$s_1, s_2, \ldots\ldots s_{n-1}, s_n \geq 0$$

The diagonal elements of matrix **S** are the singular values of matrix **F** and non-negative numbers. Singular Value of matrix shown a luminance of the frame layers.

III) Stationary Wavelet Transform 2-D (SWT)

It is a Wavelet transform algorithm design to overcome the lack of translation- invariance of discrete wavelet transform. It performs a multilevel 2D stationary wavelet decomposition using a either specific orthogonal wavelet or specific orthogonal wavelet decomposition filter.

The 2D Stationary Wavelet Transform (SWT) is based on the idea of no decimation. It applies the Discrete Wavelet Transform (DWT) and omits both down sampling in the forward and up-sampling in the inverse transform. SWT applies the transform at each point of the image and saves the detail coefficients and uses the low frequency information at each level. The Stationary Wavelet Transform decomposition scheme is illustrated in figure 2 where Gi and Hi are a source image, low pass filter and high-pass filter, respectively. Figure 2 shows the detail outcome after applying SWT to an image using SWT at 1 to 4 levels. The 2-D SWT decomposition scheme is illustrated in figure 2.

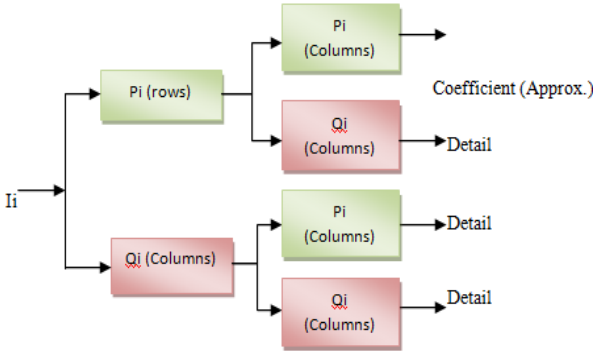

Figure 2:- 2-D SWT decomposition scheme

ALGORITHM

Step 1:-Take input which is to be watermarked

Step 2:- Divide it into frames

Step 3:- Take watermark image

Step 4:-Apply 2-D SWT which decompose the frames into 4 parts as follows

LL	HL
LH	HH

Step 5:- Apply 2-D SWT to watermark image

Step 6:-Apply SVD on LL part followed by PCA

Step 7:-Apply SVD on LL part of watermark image followed by PCA.

Step 8:-Embedded it and apply different attacks to check robustness.

Step 9:-Apply attack and extract watermark from watermark frame and check for PSNR and NC values

III. PERFORMANCE ANALYSIS AND RESULT

To evaluate the performance of proposed method we need to calculate PSNR and NC Values.

To compute the PSNR, first the Mean Square Error between the original and watermarked frame is calculated as follows:

$$MSE = \frac{1}{MN}\sum_{i=1}^{M}\sum_{j=1}^{N}\left[I(i,j) - I'(i,j)\right]^2$$

$$PSNR = 10\log_{10}\frac{255}{MSE}$$

The normalized coefficient (NC) gives a measure of the robustness of watermarking (Max value is 1) Where W and W' represent the original and extracted watermark respectively. The similarity between the original and extract watermark image use to represent how algorithm is robust against noise that is calculated by NCC value.

$$NC = \frac{\sum_i\sum_j W(i,j)\cdot W'(i,j)}{\sqrt{\sum_i\sum_j W(i,j)}\sqrt{\sum_i\sum_j W'(i,j)}}$$

Table 1 shows the comparison of existing algorithm and proposed algorithm in terms of PSNR Values.

Table 1:- Existing algorithm and proposed method PSNR value comparison

Type of Algorithm	PSNR Value
Yassin [6]	44.09
Mostafa [5]	39.06
Proposed	51.31

Table 2 shows values of PSNR and NC under the different attacks.

Table 2:- PSNR and NC values for different attacks

Type of Attack	Median filter	Gaussian Noise	Poisson Noise	Average	None
PSNR	37.02	27.74	31.78	32.51	51.31
NC Values	0.9812	0.489	0.7421	0.962	1.00

IV. CONCLUSION

In this paper Digital watermarking scheme using hybrid based approach has been proposed. The proposed method shows high robustness in comparison to the existing individual algorithms. The PSNR and NC value shows that it provides good performance under various attacks.
In future the PSNR an NC values for the proposed method can be improved using different approach.

REFERENCES

[1] S. Murty. P, M. U. Bhaskar, P. N. Babu and P. R. Kumar, "A Semi-Blind Reference Watermarking Scheme Using DWT-DCT-SVD for Copyright Protection", International Journal of Computer Science & Information Technology (IJCSIT) vol. 4, no 2, pp. 69-82 April 2012.

[2] Sanjana Sinha, Prajnat Bardhan, and Swarnali Pramanick,, "Digital Video Watermarking using Discrete Wavelet Transform and Principal Component Analysis," International Journal of Wisdom Based Computing, Vol. 1 (2), August 2011.

[3] H. B. Kekre, Tanuja Sarode, Shachi Natu, "Performance Comparison of DCT and Walsh Transforms for Watermarking using DWT-SVD", International Journal of Advanced Computer Science and Applications, Vol. 4, No. 2, 2013, pp. 131-141.

[4] Dr. H. B. Kekre, Dr. Tanuja Sarode, Shachi Natu,"Robust watermarking using Walsh wavelets and SVD", International Journal of Advances in Science and Technology, Vol. 6, No. 4, May 2013.

[5] S. A. Mostafa, A. S. Tolba, F. M. Abdelkader, and H. M. Elhindy, "Video Watermarking Scheme Based on PrincipalComponent Analysis and Wavelet Transform", International Journal of Computer Science and Network Security, vol. 9, no. 8, August 2009.

[6] Nisreen I. Yassin, Nancy M. Salem, and Mohamed I. El Adawy "Block Based Video Watermarking Scheme Using Wavelet Transform and Principle Component Analysis" IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 1, No 3, January 2012

[7] Ezz El-Din Hemdan,Nawal El-Fishaw, GamalAttiya, FathiAbd El-Samii,"Hybrid Digital Image Watermarking Technique for Data Hiding", 2013, pp. 220-228.

[8] R.C. Gonzalez, R.E. Woods, S.L. Eddins, "Digital Image Processing," Pearson Prentice Hall, New Jersey, 2004.