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Digital Video Invisible Watermarking Technology using SVD for copy right Protection.

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ABSTRACT

Due to the rapid growth of multimedia the authenticity and security issues of digital videos are becoming popular nowadays. During unauthorized reproduction of digital videos, the copyrights of digital videos are should be protected. To resolve the copyright protection problem, in this paper, a technology is proposed which is an effective, robust and imperceptible video watermarking scheme. Discrete Wavelet Transformation (DWT) and Singular Value Decomposition (SVD) of Blue channel combination is used to embed the watermark. The technology of water marking is embedded into high frequency sub band coefficients which are very difficult to remove or destroy. The combination of DWT and SVD increases the robustness, imperceptibility of the scheme. The image which is extracted finally will be matched with input logo image for authentication to access (play) the video.

Keywords- Digital video watermarking, Performance evaluation metrics, SVD Algorithm

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INTRODUCTION

The identification of objects in an image and this process would probably start with image processing techniques such as noise removal, followed by (low-level) feature extraction to locate lines, regions and possibly areas with certain textures.The chance of individual's messages being broken increases which each passing year. Information hiding can fundamentally change the way that we think about information security.

Cryptography VS Steganography

Cryptography is the science of encrypting data in such a way that nobody can understand the message which is encrypted, on the other hand, in steganography the data which is existing is conceived means its presence cannot be identified. The information to be concealed is ingrained into the cover object which can be text message, images, recording of acoustic signals or recording of moving digital images, so that the cover object doesn't vary. Through the use of a "key" the receiver can decode the encrypted message (decrypting) to retrieve the original message.

Stenography improves on this by hiding the fact that a communication even occurred. The message m is inbuilt into a harmless message c which is defined as the cover-object. The message m is then embedded into c, generally with use of a key k that is defined as the Stego-key. The message which is obtained finally is then embedded into the cover-object c, which results in Stego-objects.

ADVANTAGES OF WAVELET CODING SCHEMES

In applications such as still image compression, discrete wavelets transform (DWT) based schemes have outperformed other coding schemes like the ones based on DCT. Since there is no need to divide the input image into non-overlapping 2-D blocks and its basis functions have different length, wavelet-coding schemes at greater compression ratios which avoids blocking artifacts. Since the wavelet transforms inherent multi-resolution nature, wavelet-coding schemes are specifically suitable for applications where scalability and tolerable degradation are more important.

PROPOSED WATERMARKING TECHNOLOGY USING SVD

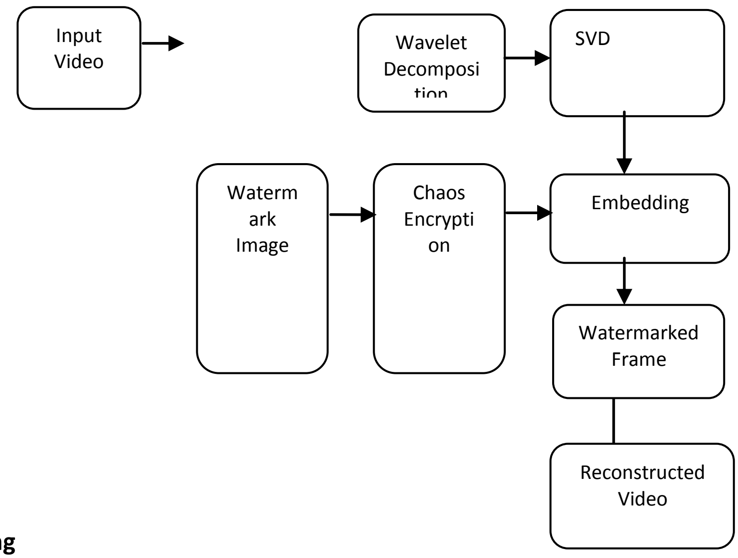
Several watermarking schemes were proposed previosly that aim to exploit the characteristics of the human visual system. This is due to the fact that Human Visual System (HVS) is less sensitive to changes in regions of high brightness. This algorithm is quite hefty against alterations made in images. DFT phase information cannot hastily be devasted by noise or changes to image contrast. Therefore this algorithm survives the kind of physical assaults that change the image contrast and those that employ filtering on the image.

This interference pattern is quite important, slight modification in this pattern can demolish the image. Hence, DFT phase of the figure is very essential compared to the DFT amplitude. Therefore this algorithm survives the kind of attacks that change the image contrast and those that employ filtering on the image. Suggests that DFT phase modulation is a good candidate for image watermarking. When the watermarking technology is imported to the phase components of the image DFT with high verbosity, unconstitutional parties would probably need to cause visually visible damage to the image to destroy the watermark. One algorithm performs watermarking on an NxN image by modifying the frequency components as follows

$$\text{Watermarked Phase}(u, v) = \text{Phase}(u,v) + m$$
$$\text{Watermarked Phase}(N - u, N - v) = \text{Phase}(u, v) - m$$

Where Phase is the Phase matrix of the DFT and m is the watermarking level desired. Due to the harmony of the DFT, watermark should be deducted from one phase coefficient whereas it should be added to its identical part. It is important to mark only those phase coefficients of DFT, which possess serious contributions to the image structure.

BLOCK DIAGRAM



Embedding

Figure: Embedding the Watermark

Extraction

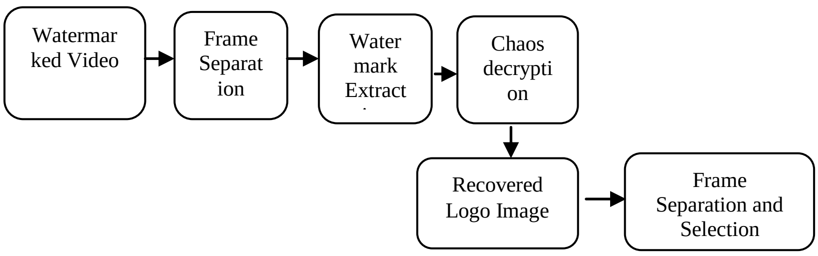


Figure: Extracting the Watermark

FRAME SEPARATION

An Input Video (.avi files) is converted into still images for processing it and to detect the objects which are moving. All the frames are transformed into images using the help of the command 'frame2im'Create the name to each images and this process will be continued for all the video frames .

WAVELET TRANSFORMATION

Block diagram of DWT

wavelet is a small wave or pulse like the one shown in Figure 3.3.1(a)

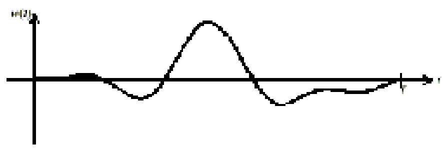
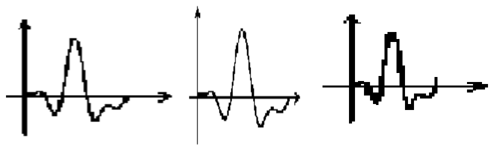


Figure: 3.3.1(a) Mother wavelet w(t)

Normally it starts at time t = 0 and ends at t = T. The shifted wavelet w(t - m) starts at t = m and ends at t = m + T. The scaled wavelets w(2kt) start at t = 0 and end at t = T/2k. Their graphs are w(t) compressed by the factor of 2k .

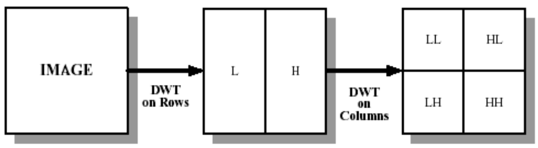
For example, when k = 1, the wavelet is shown in Figure 3.3.1 (b). If k = 2 and 3, they are shown in (b) and (c), respectively.



(i)W(2t) (ii)W(4t) (iii)W(8t)

Figure: 3.3.1(b) Scaled wavelets

The Two-Dimensional DWT (2D-DWT) converts images from spatial domain to frequency domain.



(i) (ii) (iii)

Figure: 3.3.1(C) DWT Block Diagram (i)Authentic Original Image (ii) Obtained Output image after the 1-D applied on Row input (iii) Output image after the second 1-D applied on row input

At each level of the wavelet decomposition, one by one every column of an image is first converted using a 1D vertical analysis filter-bank. The upper and lower areas of Figure 3.3.1(ii), respectively, represent the low pass and high pass coefficients after vertical 1D-DWT and sub sampling. The result of the horizontal 1D-DWT and sub sampling to form a 2D-DWT output image is shown in Figure 3.3.1(iii).We can go for various levels of wavelet transforms to concentrate data energy in the lowest sampled bands. Specifically, the LL sub band in figure 3.3.1(iii) can be transformed again to form LL2, HL2, LH2, and HH2 sub bands, producing a two-level wavelet transform. An (R-1) level wavelet decomposition is associated with R resolution levels numbered from 0 to (R-1), with 0 and (R-1) corresponding to the coarsest and finest resolutions.

Filtering

For many signals, the low-frequency content is the most signicant part.This is what the signal identification. The content which is having the high-frequency, communicate information to the signal. In analyzing the wavelet, the approximations and details are obtained after filtering. The similarities are having the high-scale and it is going to be the lowest frequency elements of the signal. The informations are having the low-scale, high frequency elements of the signal. The process of filtering is schematically represented as in Figure. 3.3.2

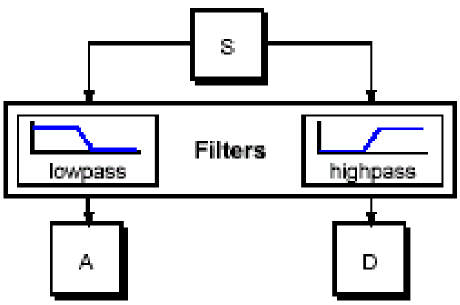


Figure 3.3.2 Single stage filtering

Decomposition and decimation

The original signal, S, passes through two complementary filters and emerges as two different signals. It is regrettable that, this will lead to double the samples and hence to eliminate this, down sampling is imported. The process which comprises down sampling at the right, yields DWT coefficients.

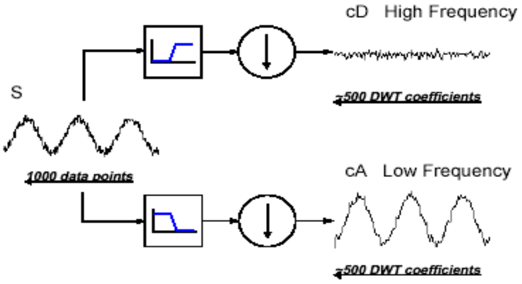


Figure 3.3.3(a) Decomposition and decimation

By doing iteration using successive approximations for the decomposition process being decomposed in turn, so that one signal is broken down into many lower resolution elements. This is termed as the wavelet decomposition tree and is depicted as in Figure 3.3.3 (b)

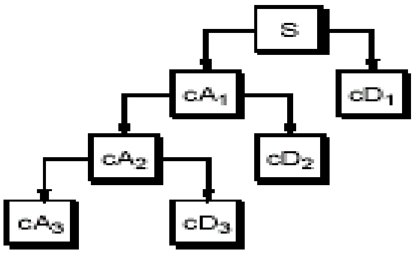


Figure 3.3.3 (b)Multilevel decomposition

Wavelet Reconstruction

The reconstruction of the image is achieved by the inverse Integer wavelet transform (IDWT). The values are first up sampled and then passed to the filters which is depicted in figure 3.3.4(a)

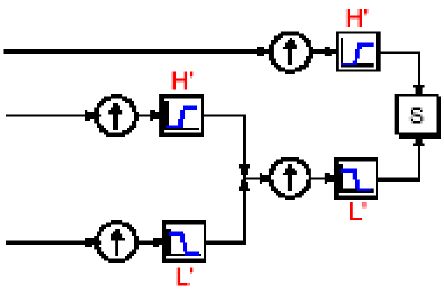


Figure 3.3.4(a) Wavelet Reconstruction

The wavelet analysis involves filtering and down sampling, on the other hand the wavelet reconstruction process comprises of up sampling and filtering. The process of up sampling is nothing but lengthening a signal component by inserting zeros between samples as shown in Figure 3.3.4(b)

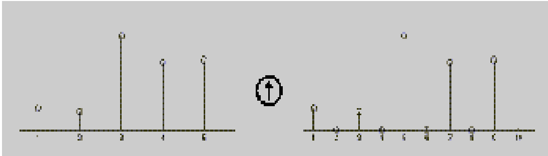


Figure 3.3.4(b) Reconstruction using up sampling

SINGULAR VALUE DECOMPOSITION

In the proposed watermarking scheme, the host image was a gray-level image. The watermark W was a binary image consisting of wxh bits, where $W=(w_1, w_2 \ldots\ldots w_{nxh})$ and $w_1 \varepsilon (0,1)$. The host image was first partitioned into blocks with nxn pixels. After that the obtained blocks were transformed using SVD.

The number of non-zero coefficients in the D component of each block was calculated to determine the complexity of this block .A set of blocks which are having greater complexity were selected according to pseudo random number generator (PRNG).And the feature of the D component. Using the PRNG increases the watermarking security.

Applying the feature of the D component prevents the smooth blocks from being selected and benefits the perceptibility of the watermarked image. On each selected block, the relationship between the first column coefficients in the U component was examined. This obtained relationship could be considered as the magnitude difference between the neighboring coefficients. The magnitude difference could be either a positive or non-positive value. To retain the image quality and provide a stronger robustness of a watermarking scheme, the coefficient modification is further considered. For each selected greater complexity block, the magnitude difference matched the watermark but was smaller than the predefined threshold value of the magnitude difference, such that both coefficients had to be further on altered.It means that the gap between two modified coefficients must larger enough to against attacks.

Both coefficients modification not only reduce the image perceptibility but also enhance the robustness to resist attacks.

Coefficient Modification

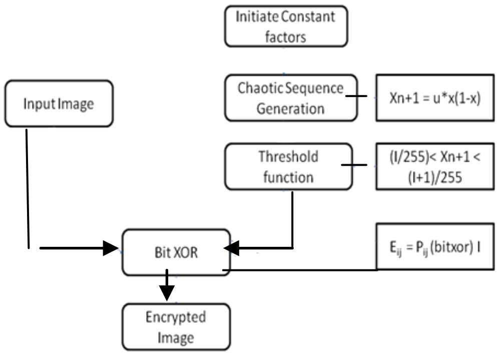
The key should be selected as least value to reduce the embedding error. The singular value of sub band will be modified by,

$$Ms = Cs + (Ws * K)$$

Where,
Cs – Singular value of cover image sub bands
Ws – Singular value of Watermark Image
Ms – Modified Singular matrix
K – Least Key Value.

CHAOS CRYPTO SYSTEM

The broad chaos encryption method is the simplest technique to encrypt video data or message by chaotic equation. This method is one of the advanced encryption standard to encrypt the image for secure transmission. The original image pixel values are encrypted using this method with encryption key value generated from chaotic sequence with threshold function by bit xor operation.



WATERMARK EXTRACTION

The watermark extracting procedure is similar to the watermark embedding technology. The first three phases of the watermark extracting method is the same as the watermark embedding procedure except that the host image is replaced with the watermarked image

Matching

- The recognition will be included for accessing the video by person who is having same logo which is already embedded.
- Before recognition, the watermark image will be extracted from corresponding frame of particular video.
- The extracted logo will be matched with query image to check authentication by extracting the statistical features.
- The co occurrence features are extracted and its matched with query features by euclidean distance.

Texture Analysis

Statistical techniques involves textures which uses the statistical properties of the grey levels of the points/pixels constitute a surface image. Typically, these above mentioned properties are measured using the grey level co-occurrence matrix of the surface, or the surface which possess wavelet transformation. Given a position operator P(i,j).

	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	0	1	2	0	0	0	0	0
2	0	1	0	2	0	0	0	0
3	0	0	1	1	0	0	0	0
4	0	1	0	0	1	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0

Figure 3.6.2 Classical Co-occurrence matrix

Let A be an n x n matrix whose element A[i][j] is the number of times that points with grey level (intensity) g[i] occur, in the position specified by P, relative to points with grey level g[j].Let C be the n x n matrix that is produced by dividing A with the total number of point pairs that satisfy P. C[i][j] is a measure of the joint probability that a pair of points satisfying P will have values g[i], g[j].C is called a co-occurrence matrix defined by P .

RESULTS AND DISCUSSIONS

Figure 4.1 Selected Image

The figure 4.1 represents the image that is selected from the video or embedding the watermark logo.

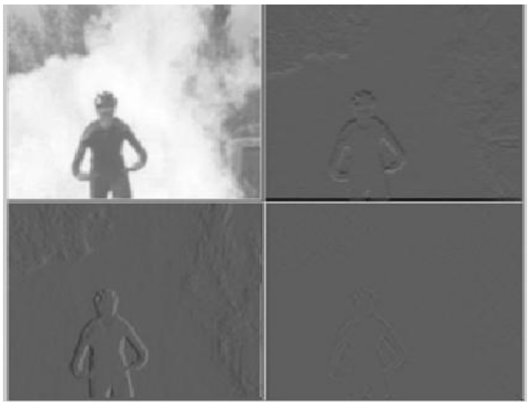


Figure 4.2 Discrete Wavelet Transform Output Image

The figure 4.2 represents the output of discrete wavelet transform.

Figure 4.3 Logo Image

The figure 4.3 represents logo image which has to be embedded with the video image for data hiding.

Figure 4.4 Watermarked Frame

The figure 4.4 represents the frame in which the logo image is embedded.

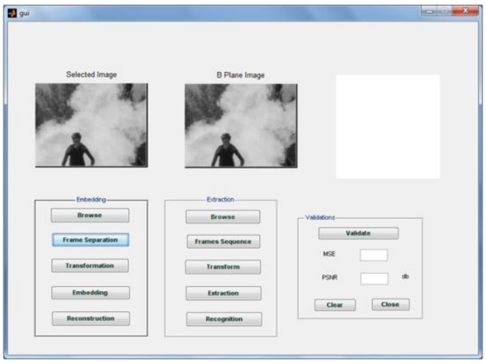


Figure 4.5 Frame separation and Blue Channel Of Image

The figure 4.5 shows the frame separated image and the blue channel of the image in which logo is to be hide.

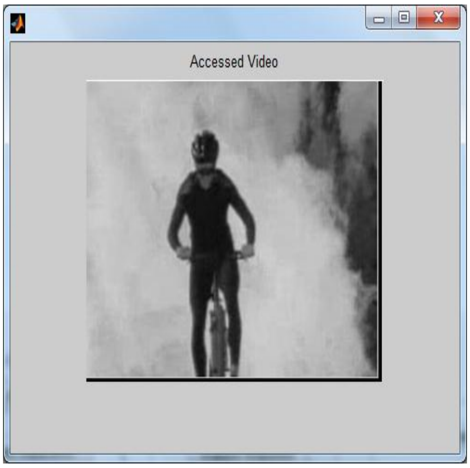


Figure 4.6 Output- Features Match

The figure 4.6 shows the output when the watermarked logo features matches with the receiver side logo features.

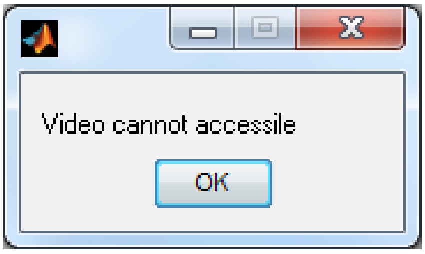


Figure 4.7 Output- Features Doesn't Match

The figure 4.7 represents the output if the feature of watermarked logo does not match with receiver side logo features.

CONCLUSION

Thus the algorithm developed find its applications in copyright identification, finger printing, transaction tracking and content authentication. The SVD property has been utilised to evolve algorithms for lossy image compression.This system has generated the stego image with less error under maximum data hiding capacity. The combination of DWT and SVD increases the security of the scheme. It also improves the robustness and imperceptibility of the system. Finally, the performance of system was evaluated with quality metrics such as error and PSNR factor. It was better compatible approach and flexibility with better efficiency rather than the prior methods.

REFERENCES

[1] Haweez Showkat* Sukhvinder Kaur SVD-DWT Based Digital Video Watermarking Using Fused Images and Low-Middle Frequency Bands,Volume 4, Issue 8, August 2014 ISSN: 2277 128X.

[2] Fung, C.W.H.,A New Approach of DWT-SVD Video Watermarking, 20-22 Sept. 2011, ISBN:978-1-4577-1797-0

[3] Dr.V.Seenivasagam,Professor, S.Subbulakshmi, S.Radhamani, A Survey on Video Watermarking and Its Applications, Volume 4, Issue 3, March 2014 ISSN: 2277 128X

[4] Nitin A. Shelke, Dr. P.N.Chatur,A Survey on Various Digital VideoWatermarking Schemes, ISSN : 2229-3345 Vol. 4 No. 12 Dec 2013.

[5] Arpita Srivastava, Praful Saxena , A DWT-DCT-SVD Based Semi Blind Image Watermarking UsingMiddle Frequency Band, Volume 12, Issue 2 (May. - Jun. 2013), PP 63-66

[6] Manjit Thapa, Dr. Sandeep Kumar Sood, Badhani (Pathankot), A.P Meenakshi Sharma-Digital Image Watermarking Technique Based onDifferent Attacks, (IJACSA) International Journal of Advanced Computer Science and Applications,Vol. 2, No. 4, 2011..

[7] Sumit Kumar Prajapati*, Amit Naik**, Anjulata Yadav***-Robust Digital Watermarking using DWT-DCT-SVD, ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 3, May-Jun 2012, pp.991-997.