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A New Watermarking Scheme Based on Combination of DCT-DWT-SVD

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Abstract-*The validation of images taken by digital cameras has become a great concern as the digital photography is gaining rapid popularity. So, due to lack of protection of digital content as they can be easily duplicated and disseminated without the owner's consent , publishers, artists, and photographers, however, are unwilling to distribute images or other data over the Internet. Therefore, to protect confidential images we propose an efficient digital watermarking technique to deal with this difficult issue. In the proposed technique, the image is first converted into YCbCr from RGB domain then watermark is embedded in Y component of YCbCr using Discrete Wavelet Transform ,Discrete cosine Transform and Singular Value Decomposition (SVD). The results show that our algorithm is resistant toward various attacks.*

Index Terms- *Digital water marking; Singular vector decomposition; YCbCr*

I. INTRODUCTION

Watermarking techniques can compliment encryption by embedding a secret imperceptible signal into the host signal in such a way that the embedded signal always remains present. Figure 1 represents the embedding and extracting process of digital watermarking. When an watermark is inserted in a host signal with a known key followed by an algorithm, then this is known as embedding process of digital watermarking. And when watermark is recover from the watermarked signal using host signal and the key is known as extracting process of digital watermarking. There are various algorithms for digital watermarking. The success of the watermarking scheme largely depends upon the choice of the watermark structure and insertion strategy [1]. The quality of digital watermarking can measure with two distinct parameters: imperceptibility and robustness. Imperceptibility is measured by PSNR of host image and embedded image in dB. Higher PSNR is desired as it means to hide the marked image efficiently. And robustness

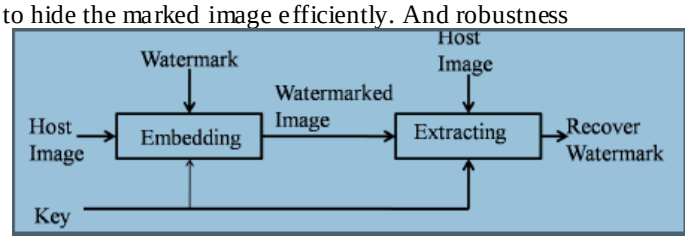


Fig.1: Embedding and extracting process of digital watermarking

is measured by correlation of the original mark image and recovered mark image [1]–[5].

II. EXISTING SYSTEM

There are many solutions that have been proposed like Cryptography, Steganography and Watermarking. The watermarking technique provides one of the best solutions among them. This technique embeds information so that it is not easily perceptible to the others. The embedded watermark should not degrade the quality of the image and should be perceptually invisible to maintain its protective secrecy. The robustness and perceptual quality of the watermarking schemes are mainly depends on how much percentage of the watermark is embedded into host image i.e., Scaling factor.

III. PROPOSED SYSTEM

The proposed Watermarking scheme is implemented as in two phases first embedding and then extraction. First on image we will apply haar wavelet transform and will get four sub band images. On sub band we are applying first DCT and on that DCT matrix we are going to apply SVD in all values. Then the watermarking step is performed by scaling down the pixel values of watermark and then embedding those values into the cover image. After this the watermarked image is obtained on which various attacks are applied in order to achieve the robustness in watermarking. Then we follow the extraction phase where we apply again the wavelet transform, DCT and SVD and extract the watermark under attacks. Finally the correlation is determined between the watermark extracted and original watermark.

IV DISCRETE COSINE TRANSFORM

The discrete cosine transform (DCT) is a function that has the ability to convert a signal into elementary frequency components. It represents an image as a sum of sinusoids of varying magnitudes and frequencies. The popular block-based DCT transform segments an image non-overlapping block and applies DCT to each block. This result in giving three frequency sub-bands: low frequency sub band, mid-frequency sub-band and high frequency sub-band. DCT-based watermarking is based on two facts. The first fact is that most of the signal energy lies at low-frequencies sub band which contains the most important visual parts of the image. The second fact is that high frequency components of the image are usually removed through compression and noise attacks The watermark is therefore embedded by modifying the coefficients of the middle frequency sub band so that the visibility of the image will not be affected and the watermark will not be removed by compression.

V. DISCRETE WAVELET TRANSFORM

To understand the basic idea of the DWT we focus on one dimensional signal. A signal is split into two parts, usually high frequencies and low frequencies. The edge components of the signal are largely confined in the high frequency part. The low frequency part is split again into two parts of high and low frequency (analysis). This process is continued until the signal has been entirely decomposed or stopped before by the application at hand. For compression and watermarking applications, generally no more than five decomposition steps are computed. Furthermore, from the DWT coefficients, the original signal can be reconstructed. The reconstruction process (synthesis) is called the inverse DWT (IDWT).

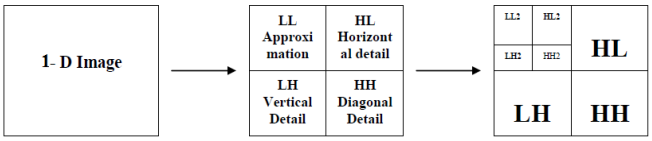


Fig. 2: Basic decomposition steps for images

A digital image is decomposed into three high frequency sub bands and a low frequency sub band by one level wavelet transform. The low frequency sub band can be decomposed continuously. With the more levels the image is decomposed by wavelet transform, the energy of the image is diffused better and the stronger image intensity can be embedded. So the wavelet decomposing levels adopted in the algorithms should be chosen as far as possible.

VI SINGULAR VALUE DECOMPOSITION

Singular value decomposition (SVD) is a numerical method depending upon the linear algebra. SVD is used to diagonalizable matrix in numerical analysis. Application of SVD covers vast field. When SVD method is carried out to an Image A of size PxQ, three matrices are found, namely U, V and S whose properties are:

- It can be expressed as A = USVT.
- U and V matrix are called unitary matrix having size PxP and QxQ respectively.
- S matrix is called diagonal matrix having size PxQ.
- U matrix is labeled left and V matrix is labeled left right singular values of the matrix A respectively.
- Singular matrix is very important for watermarking purpose and entries in this matrix are arranged diagonally and in ascending order.
- One of the most important properties of the singular values is that they are very much stable and hence if small change is made in the value of cover medium its singular values do not have any significant change.
- SVD conveniently represents the basic means of an image which are be algebraic in nature. Here brightness of the image is given by singular values and the geometric characteristic of the image is represented by singular vectors.
- An image matrix consists of very few singular values with respect to the first singular value. In spite of avoiding these singular values there is no perceptibly important modification in the reconstructed image.

VII EMBEDDING PROCESS

Stepwise description of the embedding process of the proposed method is given below.

1. Block is taken and color space conversion is performed from RGB color space to the YCbCr color space.

2. Y component of the block is selected for the purpose of watermarking

3. A two dimensional DCT is carried out on the Y Block.

4. A three level DWT is applied on the DCT transformed Block.

5. SVD is applied to both DWT transformed block and the message block.

6. The singular value of the block is modified according to the singular values of message.

7. Inverse SVD is applied to get the watermarked DWT Block.

8. Inverse three level DWT is performed to get watermarked DCT Block.

9. Inverse DCT is applied to get the watermarked Y Block.

10. Inverse color space conversion is performed to get watermarked Block.

(a)

(b)

Fig. 3: (a) original Image of (b) Watermarked Image

VIII EXTRACTION PROCESS

1. Watermarked image, which may possibly be attacked, is taken and converted into the sequence of block.

2. First block is taken and color space conversion is performed from RGB color space to the YCbCr color space.

3. Y component of the block is selected for the purpose of watermark extraction.

4. A two dimensional Discrete Cosine Transform is applied on the Y frame.

5. A three level Discrete Wavelet Transform (DWT) is applied on the DCT transformed block.

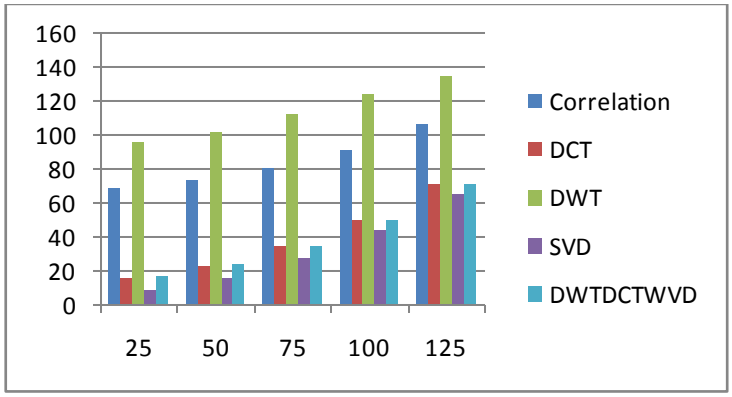
6. Singular Value decomposition is applied to DWT transformed block.

7. Singular values are modified to get the watermark message back

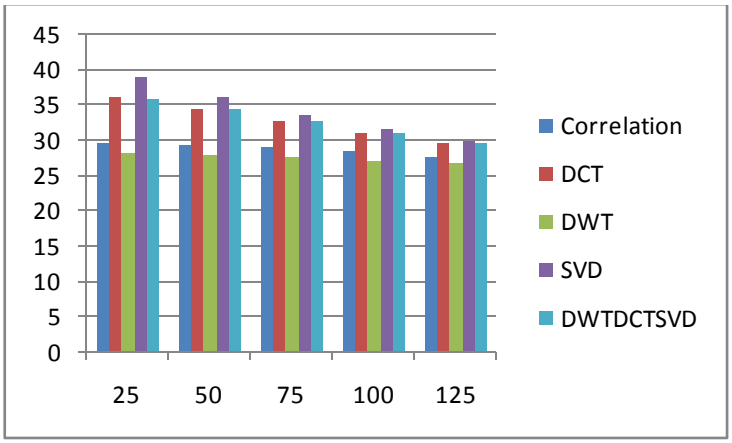
Fig. 4: Recover massage

IX RESULT OF HYBRIT WATERMARKING AGAINS THE ATRACTS

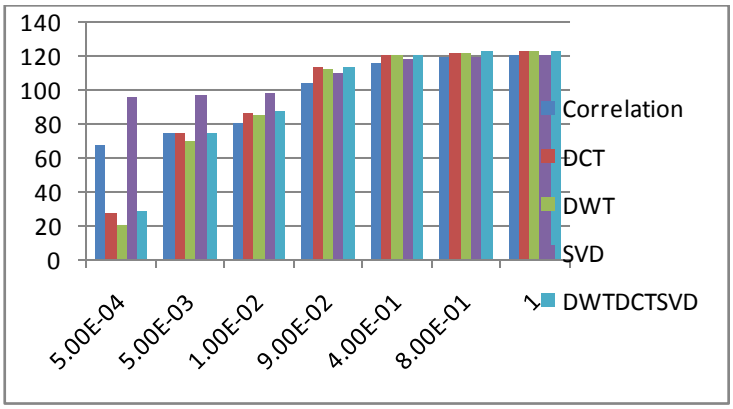
Crop MSE



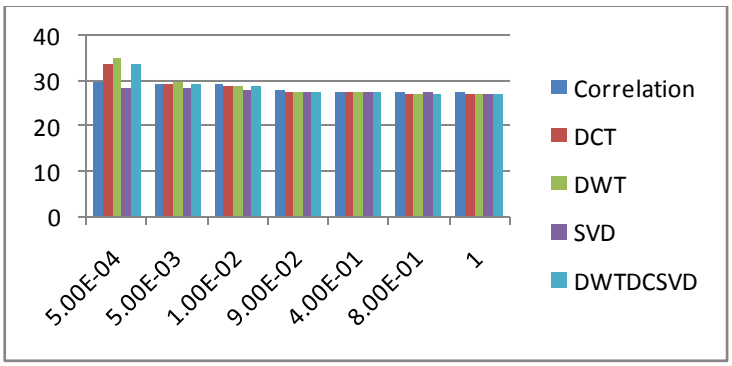
Crop PSNR



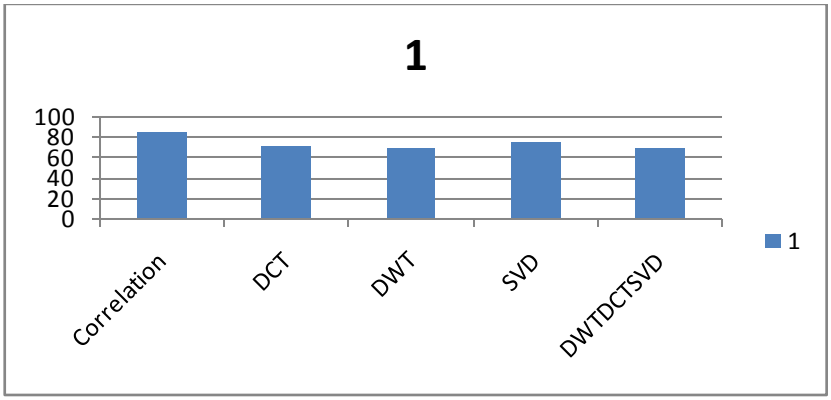
Gaussian noise MSE



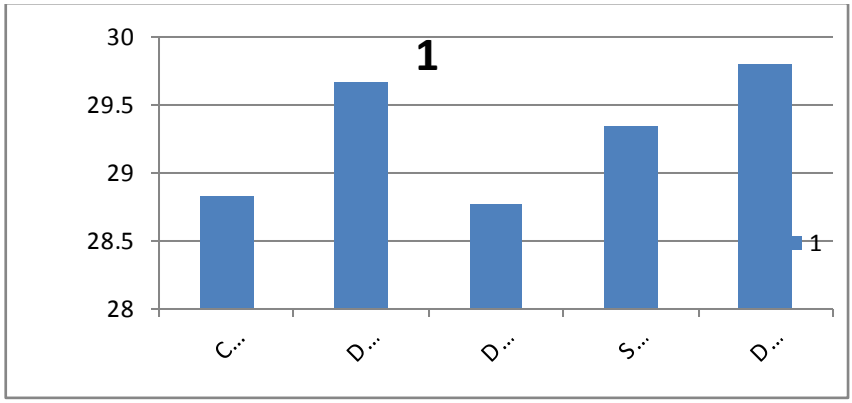
Gaussian noise PSNR



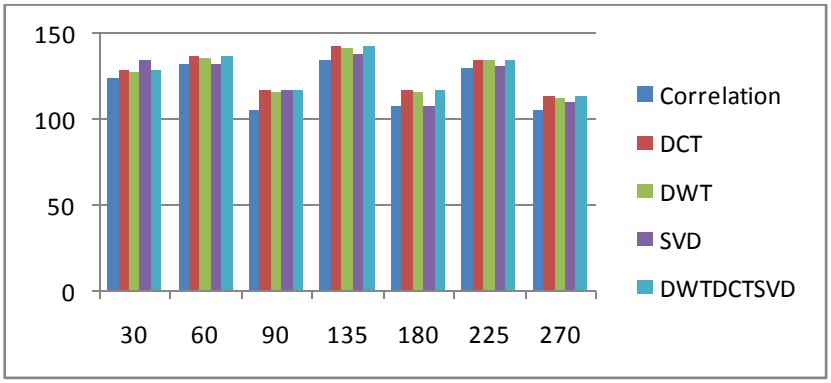
Histogram MSE



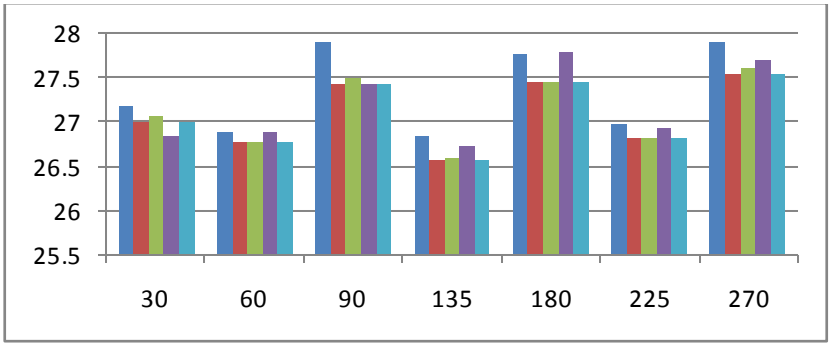
Histogram PSNR



Rotating MSE



Rotating PSNR



X CONCLUSION

So far, we carried out Hybrid method are fully robust to all other Methods. At Same Gain factor The Perceptibility of Hybrid Method is highest Compare to any other method.SVD and Hybrid method are embed both grayscale and binary message. Time Taken by Hybrid method is lowest Compare to all other Methods so, this method is used in real time Processing.

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