Image watermarking Algorithms to Protect Image Piracy: A Review

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Abstract— With the Current Trends of development of information technologies and multimedia, the use of data which is digital increasing every day. So it becomes very difficult to prevent multimedia information from piracy of data and also it ischallenging task. Now a days Copyright owners is tensed about protecting any of illegal repetition oftheir information/data. Hence, facing all these problems development of the techniques is must. Digital watermarking is a solution to prevent the multimedia data.

In this paper, an overview of watermarking is proposed and implemented. In proposed watermarking method,the original image is rearranged using random sequence and DWT (Discrete Wavelet transform) is applied on rearranged image. ThenDCT (Discrete Cosine Transform) and SVD (Single Value Decomposition) are applied on all high bands LH, HL and HH. Watermark is then embed to it by modifyingthe singular values of these kind of bands. Extraction of watermark is done by the inverting of watermarkembedding process. For choosing of these three bands it gives facility of mid-band and pure high band thatensures that good imperceptibility andprovide more robustness against different kinds of attacks.of

Index Terms— DWT, DCT, SVD,watermarking

1 INTRODUCTION

In past recent years, the increased amount of applications using digital multimedia technology hasemphasized the need to protection[2] of digital multimedia data from pirates. Authentication, copyright protection[2] ,information hiding,proof ownership , content identification have become important issue. To accomplish this issue, watermarking technology is used. Researchers are willingly interested in the field of watermarking due to its significance. These kind of work in this field have lead to several watermarking techniques such as Transform domain and spatial domain. In transform domain it may DCT[7] (discrete cosine transform) ,DWT[6] (discrete wavelet transform) ,SVD[8] (singular

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value decomposition) and their cross relation. Watermarking is a process of embedding a piece of information into a multimedia content, such as video, image, audio in such a way that it is not possible to intercept by a human, but easily encoded by computer. Before the development of digital image watermarking, it was hard to achieve authentication, copyright protection, content identification, data hiding and proof ownership. But now a days it is easy to accomplish this kind of goal using watermarking techniques. So watermarking is important for us for this kind of work. Every watermarking algorithm is consisting of an embedding and extracting process that needs to behide desired information.

The embedding and extracting processare described below. Embedded watermark may have several property such as robustness and imperceptibility. If we can't distinguish between watermarked image and host image called imperceptibility. Basically imperceptibility depend on similarity between watermarked image and host image. If it hard to remove or destroy watermark from watermarked image then it is called as robustness. Robustness measure how difficult to destroy or remove watermark from watermarked image. If it is low then robustness is low. DCT based watermarking containthe low frequency information so image contain all information that is very similar to original image. DWT[6] based compression offer scalability so image can be divided intofour sub bands in every level of decomposition and by choosing of the sub band to develop a hybrid watermarking scheme for improving the imperceptibility, robustness, and capacity and help to develop a new one hybrid method. In this method the original image is segments into blocks then we are finding find out spatial frequency of each block select reference image under certain condition then apply the following algorithms sequentially.DWT[6], DCT[7] and SVD[8] transformation. In the second method the original image is segmented or transformed into blocks then trying to find out spatial frequency of every block select reference image under some condition then apply DWT and SVD transformation. In the given method, since we consider high band so it fulfills the requirements robustness and imperceptibility. All of the domain transformation watermarking technique works with SVD, DWT, DCT and their

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mixing algorithm such as DWT-DCT[5], DCT-SVD[5] and so on.

2.PURPOSE OF REASERCH

As mentioned earlier that transform domain based watermarking method is always a better andgreat choice thanspatial domain based watermarking method. This can be achieved by using different transformation like SVD[8], DCT[6] and DWT. In this Part, we will briefly describe the SVD, DWT and DCT [6]transformations in below.

2.1. Discrete Wavelet Transform (DWT) [5]

The implementation of DWT[5] in which a one dimensional signal is divided in two parts one is lowfrequency part and another is high frequency part. Then the low frequency part is splited into two parts and the similar process will continue till the desired level. The high frequency portion of the signal is contained by the edge components of the signal. In every level of the DWT[5] (Discrete Wavelet Transform) decomposition an image divided into four parts these are approximation image (LL) as well as horizontal image (HL), vertical image(LH) and diagonal image (HH) for detailed components. In the DWT[7] decomposition input signal must be twice of n. Where, n represents the number of level of signal. To analyze and synthase of the original signal DWT provides the full information and requires less computation time. Watermarks are embedded in this region that help to increase the robustness of the watermark.

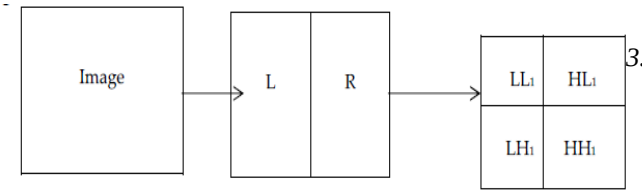

Fig. 1 One level DWT Decomposition Process

2.2. Discrete Cosine Transform (DCT) [7]

The DCT is the popular transform function used in digital signal processing. It transforms a signal from spatial domain to frequency domain. Due to good performance, it is used in JPEG standard for image compression. It is a function that represents a technique

applied to image pixel in spatial domain in order to transform it into a frequency domain in which redundancy can be eliminated. DCT techniques are robust compared to spatial domain techniques. These Kind of algorithms are more robust against simple image processing operations like brightness ,adjustment, , blurring,low pass filtering andcontrast. It is difficult to computationally more expensive.One-dimensional DCT is helpful in processing one-dimensionalsignals such as speech waveforms. For analysis of twodimensional (2D) signals such as images, we need a 2D version of the DCT.

2.3. Singular Value decomposition (SVD) [1]

The singular value decomposition (SVD) [1] matrix is useful in computer vision as adecomposition of matrix and it is a tool for image transformations. The SVD[6] of a givenimage *F* in the form of a matrix is defined as
$F=USV^T$……eq.(1)

whereS is the diagonal matrix
U and v are orthogonal matrix
$U^TU=V^TV=1$……eq.(2)
The diagonal elements of matrix **S** are the singular values of matrix **F** and arenon-negative numbers.

3. PROPOSE METHODOLOGY & WATERMARKING ALGORITHMS

In the given watermarking technique, A DCT, DWT and SVD[1] based hybrid watermarkingtechnique is formulated. In this section, we had described the watermark embedding and extracting process by using flowchart and algorithmically.

3.1 Watermark Embedding Procedure

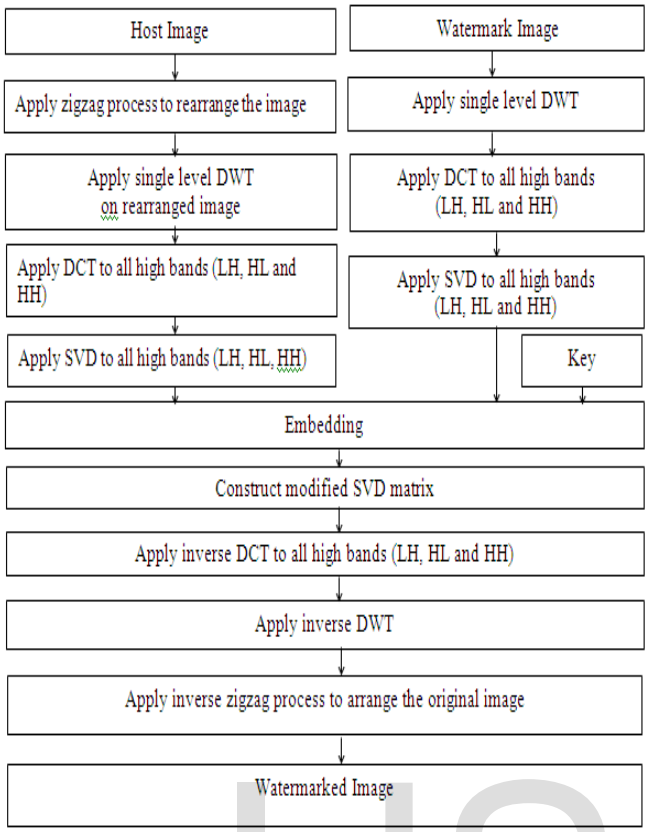

Fig. 2 Watermark Embedding Procedure

3.2 *Watermark Extraction Procedure*

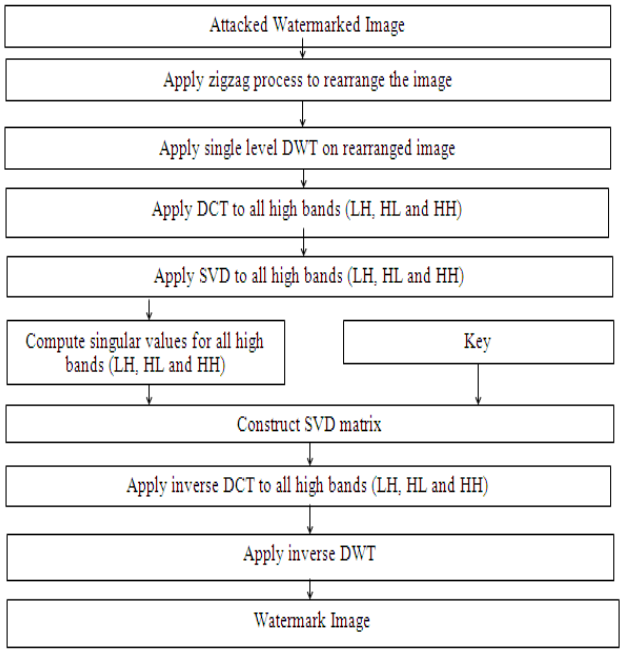

Fig. 3 Watermark Extraction Procedure

3.4. *Algorithm: Watermark Embedding*

1. Give Host image as Input.
2. Rearrange the host image pixels by applying zigzag tranfer and scnning process to get changed image.

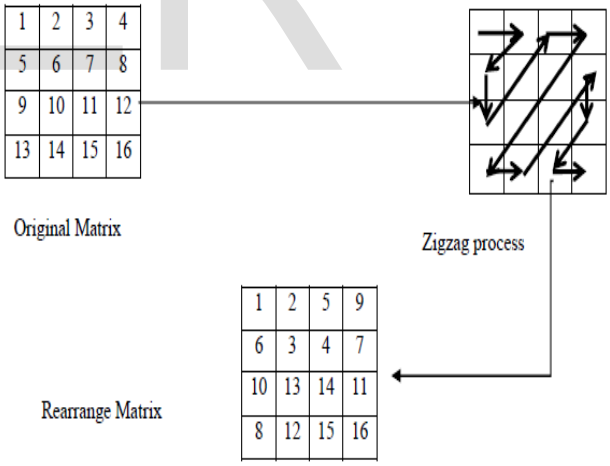

Fig.4 Re-arrange matrix by zig-zag Method

3. Apply single level DWT[7] on changed image and decompose it into four diffrent sub-bands like LL,HL, LH and HH.
4. Select all high bands from the LH, HL and HH of changed Image. Apply DCT algorithm to all high bands like LH, HL and HH.

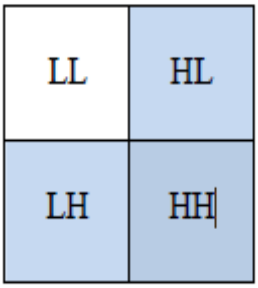

Fig.5 Selected Band for Watermarking

5. Then apply SVD algorithm to all high bands like LH, HL and HH to get SH1, SH2 and SH3.
6. Input watermark image. Apply single level DWT algorithm and decompose the image into four sub-bands like LL1, HL1, LH1 and HH1.
7. Select all high bands like LH1, HL1 and HH1 of weighted image. Apply DCT[5] algorithm to all high bands LH1, HL1 and HH1.
8. Then apply SVD algorithm to all high bands like LH, HL and HH to get SW1, SW2 and SW3.
9. Modify all SH1, SH2 and SH3
10. Construct the changed SVD[7] matrix LH11, HL11 and HH11.
11. Apply inverse DCT[5] algorithm to all high level bands LH11, HL11 and HH11. Apply inverse of DWT algorithm with LL.
12. Apply inverse of zigzag process to arrange the original portion of image and finally get watermarked image.

3.5 Algorithm: Watermark Extraction

1. Give Watermarked image as Input .
2. Rearrange the watermarked image pixels by applying zigzag scanning and tarnfer process to get rearranged image .
3. Apply single level DWT[7] algorithm on rearranged image to decompose it into four sub-bands like LL, HL, LH and HH.
4. Select all high bands like LH, HL and HH of rearranged image. Apply DCT algorithm to all high bands LH, HLand HH.
5. Then apply SVD algorithm to all high bands like LH, HL and HH to get SH1, SH2 and SH3.
6. Modify SH1, SH2 and SH3.
7.Construct modified SVD[6] algorithm matrix LH1, HL1 and HH1.
8. Apply inverse DCT[8] algorithm to all high bands LH1, HL1 and HH1.
9. Apply inverse DWT[7] algorithm to all bands to get watermark image.

EXPERIMENTAL ANALYSIS

4.1 Robustness against low pass filtering SVDmethod[1]

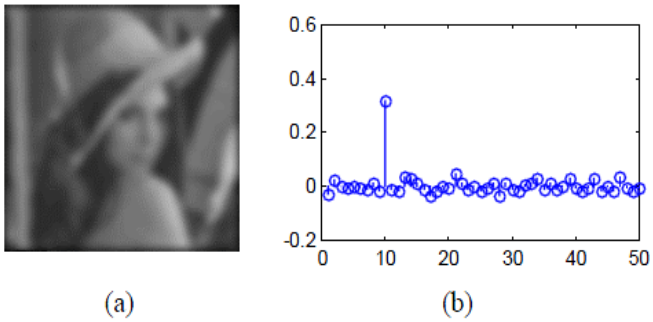

Fig 6 (a) The Blurred Image
(b) The watermark CorrelatedCoefficient

4.2 Robustness test against image rotation for the SVD[1] method

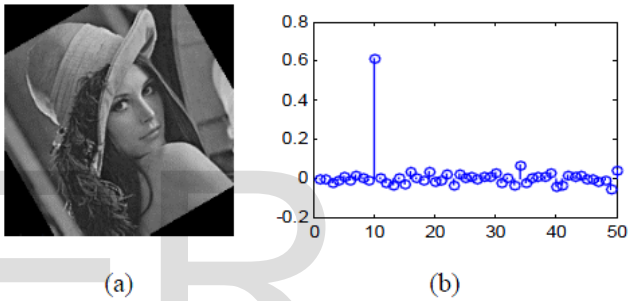

Fig 7 (a) The Rotated Image
(b) The watermark Correlated Coefficient

4.CONCLUSION

The given watermarking algorithm using DCT, DWT and SVD[1] transformation that contributes more robust in comparison with many diffrent watermarking algorithms. The watermarked image quality is better in terms of imperceptibility. In this watermarking technique all high bands LH, HL, HH are chosen which cover the mid bands LH, HL and pure high band HH that gives more robust against different kinds of filtering noises and geometric noises. In future, theproposed algorithm can be improved using full band DWT-DCT-SVD[5] and further can be extended to color images and video processing.

5.REFRANCES

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