ISSN 2320-9984

Volume 1, Issue 2, July 2013 ISSN: 2320-9984 (Online)

International Journal of Modern Engineering & Management Research

Website: www.ijmemr.org

A Watermarking Scheme Based on Authority Defined Pixel Location Based on Singular Value Decomposition

Sweta Gupta
Assistant Professor
Department of Computer Science & Engineering,
Sagar Institute of Research and Technology-Excellence,
Bhopal (M.P.) [INDIA]
Email: 6.shwetagupta@gmail.com

Prof. Sandeep Kumar Gupta
Assistant Professor
Department of Computer Science & Engineering, Jai Narain College of Technology, Bhopal (M.P.)
Email: 28.sandeepgupta@gmail.co

Abstract*—*Digital watermarking schemes have been proposed. In this paper, singular value decomposition (SVD)-based watermarking scheme is proposed. SVD transformation preserves both one-way and non-symmetric properties. In the proposed scheme, both of the D and U components are explored for embedding the watermark. A new robust method of non-blind image watermarking is proposed in this paper. The suggested method is performed by modification on singular value decomposition (SVD) of images in context PSNR. Modification of the appropriate sub- bands leads to a watermarking scheme which favorably preserves the quality. The additional advantage of the proposed technique is its robustness against the most of common attacks. Analysis and experimental results show much improved performance of the proposed method in comparison with the pure SVD-based as well as hybrid methods (e.g. SVD as the recent best SVD-based scheme).

Keywords*—*Image watermarking; Singular value decomposition.

1. INTRODUCTION

With the advance in the technology, illegal operations in digital media have become easy. Therefore, the copy right protection has become an important issue. One of the solutions for this problem is the embedding of digital watermark into the data. A limiting factor in the development of multimedia networked services is that authors, publishers and providers of multimedia data are reluctant to allow the distribution of their documents in a networked environment because the ease of reproducing digital data in their exact original form is likely to encourage copyright violation A digital watermark is a code carrying information about the copyright owner, the creator of the work, the authorized consumer and whatever is needed to handle the property rights associated to any given piece of information. The watermark is intended to be permanently embedded into the digital data so that authorized users can easily read it. At the same time, the watermark should not modify the content of the work but slightly (it should be unperceivable or almost unperceivable by human senses), and it should be virtually impossible for unauthorized users to remove it. Watermarking is the process of embedding a watermark into an object. This object may be audio, video or image. Digital watermarking is defined as a process of embedding data (watermark) into a multimedia object to help to protect the owner's right to that object. The embedded data (watermark) may be either visible or invisible. In visible watermarking of images, a secondary image (the watermark) is embedded in a primary (host) image such that watermark is

intentionally perceptible to a human observer whereas in the case of invisible watermarking the embedded data is not perceptible, but may be extracted/detected by a computer program. The desired characteristics of visible watermarks are:

- A visible watermark should be obvious in both colour and monochrome images
- The watermark should be spread in a large or important area of the image in order to prevent its deletion by clipping.
- The watermark should be visible yet must not significantly obscure the image details beneath it.
- The watermark must be difficult to remove; removing a watermark should be more costly and labour intensive than purchasing the image from the owner.
- The watermark should be applied automatically with little human intervention and labour. [3].

There are four essential factors those are commonly used to determine quality of watermarking scheme. They are robustness, imperceptibility, capacity, and blindness.

Robustness: Watermark should be difficult to remove or destroy. Robust is a measure of immunity of watermark against attempts to image modification and manipulation like compression, filtering, rotation, scaling, collision attacks, resizing, cropping etc.

Imperceptibility: Means quality of host image should not be destroyed by presence of watermark.

Capacity: It includes techniques that make it possible to embed majority of information. [5].A watermarking algorithm must consists of the watermark structure, an embedding algorithm, and an extraction, or a detection, algorithm. Watermarks can be embedded in the pixel domain or a transform domain. In spatial domain, the watermark is directly embedded into the specific pixels of the host image, but in transform domain the watermark is embedded into the transform coefficients of the host image after applying DWT, DFT or DCT transform. The spatial domain methods are the simplest watermarking techniques but have low robustness against different geometric and non geometric attacks, unlike the transform domains watermarking methods are more complex and have high robustness against various attacks [4].

2. RELATED WORK

Wang Hui-Qin [1] proposed a new optimal method and it is based on DWT-SVD, in which a watermark is embedded into the blue component of a colour image with the help of quantizing method. Embedding the watermark to the blue component can ensure the invisibility by applying the SVD in DWT domain so that it may improve the singular value's stability with the help of logistic chaotic mapping for watermark before it is embedded. Yan Xing and Jieqing Tan proposed [2] a novel colour watermarking scheme based on block-SVD and Arnold transformation. Because of the good stability of the SVs of image matrix, the watermark bits are embedded into the maximum SVs of blocks of host image to repulse the common image processing attacks. Jianyong Huang proposed [3] a robust watermarking algorithm, in this algorithm; the redundant embedding of watermark using multi resolution wavelet, transform and hold the transform against the *JPEG* compression and image processing operations, some time the transform provide the robustness. Chaokun Wang et al [4] proposed recognition of watermark information and in a much visual condition and easy to embed a digital image into numeric relational data as digital watermarks By virtue of the periodicity of Arnold scrambling transform together, the number of scrambling transforms is used as a valid parameter. Samira Mabtoul et al [5] proposed a watermarking method in which the gray scale visual watermark image is inserted into the

host colour image with the help of Dual Tree Complex Wavelet Transform and the Singular Values Decomposition where the copyright of Watermark is printed. Deng Jianghua [6] proposed a colour image digital watermarking method which is based on Singular Value Decomposition. The main aim at the binary text image's characteristics of simple pixel, complex texture and bad immunity of information concealment, a digital watermarking embedment location choosing method based upon Singular Value Decomposition has been put forward**.** WANG Huiqin [7] proposed Colour Image Watermarking Algorithm which is based on the Arnold Transform. In this algorithm, the binary watermark image was deal with the error-correction coding Arnold scrambling transform, and then embedded into the bit plane of the original colour image, which is effectively improve the security of the algorithm. Liu Fang [8] proposed scramble the watermark by Arnold transformation in watermark pre-processing, we can improve the capabilities of the watermarking algorithm greatly. Chih-Chin Lai [9] proposed a hybrid image watermarking technique based on DWT and SVD, where the watermark is embedded on the singular values of the cover image's DWT sub- bands. Fanzhi Kong and Yizhun Peng [10] proposed watermarking algorithm for digital color images and the HSI colour space is applied for its being in correspondence with HVS characteristic. Variance of intensity sub-blocks is computed to obtain the most complex sub-blocks for embedding watermark.

In the recent years, singular value decomposition (SVD) is used widely in watermarking [4-6]. Liu and Tan [7] presented an image watermarking method based on SVD in spatial domain. Although this method is robust against common attacks, however it doesn't present good transparency for the watermarked image and it is a non-blind method. Chandra et al. [6] suggested a digital image watermarking method in spatial domain. In this method, the embedding is done by modifying the singular values of the host image with the singular values of the watermark image. This method didn't offer good transparency and robustness against geometric attacks. Ganic and Eskicioglu [8] presented SVD based digital image watermarking scheme in discrete wavelet transform (DWT) domain. The embedding is done by modifying the singular values of the wavelet transformed sub-bands with the singular values of the watermark image. This method is robust against different attacks because of using all bands in embedding process, but it is a non- blind method and the transparency of the watermarked image is not good.

Lin et al. [9] proposed a full-band DWT domain image watermarking method using singular value decomposition. In this scheme the watermark is embedded into the LL and LH bands directly and the singular values of watermark image are embedded into the singular values of HL and LH bands with small scale factor. This method has good robustness against different attacks but needs the original image in extraction process. The quality of the watermarked image is also not good enough.

Most of SVD-based watermarking algorithms, such as those where described [6-9] are semi or non blind methods. These works need to reference or original image in their extraction process.

In past years, several SVD-(Singular Value Decomposition) based watermarking schemes have been proposed [1,16]. In 2007, Chang et al. proposed a novel SVD watermarking scheme [3]. Their embedding strategy is simple and the experimental results confirm that their scheme not only resists various digital signal processes but also provide acceptable image quality of watermarked images[8]

3. PROPOSED WORK

Early watermarking schemes were introduced in the spatial domain, where watermark is added by modifying pixel values

of host image. Least Significant Bit insertion is example of spatial domain watermarking. But such algorithms have low information hiding capacity, they can be easily discovered and quality of watermarked image and extracted watermark is not satisfactory as pixel intensities are directly changed in these algorithms**.** Any watermarking algorithm has two parts: embedding algorithm and detection (extraction) algorithm.

3.1 Watermark Embedding

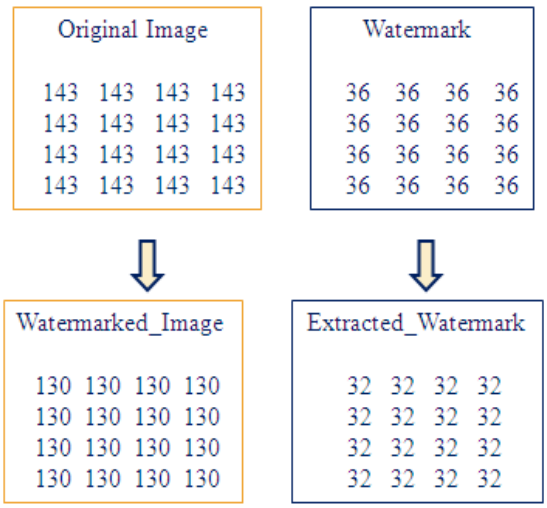


Figure: 3.1 Pixel of Cover image (Original Image), Watermark, Watermarked Image and Extracted Watermark

Water Marking Algorithm:

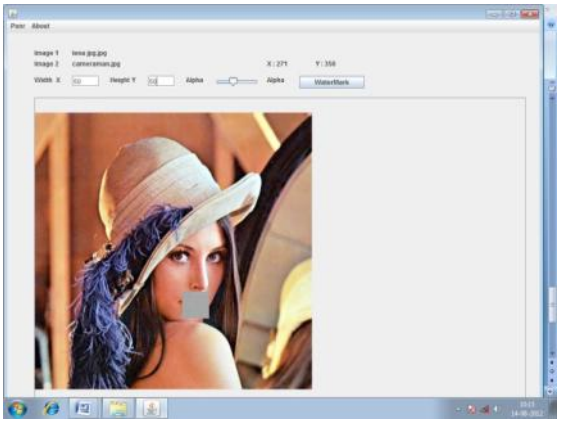
For *wmean* = -3 : 0.2 : 3 //Grid *x*
For *wstd* = -6 : 0.2 : 6 //Grid *y*
1. Embed watermark to host image *h* using (*wmean*,
wstd) pair to compute (1)
2. Save the watermarked image
3. Compute its PSNR value
4. For i =
1 : 9
Apply attack i to the watermarked image Extract watermark from the attacked image Compute BERi
End
5. AverageBER = mean(BERi) //
Compute average
6. GridPSNR(*wmean*, *wstd*) = PSNR;
7. GridBER(*wmean*, *wstd*) = AverageBER;
End
End

On the basis of peak signals to noise ratio (PSNR) we have done image watermarking process and The quality of watermarked image is measured by PSNR (Peak signal to Noise Ratio). Bigger is PSNR, better is quality of watermarked image. PSNR for image with size M x N is given by:

$$PSNR(db) = 10\log_{10}\frac{(Max_I)^2}{\frac{1}{M*N}\sum_{i=1}^{M}\sum_{j=1}^{N}[f(i,j)-f'(i,j)]^2} \quad (1)$$

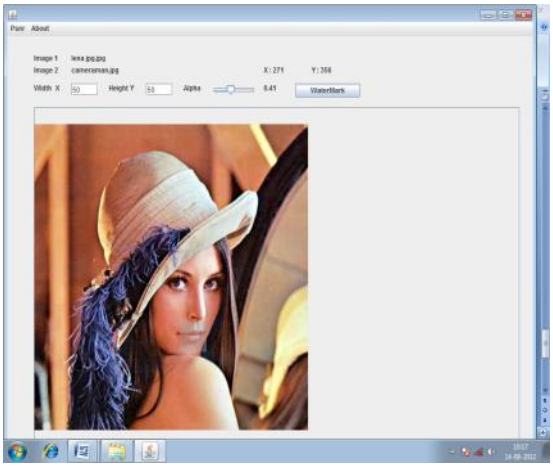
3.2 Experiment Results:

Get x and y position in original image by using mouse, dragging the watermark at the position to be watermarked.



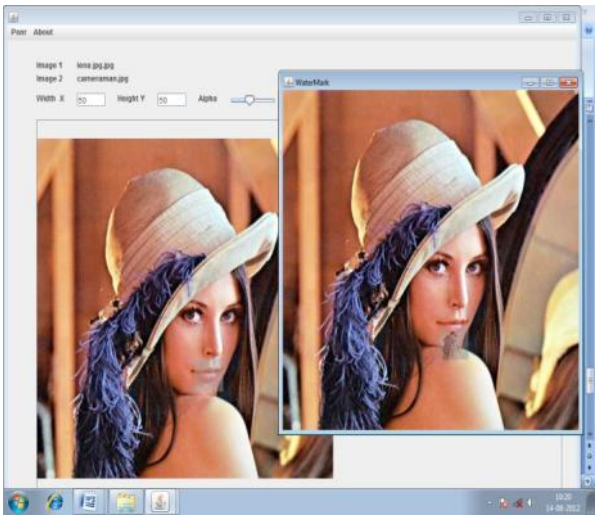
(a)

2. Adjusting the alpha transparent value from slider



(b)

In image (b) the SNR and PSNR values are
SNR:5.630002233738249
PSNR(max=255): 5.870514724523488
PSNR(max=255.0): 5.870514724523488
3. Finally watermark using SVD.



(c)

In image (b) the SNR and PSNR values are
SNR: 5.630002233738249
PSNR(max=255): 5.870514724523488
PSNR(max=255.0): 5.870514724523488

4. CONCLUSION

In this paper, a new image watermarking scheme based on SVD was proposed. SVD transformation is quite different from the commonly used DCT, DFT, and DWT transformations, since non-fixed orthogonal bases and one-way non-symmetrical decomposition are employed in SVD. These properties provide the advantages of various sizes of transformation and more security. That is, a good performance of the proposed scheme both in robustness and security can be achieved. The features of the D component and the relationship between the U component coefficients were explored in the proposed scheme providing a stronger robustness against different attacks and better image quality than Sun et al. The experimental results also demonstrated the effectiveness of the proposed watermarking scheme. Furthermore, extracted watermarks from tampered images were also clearly identified.

REFERENCES:

[1] Robust Dct-Svd Domain Image Watermarking For Copyright Protection: Embedding Data In All Frequencies

[2] Robust DWT-SVD Domain Image Watermarking: Embedding Data in All Frequencies

[3] A DCT Domain Visible Watermarking Technique for Images [1] Yeung M.M., et al., "Digital Watermarking for High- Quality Imaging", Proc. of IEEE First Workshop on Multimedia Signal Processing, Princeton, NJ, pp. 357-362,June 1997. [2] Mintzer F., et al., "Effective and Ineffective Digital Watermarks", Proc. of IEEE International Conference on Image Processing ICIP-97, Vol.3, pp. 9-12, 1997

[4] Robust Digital Image Watermarking Using Singular Value Decomposition Morteza Makhloghi1,Fardin Akhlaghian1 and Habibollah Danyali1

[5] Robust watermarking scheme based on RDWT-SVD: Embedding Data in All subbands.

[6] Non-Blind Image Watermarking Scheme using DWT-SVD Domain (IJCSIS) International Journal of Computer Science and Information Security,Vol. 8, No. 1, April 2010

[7] Robust DWT-SVD Domain Image Watermarking: Embedding Data in All Frequencies

[8] Robust Dct-Svd Domain Image Watermarking For Copyright Protection: Embedding Data In All Frequencies

[9] Robust watermarking scheme based

on RDWT-SVD: Embedding Data in All subbands.

[10] Robust Digital Image Watermarking Using Singular Value Decomposition Morteza Makhloghi1,Fardin Akhlaghian1 and Habibollah Danyali1

[11] An overview of transform domain robust digital image watermarking algorithms. Journal of emerging trends in computing and information sciences ©2010-11 CIS Journal. All rights reserved.

[12] DWT-based robust technique of watermarking applied on digital images. (IJSCE)ISSN :2231-2307 Vol-2, issue-2 may2012.

[13] A DCT Domain Visible Watermarking Technique for Images

[14] Yeung M.M., et al., "Digital Watermarking for High-Quality Imaging", Proc. of IEEE First Workshop on Multimedia Signal Processing, Princeton, NJ, pp. 357-362, June 1997.

[15] Mintzer F., et al., "Effective and Ineffective Digital Watermarks", Proc. of IEEE International Conference on Image Processing ICIP-97, Vol.3, pp. 9-12, 1997.