Themed Section : Engineering and Technology
© 2018 IJSRSET | Volume 5 | Issue 3 | Print ISSN: 2395-1990 | Online ISSN: 2394-4099

Robust Medical Image Watermarking Scheme Based On RDWT-SVD

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ABSTRACT

In the modern era, digital image watermarking is a successful method to protect the multimedia digital data for example copyright protection, content verification, rightful ownership identification, tamper detection etc. In this system, for improving the robustness and security, a Dual watermarking approach using Redundant Discrete Wavelet Transform (RDWT) and block based singular value decomposition (SVD) is presented. After applying RDWT to both cover and watermark images, we apply SVD to the LL sub bands of them. Then modify singular values of the cover image using singular values of the visual watermark. The advantage of the proposed technique is its robustness against most common attacks. In the existing system, the original images is split into the blocks and proceed DFT transform after that by using Arnold scrambling produce. Analysis and experimental results show higher performance of the proposed method in comparison with the DWT-SVD method.

Keywords: Medical Image Watermarking, Redundant Discrete Wavelet Transform, Singular Value Decomposition

I. INTRODUCTION

Watermarking (data hiding) is the process of embedding data into a multimedia element such as image, audio or video for security purposes or copyright protection. This embedded data can later be extracted from, or detected in the multimedia. A watermarking algorithm consists of an embedding algorithm, and an extraction, or detection algorithm. The type of information needed by the detector is an important criterion in classification of watermarking schemes:

- Non-blind schemes require both the original image and the secret key(s) for watermark embedding.
- Semi-blind schemes require the secret key(s) and the watermark itself.
- Blind schemes require only the secret key(s) [1].

Watermarking can be performed in the spatial or transform domain. Spatial domain methods are less complex but are not as robust as transform domain methods against various attacks [2]. One of the most common techniques in transform domain watermarking is to modify the coefficients obtained from singular value decomposition (SVD) of the cover image. The SVD based watermarking algorithm was first presented by Liu et al. [3]. In this algorithm, the authors after applying singular value decomposition to the cover image modify these coefficients by adding the watermark. They apply SVD transform

again on the resultant matrix for finding the modified singular values. These singular values were combined with the known component to get the watermarked image. In another similar work, Chandra et al. [4], embed singular values of the watermark in the singular values of entire host image.

The most important drawback of SVD-based algorithms is quality degradation of the watermarked image. In addition, the extracted watermark is not robust enough against common attacks in SVD based algorithms. Thus researchers, usually combine SVD with other algorithms such as DCT and DWT.

In [5], authors combined DWT with SVD technique. In that paper, after decomposing the host image into four sub-bands, applied SVD to each sub-band and embedded singular values of the watermark into the sub-bands. In [6] DWT is combined with SVD technique to hide singular values of watermark in high frequency band (HH) of an image. When DWT is combined with SVD technique the watermarking algorithm outperforms the conventional DWT algorithm with respect to robustness against Gaussian noise, compression and cropping attacks [7]. Despite good performance of DWT methods in Watermarking, they suffer from drawbacks which are mentioned in section 2. To over come the drawbacks of DWT based watermarking, one solution is the use of Redundant Discrete Wavelet Transform (RDWT).A New Robust Watermarking Scheme Based on RDWT-SVD.

A. RDWT

One of the most common methods used for watermarking is DWT, but one of the main drawbacks of this method is that because of the down-sampling of its bands, it does not provide shift invariance. This causes a major change in the wavelet coefficients of the image even for minor shifts in the input image. The shift variance of DWT causes inaccurate extraction of the cover and watermark image [8],since in watermarking, we need to know the exact locations of where the watermark information is embedded, to overcome this problem, researchers have proposed using Redundant Discrete Wavelet Transform.

3. SVD

SVD efficiently represents intrinsic algebraic properties of an image, where singular values correspond to brightness of the image and singular vectors reflect geometry characteristics of the image. Since slight variations of singular values of an image may not affect the visual perception, watermark embedding through slight variations of singular values. The singular value decomposition of a matrix is a factorization of the matrix into a product of three matrices.

II. PROPOSED SYSTEM

In this system, trying to realize a new algorithm by combining both DWT and SVD. Generally wavelet domain allows us to hide data in regions that the human visual system (HVS) is less sensitive to, such as the high resolution detail bands (HL, LH and HH), Hiding data in these regions allow us to increase the robustness while maintaining good visual quality. Integer wavelet transform maps an integer data set into another integer data set. In discrete wavelet transform, the used wavelet filters have floating point coefficients so that when we hide data in their coefficients any truncations of the floating-point values of the pixels that should be integers may cause the loss of the hidden information which may lead to the failure of the data hiding system.

To avoid problems of floating point precision of the wavelet filters when the input data is integer as in digital images, the output data will no longer be integer which doesn't allow perfect .reconstruction of the input image [10] and in this case there will be no loss of information through forward and inverse transform [9]. Due to the mentioned difference between integer wavelet transform (IWT) and discrete wavelet transform (DWT) the LL sub band in the case of IWT appears to be a close copy with smaller scale of the original image while in the case of DWT the resulting LL sub band is distorted. Lifting

schemes is one of many techniques that can be used to perform integer wavelet transform it is also the scheme used in this system.

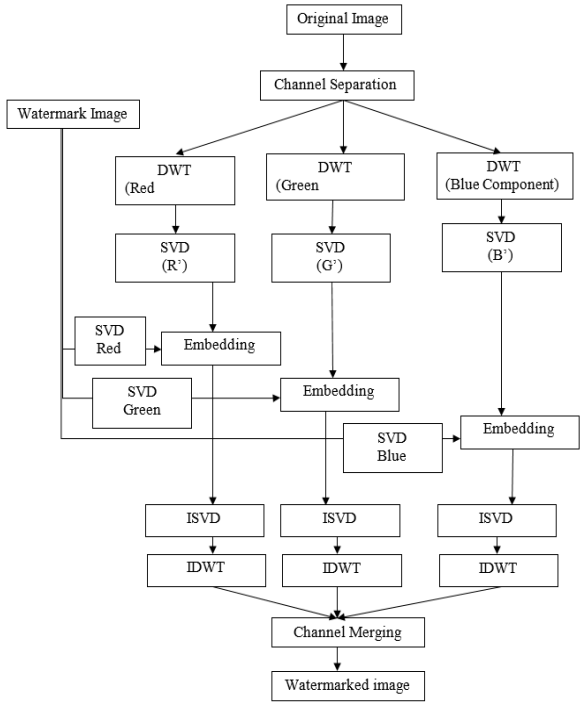

Figure 1. Watermark Embedding Process

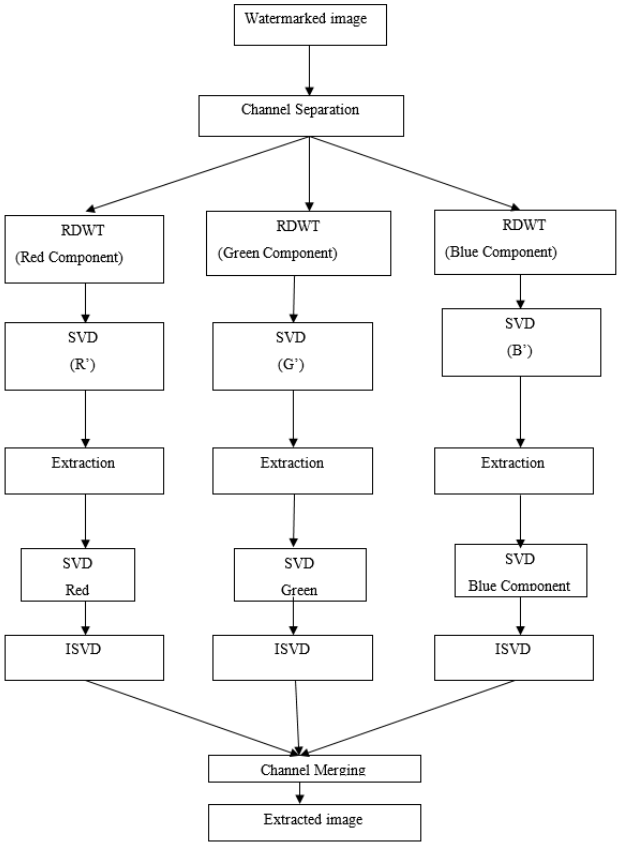

Figure 2. Watermark Extraction Process

III. CONCLUSION

The image is divided into two different watermarks are inserted into the horizontal and vertical sub-bands of wavelet coefficients. In this system, a new blind digital image-watermarking scheme using SVD in RDWT domain is presented. The transparency and robustness of the proposed method is investigated with extensive experiments. The experimental results show that the proposed method offers good transparency for the watermarked images, which is evaluated by PSNR. The performance of the proposed method against different attacks of the watermarked image is evaluated by correlation coefficients of extracted watermark logos and some subjective image tests. The experimental results show that the proposed method can effectively resists against geometric and non-geometric attacks.

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