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Comparison of multiple watermarking techniques using genetic algorithms

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Abstract

Multiple watermarking is used to share the copyright of multiple users, increase robustness and high security. The proposed method is comparison of multiple-watermarking techniques based on Discrete Wavelet Transform and Singular Value Decomposition using Genetic algorithm. This research elaborates the three main categories of multiple watermarking techniques such as successive, segmented and composite watermarking. The experimental results show that the DWT-based watermarking algorithms possess multi-resolution description characteristics achieving imperceptibility. The SVD-based watermarking algorithms add the watermark information to the singular values of the diagonal matrix achieving robustness requirements. The optimization is to maximize the performance of peak signal to noise ratio and normalized correlation in multiple watermarking techniques using genetic algorithms.

Keywords: Multiple watermarking; Successive watermarking; Segmented watermarking; Composite watermarking; Genetic algorithms

1. Introduction

Digital Image Watermarking is an important technique in the area of information security. It is one of the important techniques which are used for safeguarding the origins of the image by protecting it against Piracy. Multiple watermarking approaches combine the advantages of single watermarking to create a sophisticated multiple watermarking techniques, which is efficient in terms of high security and robustness. Jaiswal and Patil (2012) applied text watermarking to image and text documents will detract the invisibility and robustness of embedded watermarks. This problem can be resolved by using Dual Watermarking Scheme Based on Threshold Cryptography (DWTC) for Web Document. DWTC consists of three processes that is generation of watermark in web document embedding watermark into web document, and detection of watermark from embedded web document. Based on threshold cryptography, generation

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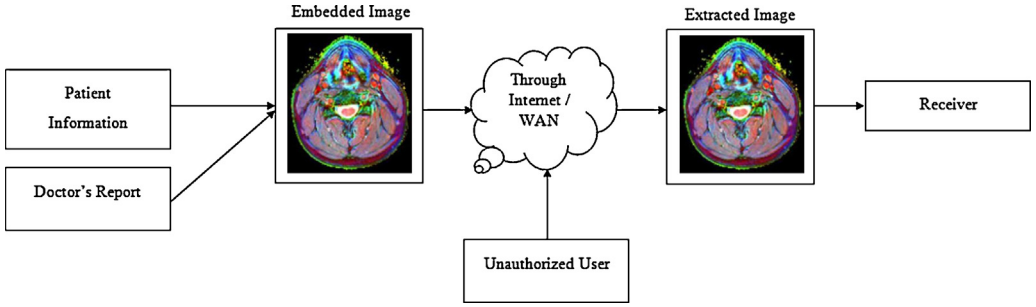

Fig. 1. Block diagram of image watermarking.

of watermark process can increase the robustness. But Dual Watermarking based on threshold cryptography has less capacity of watermarking and tamperproof performance. To resolve this problem, they can increase watermarking capacity and tamperproof performance by means of applying multiple watermarking.

Nasir et al. (2008) proposed a novel and robust colour image watermarking technique in spatial domain based on embedding four identical watermarks into the blue component of the host image. In the extraction process, the original image is available and five watermarks can be extracted from different regions of the watermarked image and only one watermark is detected or constructed from the five watermarks according to the highest value of normalized cross correlation (NCC). The experimental results show that their proposed scheme is robust for several attacks. Their proposed technique is also secure, and has the correct key to extract the watermark.

Kallel et al. (2010) applied a multiple watermarking technique in the wavelet field to preserve the traceability and the record of the medical image diagnosis made by doctors. Their technique is to hide information in the medical image and at the same time to ensure its imperceptibility. Their diagnosis made by the practitioner is the data inserted in the image. The fundamental challenge of their paper is how to hide the full diagnosis of each practitioner in the image ensuring a good quality of the image at the same time.

1.1. Problem definition

- Many digital watermarking techniques have been proposed to solve this problem by hiding an invisible watermark in an image to prove the ownership of the image. Because of most prominent applications, embedded information about the owner to prevent others from claiming copyright is adopted.
- Generally, the embedded information of medical images is exchanged from hospitals to required area through unsecured open networks. It creates a threat which results in undesirable outcome. Considering this fact the multiple watermarking techniques are used in the proposed a watermarking scheme. This is important for addressing different problems like high security of medical images, more robustness and to preserve the privacy of patients. The block diagram of medical imaging watermarking is shown in Fig. 1.
- The extraction process of a watermarking algorithm achieves transparency and robustness. The understanding between the requirements of transparency and robustness is considered as an optimization problem and is removed by applying genetic algorithms.

2. Material and methods

2.1. Discrete wavelet transform

In recent years, several digital image watermarking algorithms have been proposed based on discrete wavelet transform (DWT) and Singular Value Decomposition (SVD). The wavelet transform which is based on small waves has gained widespread acceptance in signal processing and image compression. Anoop Suraj et al. (2014) reviewed discrete wavelet transform based image fusion and denoising in FPGA. They effectively fused the MRI images of a patient suffering from sarcoma using Daubechies mother wavelet. Their approach is focused on the FPGA implementation of algorithm and the scaling-up of the algorithm to perform real time operations. Wavelet-coding is especially suitable for the applications of tolerable degradation and scalability. The wavelet analysis is the heart of multi-resolution analysis