Secure and Robust QR Decomposition Fragile Watermarking Scheme for Medical Images

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Abstract

With the development of computer-based communication in health services applications, the need for medical image security is urgent to protect the patients' Sensitive data. Medical image analysis aims to solve medical problems using different imaging modalities and digital image analysis techniques. This project proposes a new fragile watermarking based scheme for image authentication and self-recovery for medical applications. The proposed scheme locates image tampering as well as recovers the original image. A host image is broken into 4×4 blocks and QR decomposition is applied by inserting the traces of block wise QR into the least significant bit (LSB) of the image pixels to figure out the transformation in the original image. Two authentication bits namely block authentication and self-recovery bits are used to survive the vector quantization attack. The insertion of self-recovery bits is determined with Arnold transformation, which recovers the original image even after a high tampering rate. QR-based watermarking information improves the image authentication and provides a way to detect different attacked area of the watermarked image. The proposed scheme is tested against different types of attacks such as text removal attack, text insertion attack, and copy and paste attack. Compared to the state-of-the art methods, the proposed scheme greatly improves both tamper localization accuracy and the Peak Signal to Noise Ratio (PSNR) of self-recovered image.

I INTRODUCTION

The well-known emergence of computer networks and the popularity of electronic organization of medical records have made it possible for digital medical images to be shared across the globe for services such as telemedicine, teleradiology, telediagnosis, and teleconsultation. Instant diagnosis and considerate of a certain disease as well as cutting down the number of misdiagnosis has had broad social and economic force, clearly showing the need for efficient patient information sharing between experts of different hospitals. In the handling of medical images, the most important priority is to secure protection for the patient's documents against any act of corrupting by unauthorized persons. Thus, the main distress of the existing electronic medical organization is to develop some standard solution to protect the authenticity and honesty of the content of medical images.

For that reason, one solution for tackling the above concern is the use of digital watermarking. In further words, watermarking can enhance the security of medical images by adding a special information, called a watermark or hidden records, in a non-evident way. Watermark information is usually inserted in a binary format to the pixel value of the host image. This information can soon after be retrieved and ensured whether the medical image is distributed with the genuine source (authenticity) or belongs to the exact patient (integrity).

Watermarking methods can be classified based on unusualanalysis. In the following, special categories of watermarking methods are explained. Based on the embedding information thought, watermarking algorithms can be sorted as either spatial or transform domain. In the spatial domain, the watermark information is frankly embedded in the pixel value of the host or cover image. These methods are speedy and simple and also present high capacity for embedding watermarks. Spatial domain methods may have some advantages and may conquer cropping attacks, but their main drawback is their weak point against noise or failure compression attacks. In addition, upon noticing the method, embedded watermarks can simply be modified by a third party. In the transform domain, the watermarked image is obtained by embedding the watermark onto the distorted version of the original image. Some of these transforms and a conversation on their benefits and flaws are provided in the following sections.

According to human observation, the watermarking methods can be assembled into visible and invisible watermarks. A popular sketch of visible methods is logos, which are put at the curve of images or videos for content or copyright protection. Invisible watermarks are helpful for application such as authentication, reliability verification, and copyright

protection. Sometimes, visible and invisible watermarking can be used concurrently. In this case, the invisible watermark can be allowed as a backup for the visible one. This is called the dual watermarking system.

Invisible watermarking schemes can be separated into four groups: fragile, semi-fragile, robust, and hybrid methods. The fragile method allows the watermark to easily be destroyed by the smallest of variations. Applications for this type of watermarking are limited to authentication and integrity verification. The semi-fragile process protects the hidden data against intentional attacks, but is fragile against cruel attacks. The robust watermarking method, which is typically used for copyright protection principles, should be unwilling against multiple different attacks. The robustness of this technique can be measured by applying special attacks on the watermarked images and comparing the embedded and extracted watermark by different benchmarks. The lists of a mixture of attacks and benchmarks are introduced in the following segments. In conclusion, the hybrid watermarking is a fusion of robust and fragile techniques to offer authentication, integrity verification, and copyright protection at the same time.

In adding up to above groupings, reversibility (also well-known as lossless or invertible watermarking) is another important portion in watermarking. Compared to the conventional watermarking schemes, reversible data hiding restores not just the watermark but also the original multimedia flawlessly, which is a critical requirement for medical and military applications. The main feature of reversible methods is the capability to recover the original image without lacking any distortion after extracting the watermark bits, moreover providing corrupt proofing and authentication. By using a reversible data hiding algorithm to drive in patient information and diagnostics records into the medical image, medical officers can make progress perfectly both the hidden in order as well as the image itself.

II LITERATURE SURVEY

Yuan et al. [6] proposed an integer wavelet based multiple symbol watermarking scheme. The watermark is permutated using Arnold transform and is implanted by adjusting the coefficients of the HH and LL subbands. In this system, an integer wavelet based multiple logo-watermarking schemes for copyright defense of digital image is offered. A visual meaningful binary symbol is used as watermark. The method of watermark embedding is carried out by converting the host image in the integer wavelet domain. To erect a blind watermarking plan, wavelet coefficients of HH and LL bands are modified depending on the watermark bits. To add the safety, permutation is used to preprocess the watermark.

Lin et al. [14] proposed a DWT based blind watermarking method by scrambling the watermark using chaos series. In addition, watermarking in DWT domain has drained extensive attention for its fine time-frequency features and its perfect matching of the human visual system (HVS).**Chen et al.** [15] presentedtwo DWT-based audio watermarking algorithms that one of them is based on optimization method using set-amplitude quantization and the further embeds information by energy-proportion system. Therefore, normalized energy is used as a substitute of probability which alters the entropy in information theory as energy proportion task.**Preda et al.** [16] presented three DWT-based video watermarking approaches in which the watermarks used are binary images. Even though, in one of them a spread-spectrum skill is used to stretch the power spectrum of the watermark data, in the two others, watermarking methods are based on a grouping of spread spectrum and quantization.**Deng and Jiang** [17] projected a DWT-based image watermarking algorithm in which the code-division multiple access (CDMA) encoded binary watermark, adaptively is rooted into the third level feature sub-band of DWT domain.

Chin-Shiuh Shieha et. al. [35] proposed genetic watermarking based on transform-domain systems. A genetic algorithm is a look for heuristic used for optimization. It generatesanswers using method inspired by natural evolution, such as legacy, mutation, selection, and crossover. The evolution typically starts from a population of at random generated individuals and happens in generations. In each generation, the robustness of every individual in the population is evaluated, multiple individuals are stochastically chosenfrom the current population (based on their fitness), and modified (recombined and possibly randomly mutated) to form a new population. The latest population is then used in the next iteration of the algorithm. Commonly, the algorithm concludes when either a highest number of generations have been produced, or a reasonable fitness level has been reached for the population. In case of watermarking, the singular values (SVs) of the host image are customized by multiple scaling factors to implant the watermark image. Modifications are optimized using GA to acquire the highest possible toughness without losing the transparency.

Fuzzy logic is a multi-valued logic with un-sharp limitations in which membership is a matter of degree. Fuzzy set theory has been introduced by Lotfi A. Zadeh as an expansion of the classical crisp set

theory. The basic concept underlying fuzzy logic is that changeable values are words or linguistic variables, quite than numbers. Though words are inherently less accurate than numbers, their use is closer to human intuition. Additionally, computing with words utilizes the tolerance for elusiveness and in that way lowers the cost of solution. Watermarking based on fuzzy logic is constructed to extract human eye sensitivity knowledge. FIS is used to regulate the watermark strength and to place in maximum possible watermark length that can be fixed without degrading the quality of image.

Nizar Sakr et. al. [36] proposed a dynamic fuzzy logic approach to adaptive HVS based watermarking. The watermark is adaptively embedded in important DWT coefficients that are chosen in higher level sub bands. In order to agree on texture activity, only sub band in which watermarking will be executed is considered rather than allowing for the sub bands with all three orientations.

Santi P. Maity and Seba Maity [37] presented a multistage spread spectrum watermark detection method using fuzzy logic. There are additionaltechniques suggested based on fuzzy c-means grouping, adaptive fuzzy grouping, flexible fuzzy approach, fuzzy inference filter and fuzzy inference system.

III PROPOSED SYSTEM

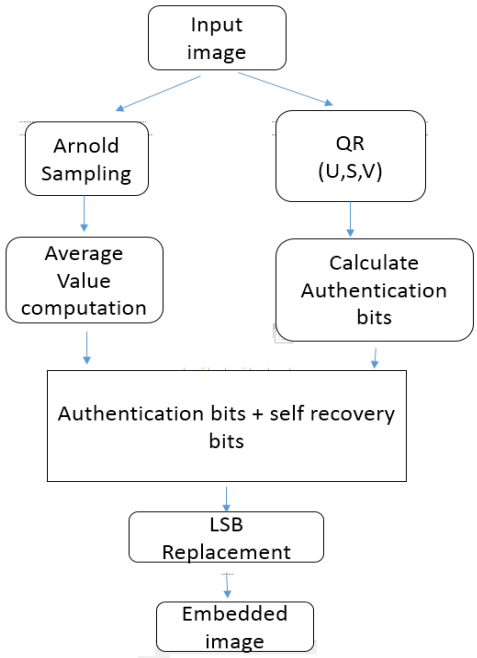


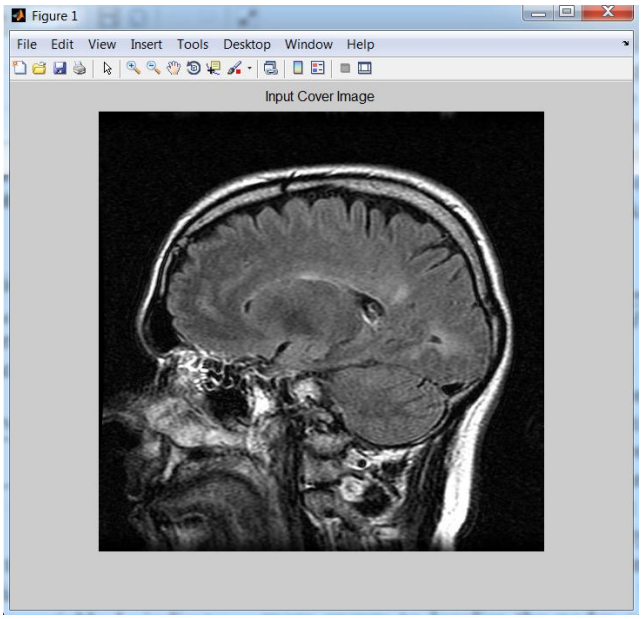
Figure 1 Proposed architecture

The proposed scheme locates image tampering as well as recovers the original image. A host image is broken into 4×4 blocks and singular value decomposition (SVD) is applied by inserting the traces of block wise SVD into the least significant bit (LSB) of the image pixels to figure out the transformation in the original image. Two authentication bits namely block authentication and self-recovery bits are used to survive the vector quantization attack. The insertion of self-recovery bits is determined with Arnold transformation, which recovers the original image even after a high tampering rate. SVD-based watermarking information improves the image authentication and provides a way to detect different attacked area of the watermarked image

In linear algebra, a **QR decomposition** (also called a **QR factorization**) of a matrix is a decomposition of a matrix A into a product $A = QR$ of an orthogonal matrix Q and an upper triangular matrix R. QR decomposition is often used to solve the linear least squares problem and is the basis for a particular eigenvalue algorithm, the QR algorithm.

IV RESULTS & DISCUSSION

Figure 2 input image



Above shows input image for our embedding process .in this stage image converted into gray scale image and resized to required stage

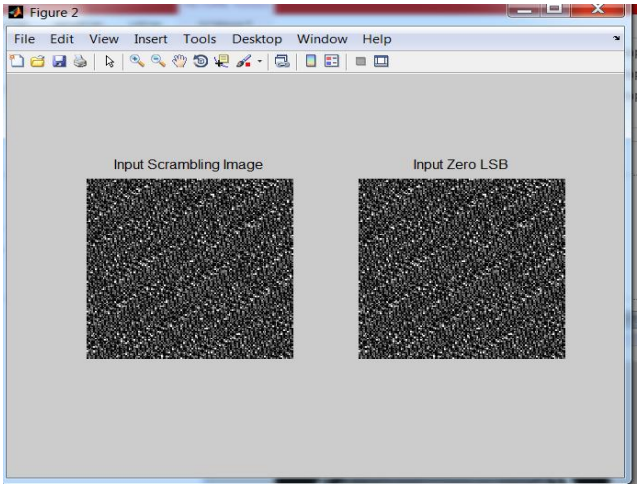


Figure 3 Scrambled And LSB numbered Image

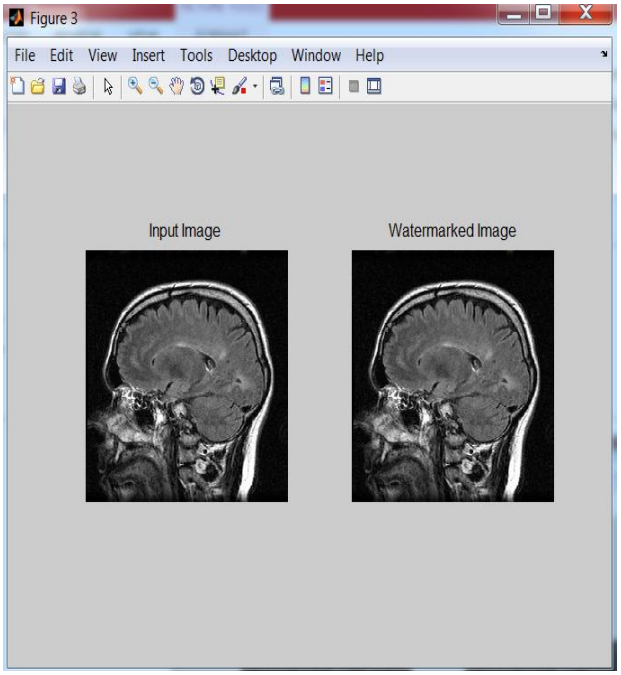


Figure 4 Input And Watermarked Image

Above shows scrambled image and LSB renumbered image for our embedding process .In this stage image authentication bits are identified using Arnold sampling

V CONCUSION

Watermarking is a crucial technique in the copyright identification mechanisms of digital assets. It is widely recognized as one of the key issues of data copyright protection In this work we considered the defect of traditional watermarking schemes, while dealing with the nonnumeric attributes. This project presents a QR based fragile watermarking scheme using grouped block method to offer more security and provide a supplementary way to locate the attacked areas inside different medical images. Two authentication bits namely block authentication and self-recovery bits were used to survive the vector quantization attack. The usage of Arnold transform makes it possible to recover the tampered region from the neighboring blocks, which ultimately increases the NCC and PSNR of the recovered host.

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