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A Secure Crop Medical Image Watermarking Technique

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ABSTRACT:

In this article, a new fragile, blind, high payload capacity, ROI (Region of Interest) preserving Medical image watermarking (MIW) technique in the spatial domain for gray scale medical images is proposed. We present a watermarking scheme that combines lossless data compression and encryption technique in application to medical images. The effectiveness of the proposed scheme, proven through experiments on various medical images through various image quality measure matrices such as PSNR, MSE and MSSIM enables us to argue that, the method will help to maintain Electronic Patient Report (EPR)/DICOM data privacy and medical image integrity.

Keywords- Image Water marking Electronic Patient Report; Fragile water marking; Region of Interest.

INTRODUCTION

During the last few years as a consequence of the fast and significant advancements in information and communication technologies, medical data management systems have changed immensely. Hospital Information Systems (HIS) and Picture Archiving and Communication Systems (PACS) based on DICOM as advised by NEMA, form the base of the modern integrated health-care delivery systems.

These systems provide easier access, manipulation and distribution of medical data. On the other hand, these advances have introduced new risks for inappropriate use of medical information, given the ease with which digital data can be manipulated. It is important to prevent unauthorized accesses and protect medical confidentiality, source authentication should take place, medical data integrity must be safeguarded, as tampering of the medical data might result in misdiagnosis. MIW is a particular subset of image watermarking, where medical information is embedded in the medical images. The sensitive nature of the medical image data requires that any additional information that is stored within a medical image must not affect the perceptual integrity of the image. MIW is one of the most important fields that need lossless watermarking techniques where distortion may cause misdiagnosis.

The two main objectives of watermarking are foreseen in the medical domain: data hiding for the purpose of inserting meta-data to render the image more usable and information protection with application like integrity control. Despites its attractiveness, multimedia watermarking methods may encounter limitations in medical images. The added watermark signal frequently alters the host image inane irreversible manner and may mask subtle details. Consequently, proposed solutions try to preserve the image diagnosis quality value avoiding critical information loss. Many MIW techniques have been proposed by various researches. Proposed an LSB-based reversible scheme to verify the integrity and authenticity of DICOM ultrasound images. Another spatial domain technique was proposed to improve the security of medical images by involving the ability to detect tamper and subsequently recover the image presented a watermarking method for

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verifying the authenticity and integrity of digital mammography images.

An LSB technique of embedding EPR data in medical images. A frequency domain technique based on discrete wavelet transformation (DWT) proposed a discrete cosine transform (DCT) based data hiding scheme, which is capable of hiding EPR-related data in the quantized DCT coefficients into a marked image. The proposed two schemes based on Modulo 256 and DCT, for tamper detection and recovery purpose. Woo et al. [10] proposed a multiple digital image watermarking method which is suitable for privacy control and tamper detection in medical images.

PROPOSED SCHEME

We have combined spatial domain watermarking technique with lossless data compression and encryption technique in our method. The various steps of the propose scheme is described here: A. Selection of ROI and finding the hash of the ROI In our scheme a polygonal ROI can be defined by the Doctor interactively. We chose polygonal ROI because; in most of the cases ROI in a medical image is irregularly shaped. A polygon is completely characterized by the number of vertices nv, and the vertex coordinates v(x, y). We have used SHA-256 hashing algorithm to calculate an one-way hash value of the ROI (other hashing techniques can also be used) of the original image. This hash value can be used as a Message Authentication Code (MAC). Let the hash value of the ROI be Hash ROI.

In fact 3-level wavelet transform of the image is just to construct an initial mark which has a smaller size than original image. The initial mark could be any binary image because the final mark is a multiplication of initial mark and a pseudo random image. Although there are many embedding algorithms such as spiral embedding around ROI part in the spatial domain [2], since our final goal is estimating the quality of original image, we embed the constructed mark into special frequencies of DWT domain of non-ROI image with use of spread spectrum technique. This method shows better results for the purpose of quality assessment.

As stated before, we should not alter quality of ROI part. It seems that mid frequencies of DWT domain is appropriate for the purpose of assessing the quality of an image. Embedding the mark in low frequencies can change the whole luminance of an image and causes visible impairments, on the other hand embedding the mark in high frequencies produces a very fragile mark which is not robust enough against different types of noise. By dividing the original image into ROI and non-ROI parts and embedding the mark into mid frequencies of non-ROI part we have less variations in low frequency regions of non-ROI part .One of these low frequency regions which is important for us is the places onto which we want later add the ROI image. So by using of this technique in addition to embed the mark in a manner that can estimate the quality of whole image, we do not meaningfully affect the quality of ROI part.

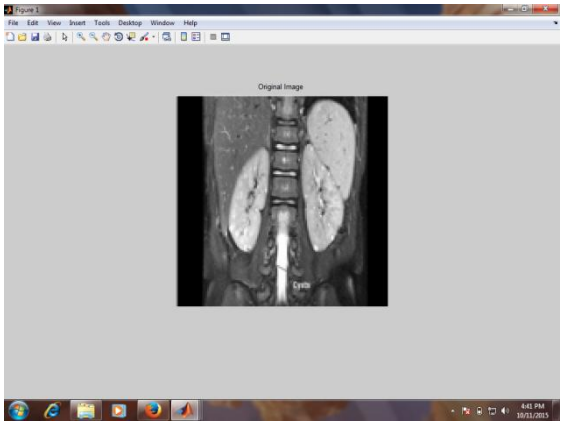

Fig 1 original image

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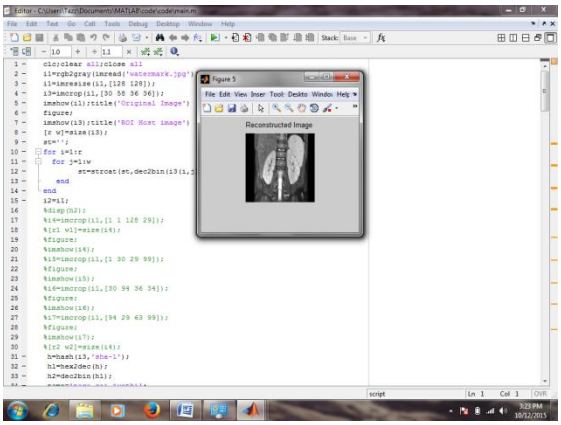

Fig 2 Reconstructed image

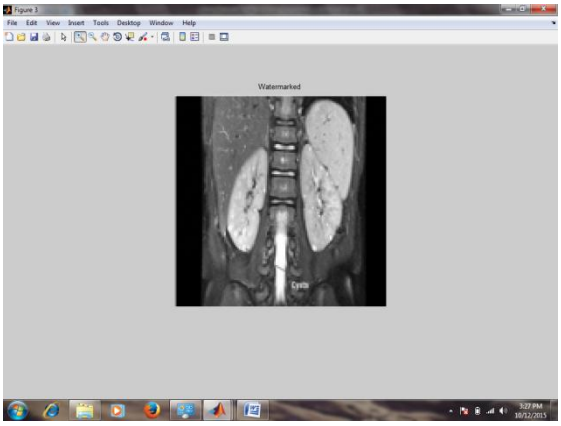

Fig 3 watermarked image

After compression and/or transmission, at the receiver side we separate the received image into ROI and non-ROI parts again and we subtract the calculated offset matrix from that to obtain the important ROI part of the image with least degradation. At the next stage we extract the embedded mark from non- ROI part .For that reason we do again DWT of non-ROI part and then multiply the same PN image to the same DWT coefficients.

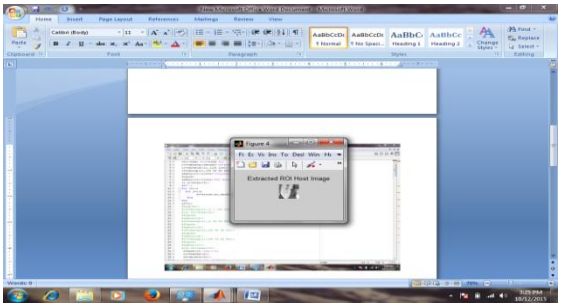

Fig 4 Extracted R.O.I image

RESULTS

The performance of the watermarked image can be evaluated on the basis of peak signal to noise ratio (PSNR) in decibels (dB). Higher the value of SNR better is the quality of the watermarked image. PSNR more than 30 dBs is considered to be the acceptable quality image in which watermark is making no alteration to the quality of the image. We examined the performance of our proposed metric with measuring correlation of whole image degradation and *MSE* and *PSNR* of the extracted mark. We considered 100 different images which were compressed by JPEG qualities from 1 to 100 and 100 other images which were degraded by Gaussian noise with zero mean and standard deviation0.01 to 0.1.

CONCLUSIONS

We have presented a blind, fragile watermarking scheme applied to medical images with good imperceptibility, high payload and enhanced security. Our scheme can be used for different medical image modalities. We evaluated the performance of the method by measuring correlation of the degradation of original image with objective metrics such as PSNR and MSE. Results show that while preserving the quality of ROI part, there is a reasonable relationship and strong correlation between MSE and PSNR of extracted mark and different CROP qualities. The experimental results indicate that the proposed scheme is feasible and given its relative simplicity, it can be applied to the medical images at the time of acquisition to serve in many medical applications concerned with privacy protection, safety, and management.

REFERENCES

[1] M. Awrangjeb, An Overview of Reversible Data Hiding, 6th International Conference on Computer and Information Technology, pp. 75-79, December 2003.

[2] G. Coatrieux and H. Maitre and B. Sankur and Y. Rolland and R. Collorec, Relevance of

watermarking in medical imaging, IEEE EMBS International Conf. On Information Technology Applications in Biomedicine, pp. 250-255, Arlington, VA, USA, 2000.

[3] J. M. Zain and L. P. Baldwin and M. Clarke, Reversible watermarking for authentication of DICOM images, in Proc. 26th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, pp. 3237-3240, 2004.

[4] J. M. Zain and A. R. M. Fauzi, Medical Image Watermarking with Tamper Detection and Recovery, Proc. 28th IEEE EMBS Annual International Conference, pp. 3270-3273, 2006.

[5] Xiaoqiang Zhou and H. K. Huang and Shieh Liang Lou, Authenticity and integrity of digital mammography images, IEEE Trans. Med. Imaging, Vol.20, No.8, pp. 784-791, 2001.

[6] A. Giakoumaki and S. Pavlopoulos and D. Koutsouris, A medical image watermarking scheme based on wavelet transform, in Proc. 25" Annual Intemational Conference of the IEEE Engineering in Medicine and Biology Society, pp. 856-859, 2003.

[7] J. H. K. Wu and R.-F. Chang and C.-J. Chen and C.-L. Wang and T.-H. Kuo and W. K. Moon and D.-R. Chen, Tamper Detection and Recovery for Medical Images Using Near-lossless Information Hiding Technique, Journal of Digital Imaging, Vol. 21, pp. 59-76, 2008.

[8] R. Acharya and P. Subhanna Bhat and S. Kumar and C. Min, Transmission and storage of medical images with patient information, Journal of Computers in Biology and Medicine, Vol. 33, pp. 303-310, 2003.

[9] H.M. Chao and C.M. Hsu and S.G. Miaou, A data-hiding technique with authentication, integration, and confidentiality for electronic patient records, IEEE Trans Inf Technol Biomed, Vol. 1, pp. 46-53, March 2002.

[10] C.-S. Woo and J. Du and B. Pham, Multiple Watermark Method for Privacy Control and Tamper Detection in Medical Images, in Proc. APRS Workshop on Digital Image Computing Pattern Recognition and Imaging for Medical Applications, pp. 43-48, 2005.

[11] Xuanwen Luo, Qiang Cheng, Joseph Tan, A Lossless Data Embedding Scheme For Medical in Application of e- Diagnosis, Proceedings of the 25th Annual International Conference of the IEEE EMBS Cancun, Mexico. September 17-21, 2003.