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Digital Water Marking For ROI And RONI With Break Through Visibility Parameter

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ABSTRACT

Due to fast growth of computer network, multimedia technology, digital media things can easily duplicate and distribute. Internet is used for the applications like telemedicine, online banking etc..Telemedicine is the communication transferring medical images from one place to other. This is helpful for the patience those who are staying in remote areas and easy to communicate with specialist from farawayplaces. But while transmitting if any changes in medical images whether intentionally or accidently then it is effects to health or life of patient. The Main intention of secure medical images by applying digital watermarking on ROI and RONI by zero watermarking and reversible water marking and finding invisibility by applying parameters.

Keywords—***Digital*** water marking, ROI(Region of interested), RONI(Region of not interested).

I. INTRODUCTION

The technique of adding information to digital data is known as digital water marking and in everyday's life we are using this for data security purpose. (Adding and removing data is complicated from these watermarked files). In hospitals and biomedical institutes, securing data is of very important and this medical image processing plays an important role. Usage of watermarking has an adequate advantage of securing data directly to embed itself, and also helps in separating the security measures and original data. Medical image processing is highly sensible to slight changes in the modification of visual images (1). In the medical image a single pixel modification may affect the overall information in some of the cases of image, and also influences the diagnosis and also it may intimidate patient's life. Hence watermarking is approachable in the area of medical images. Medical image data can be secured by using different methods of watermarking is described in this paper. Here a proposed method of adding advantages and removing zero and reversible watermarking disadvantages is discussed.In adding and removing of watermarks in Region of Interest (ROI) uses Zero watermarking method is described here (2). Section 5contains Regions of Non-Interest (RONI)used by Reversible water-marking method is described in detail. Section 6explains about the sub-methods of data exchange and connection principle. The approached method and and the remaining methods comparison are discussed at the end section.

II. REVIEW ON RELATED RESEARCH

Thepresent study has gained sufficient information from other published research articles and a lot of work done in huge amount in medical image processing area. Many schemes for watermarking medical images are described in the below survey, to solve authentication problem and medical information security issues.

i) Wakatani reported a medical image watermarking, with the diagnosis value not to compromise and also it keeps away ROI from enclosed watermarking. Here addition of watermarking is done first and then progressive coding algorithm compression for example Zero Tree Wavelet is used. Discrete Wavelet Transform (DWT) is used for processes of embedding [8]. Haar basis is used for original image transformation. Embedding process reverse is done for watermark extraction. Non-watermarked area medical images attacked by copy are the major disadvantage of this algorithm.

ii) Yusuk Lim et al. proposed image authentication system based on web.CT scan images are used here. Medical images authenticity and security principle is used in this technique.As hash input function except least

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significant bit, only by using 7 most significant bit planes pre-processing of Watermarking is done. Using secret key and hash function binary values of 0 and 1 are generated. Finally to get a watermarked image this function is embedded with cover image of LSB bit.

iii) Rodriquez et al.used spiral scan which started from the cover image centroid and embed information from suitable pixel using spiral scan is proposed in this paper.The value of bit0 to embed is checked and the selected pixel position at the centre is obtained by the block. Luminance block value and mean value of grey-scale level is used to change the luminance value by information embedding if value of the bit is 1.Pixel value of the centre is also modified by eliminating the block of value of luminance from mean value of grey scale level if the value of the bit is 0(2).

iv) HeminGolpira et al. Proposed reversible blind watermarking.Here decomposition of four sub bands is done by Integer Wavelet Transform (IDWT) during embedding process. Based on watermark data capacity watermark is embedded by selecting two points, called thresholds. Inverse Integer Wavelet Transform (IIDWT) is applied to watermarked image. To host image and extract watermark in the process of extraction all these steps are performed in reverse order(5).

v) Nisar Ahmed Memonet et al. Proposed separating ROI and RONI from medical images using fragile and robust process. By using user defined key which is generated by pseudo random sequence, Electronic patient record (EPR) is maintained by different watermarking techniques, Doctors identification code (DIC) and ROI first bit plane is achieved by extracting the LSBs. IWT in RONI large frequency part embedding is done by final watermark. Tiled fashion of generating the binary image is approached here and the same size can be cropped as ROI from the same watermark which is known as Fragile watermark and this domain of ROI is done by using this algorithm (4). Embedding process reverse is nothing but the extraction process here.

III. DIGITAL WATER MARKING INSERTING DOMAIN

Digital water marking is a process of embedded the data into digital form. Watermarking is mainly categories to 3 domains. One is spatial domain it is a time domain applied to the 2-D images data. The known method of this domain isLSB(Last Significant Bit).disadvantages of this domain is low robustness mainly used to ensure authenticity. Other category is transform domain in this domain high robustness compared to other domain. in this 3 transform domains are DCT,DFT and DWT With coefficients from both transform is done mathematically.Compared to DCT and DFT high robustness is DWT(3).disadvantage of DWT is linear shift variant and directional so in this domain DT-CWT is high directional and high robustness. Othercategories is parametric domain water marking in this domain are robust using signal filtering or compression. Disadvantage is watermark insertion also possible to use changes in colour palette matrix. This domain effect is visual image distortion due to change in brightness or contrast.The best domain suits for a medical image is transform domain.

IV. DIGITAL WATER MARKING FOR ROI AND RONI

Original image is divided into two parts one is region of interest(ROI) and other one is region of not interested (RONI).ROI is divided based on the rectangular, polygonal and elliptical shape remaining part is RONI. But marking manually or automatically ROI is not so easy or it's not efficient so marking ROI based on medical images and lab specialist to protect medical images by applying digital watermarking on ROI and RONI by different methods.

Zero watermarking is not inserting directly water mark into the watermarked data but kept separate for comparison.In this there is no data is modified and it is based on CA (Certification Authority) and PKI (Public Key Infrastructure).Advantage of this is high robustness and without distortion of watermarked image.

Reversible watermarking is a process of watermarking insertion to medical images and these images will be transmitted and extraction of original image watermark and later comparison of original data and extracted image.Reversible watermarking is two kind one is additive in this watermark is added or subtracted to original image. Other one is substitutive in this method watermark is inserted in to original image directly and extracted at recipient side to get back original image. In this case main intension is authenticity, confidentiality and data exchangeability(4).

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V. MASKING AND WATERMARK EXTRACTION IN ROI

Original image is two parts that is ROI and RONI. Here ROI is applied for DT-CWT for high robustness and multi directionallyLL sub band is selected based on transform domain. using that LL sub band finding average of LL sub band is finding to use secret key to determine pixels of random location and the total location value with respect pixels number are equal in the watermark (11).It should not be nearer to four point with edge is shown in fig 1.The size of F watermark insertion with image feature is analyzed and then matrix B will generate .B matrix will applied to VC coding to do XOR operation watermarked image will be generate.This watermarked image will be used in RONI.This reverse process is extraction of watermark in ROI shown in fig: 1.

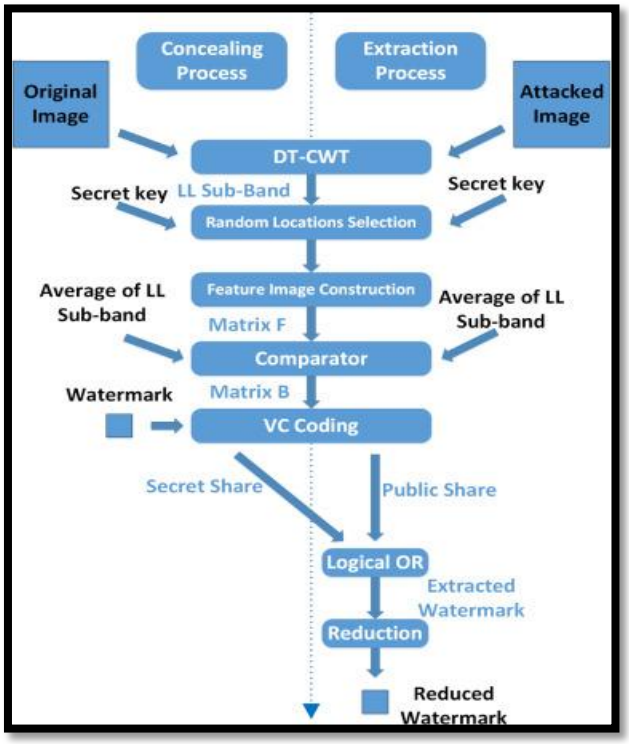

Fig 1: masking and watermark extraction of image on ROI

Pixel				
Matrix B	0	1	0	1
Public Share				
Secret Share				
Public Share ⊕ Secret Share				

Table 1: public share and secret share key generation using codebook

VI. IMPLEMENTATION OF WATERMARK ON RONI

Original image is classified as Region of interest and Region of not interest .ROI is applied to zero watermarks with watermark to generate secret key.RONI is applicable for reversible watermarkwith secret key and both ROI and RONI combination gives watermarked image as shown in fig2.

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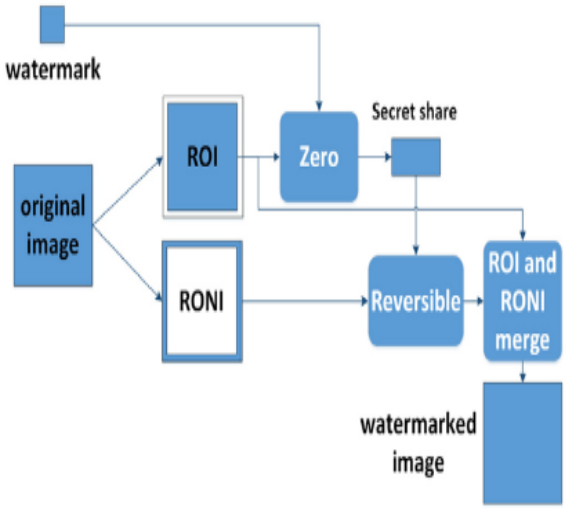

Fig 2: process of watermark image

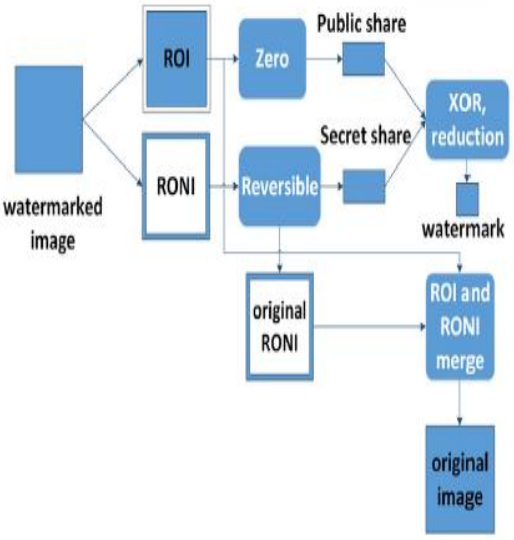

Fig 3: process of extraction watermarked image

Watermarked image is divided into ROI and RONI. ROI is applied to zero watermarking to generate public share key.RONI is applied to reversible watermarking to generate secret key. Both secret key and public share key will be XOR reduction so that watermark will be extracted. Original ROI and reversible RONI will be combined to form original data as shown in fig 3.

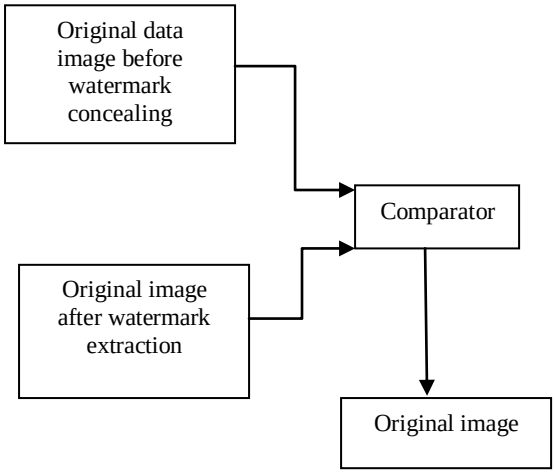

Fig 4: comparison of original image and extracted original image

Finally comparing original image before concealing watermark at transmitter side and original image after watermark extraction at receiver side to get back our original image is as shown in fig 4.

VII. INVISIBILITY OF WATERMARK WITH EXPERIMENTAL RESULTS

Invisibility of watermark in medical image is by the parameters like PSNR(Peak Signal to Noise Ratio) and SSIM(Structural Similarity Metric Index).

$$PSNR = 10 \log \frac{X^2}{\frac{1}{N_1 N_2}\sum_{i=1}^{N_1}\sum_{j=1}^{N_2}(C_O(i,j) - C_W(i,j))^2}, \quad \text{.....1}$$

$$SSIM(x,y) = \frac{(2\mu_x\mu_y + C_1)(2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_x^2 + \sigma_y^2 + C_2)}, \quad \text{....2}$$

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Where N1 andN2 ishorizontal and vertical dimensions of the image. X is maximum pixel value. and Cw are original data image and watermarked image from equation 1.Where x and y is original and modifies data,μ is average of luminance value,σ is root mean square of variance from equation 2. Comparison of original watermark and extracted watermark by NC(Normalized Correlation) equation 3. Where Wi,j is original watermark and W`i,j is extracted watermark(7).

$$NC = \frac{\sum_{i=1}^{r}\sum_{j=1}^{c}\left(w_{i,j} \oplus w'_{i,j}\right)}{r \times c} \times 100\,\% \quad .....3$$

VIII. RESULT FOR WATERMARK ON RONI

Watermark insertion has done by dividing the image intoROI and RONI. The Region of interest is nothing but the image area which cannot be modified, since it takes medical image data. Region of interest is normally the large area of the medical imaging data. Usually, it is an area which gives the picture of patient and of irregular in shape. With respect to computer analysis either it can be selected automatically or manually by personnel data speciality medical imaging. Region of not interested is nothing but the remaining image in which the medical information is not included. In this approached method, the Region of interested area remains same and the data of watermarked data are embedding only into the Region of not interested. To enclose and store watermarked data and to extract the data into the original shape needs neither the original image data (8).

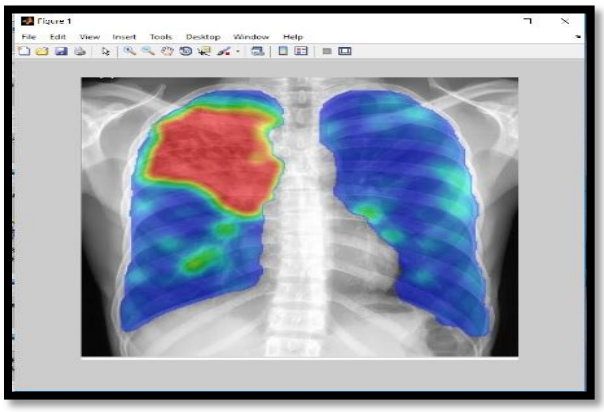

Fig 5: Medical image under test

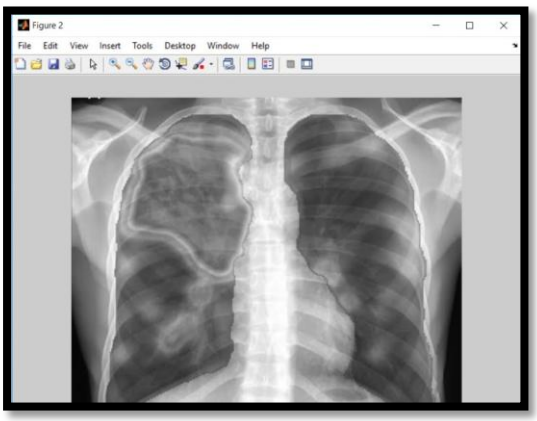

Fig 6: Converted to Grey image under test

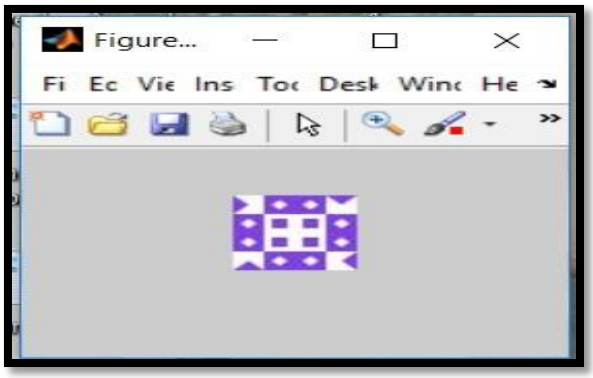

Fig 7: Watermark to be proposed to insert

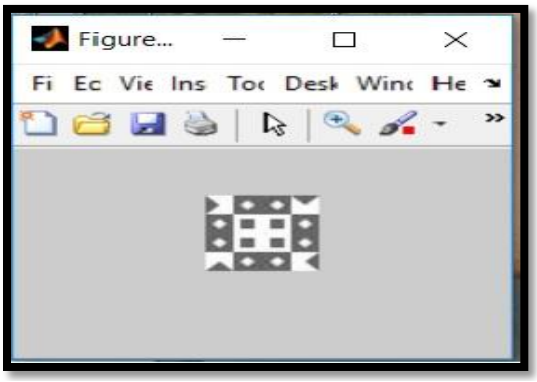

Fig 8: Watermark converted to Grey image

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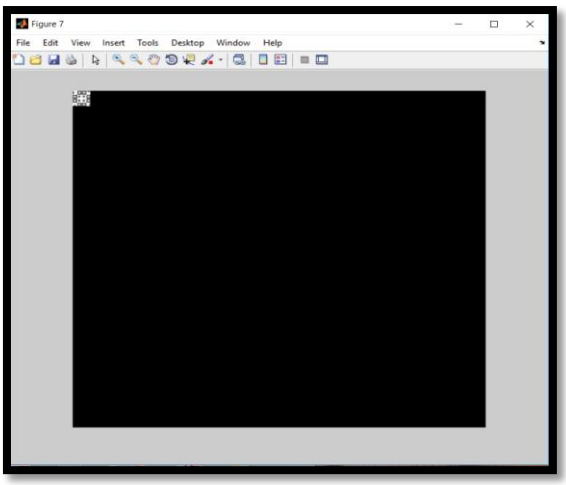

Fig 9 : Watermark Inserted to RONI

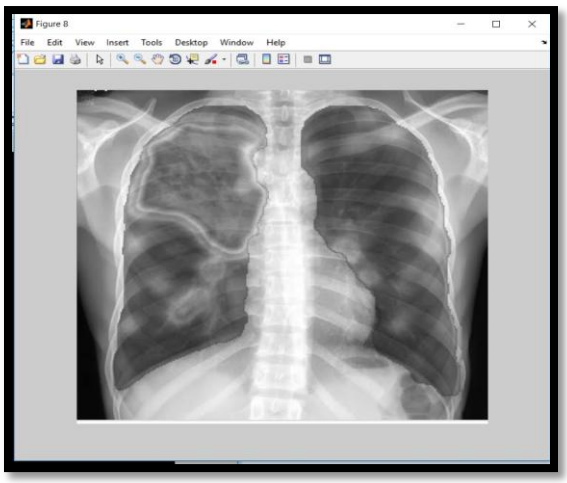

Fig 10: Water marked Image

IX. CONCLUSIONS

This article describes a Watermarking is the great solution to protect copyright. Watermarking is the solution for the protection of legal rights of digital content of the owner and customer. Extend the opportunity of protecting the contents after the release of content to the open environment Prevent the unauthorized use and duplication. Global exchange information is possible. Important to protect intellectual properties of digital media of medical image. In healthcare institutions it is acceptable to test larger database of medical images which is ten times bigger compared to left images. This proposed method removes the disadvantages of the remaining two methods by safely combining in which they are automated fully.

REFERENCES

[1]. A. Rocek, M. Javorník, "Securing a publicly accessible database of medical images usingwatermarking with direct diagnose capability" Recent Adv. Comput. Sci., 13 (2014), pp. 79– 86 c. 24, s. ISSN 1790-5109.

[2]. A. Rocek, "Medical image data security based on principles of digital watermarking methods" Malta Adv. Data Netw. Commun.Comput.Mater.(2012), pp. 47–52 stránky 978-1-61804-118-0.

[3]. F. Rahimi, H. Rabbani, "A dual adaptive watermarking scheme in contourlet domain for DICOM images" BioMed. Eng. Online (2011) 10:53

[4]. O.M. Al-Qershi, B.E. Khoo, "Authentication and data hiding using a hybrid ROI-based Watermarking scheme for DICOM images" J. Digit. Imaging, 24 (February (1)) (2011), pp. 114–125

[5]. Ch. K. Tan, J. Ch. Ng, X. Xu, Ch. L. Poh, Y.L. Guan, K. Sheah, "Security protection of DICOM medical images using dual-layer reversible watermarking with tamper detection Capability" J. Digit. Imaging, 24 (June (3)) (2011), pp. 528–540

[6]. Rahmani, R. Mortezaei, M.E. Moghaddam, "A new lossless watermarking scheme based on DCT coefficients 6th International Conference on Digital Content, Multimedia Technology and its Applications (IDC)" (2010), pp. 28–33 ISBN: 978-1-4244-7607-7

[7]. W. Pan, G. Coatrieux, J. Montagner, N. Cuppens, F. Cuppens, Ch. Roux, "Comparison of some reversible watermarking methods in application to medical images" in: 31st Annual International Conference of the IEEE EMBS, Minneapolis, Minnesota, USA, Sep. 2–6, 2009, pp. 2172–2175.

[8]. R. Fu, W. Jin A "Wavelet-Based Method of Zero-Watermark Utilizing Visual Cryptography International Conference on Multimedia Technology (ICMT)" (2010), pp. 1–4 ISBN: 978-1-4244-7871-2 .

[9]. J.M. Zain, A.R.M. Fanzi, A.A. Aziz "Clinical evaluation of watermarked medical images Proceedings of the 28th Annual International Conference of the IEEE EMBS" New York (2006),pp. 5459–5462 .

[10]. MeryemBenyoussef,SamiraMabtoul, Mohamed El Marraki, DrissAboutajdine "Robust image watermarking scheme using visual cryptography in dual-tree complex wavelet domain" J. Theor. Appl. Inf. Technol., 60 (2) (2014), pp. 372–379 ISSN 1992-8645

[11]. Ales rocek, Karelsalvicek, "A new approach to fully reversible watermarking in medical imaging with breakthrough visibility parameters" 1746-8094/2016, http://dx/doi.org/10.1016/j.bspc.2016.05.005