ISSN: 0975 -8542

Journal of Global Pharma Technology

Available Online at www.jgpt.co.in

RESEARCH ARTICLE

Telemedicine Medical Image Compression based on ROI (A Case Study of Spine Medical Images)

Abd Abrahim Mosslah

University of Anbar - College of Islamic,Iraq.

Abstract

In recent years, telemedical need arose, as a result of the increasing numbers of patients significantly, where using image compression is one of the most important techniques in the field processing research field, as well as in multiple applications such as medicine, reconnaissance, aerial surveillance, and space. Image compression necessary to reduce transport costs due to rising transport prices and distances In this method, we divide the original image into two separate sub-images called ROI and non-ROI. Region of interest (ROI) is the decisive area in a medical image, which is very important. This area may indicate a disease and must result in a right diagnosis. We use the spread spectrum-embedding algorithm to embed a binary mark into DCT transform of non-ROI part of an image. In this search review the compression of the medical images and encoded and then decoder with no distort medical images was taken for sections of the spine for sick people. Used in the field of telemedicine, Medical images encoded works with LSK through use WT (wavelet transform), During the user interaction (encryption) obtained of the ROI regions that lead us to get high compression ratio.The method used in this technology decompress on the block and like-minded countries on the basis of the value stored, note that the time of implementation of this method is low when compared with other methods.

Keywords: *Telemedicine, Medical Image Compressing, ROI, fractal image compression, LSK.*

Introduction

Compressing a digital image can facilitate its transmission, storage, and processing. As medical imaging becomes increasingly digital, the quantities of image data are forcing consideration of compression in picture archiving and communication systems (PACS) and evolving telemedicine systems. HIS (Hospital Information System) and PACS based on DICOM standards pave the way to store medical images and ease remote medical treatments. It has been reinforced through extensive research that a lossless or a near lossless algorithm must compress the diagnostically important regions of medical images - the region of interest (ROI) in order to prevent from a wrong diagnosis due to a poor image quality. Most of the quality metrics proposed in the literature are Full Reference (FR) metrics.

The major drawback of the FR quality metrics for huge databases is that a large amount of reference information has to be provided at the final comparison point. It is essential to develop No-Reference (NR) quality metrics that blindly estimate the quality of an image. Most of the proposed NR metrics estimate annoyance by detecting and estimating the strength of commonly found artifact signals. In this paper, we use a spread spectrum technique in order to data hiding (watermarking) and producing a reliable metric for estimating the quality of image [1].

Although there are medical oriented watermarking studies in the literature and it's a valuable tool for copyright protection, patient, and examination-related information hiding, data integrity control and source identification, in this work we use watermarking in order to data hiding into non-ROI part of the image while preserving the quality of ROI part and in a manner which can estimate the quality of original image. Watermarking may be done in the spatial domain or in the transform domains such as DCT or wavelet. We choose to insert the mark in DCT domain because this is the domain still used by many compression algorithms such as JPEG standard.

Telemedicine

The request of this growing today on telemedicine farsightedness geographical distances, as a result of the development of information technology and telecommunications has been the use of such technology to provide health care and clinical trials and the exchange of information from one location to another through electronic messages, which use a range of applications using video with directions, smart devices, e-mail, and to facilitate the process of telemedicine.

Sometimes you need an interview directly between patient and health experts is very essential, so be patient at the site and another site expert Where the use of flat-two directions to the interview the number of patients with various diseases of the spine a large segment of society (break, sliding, lumbar spine trauma. Etc) so telemedicine contributed to solving part of these problems [2].

Telemedicine the benefits of several could be envisaged through the following

- Improving access to information as a result of information technology.
- The provision of health care through the delivery of information
- Healthcare services.
- Vocational education to facilitate the services.
- The development of techniques for the examination and reducing the costs of social care.

Medical Image Compressing

In telemedicine, medical images are very important in the field of medicine, with the passage of time and the data generated a very large number of medical images by storing the disease data generated by imaging techniques, computed tomography (CT), digital subtraction angiography (DSA), positron emission tomography (PET), and magnetic resonance imaging (MRI), Etcetera medical imaging techniques. Some of the medical images are shown in Fig. 1 As a result of the foregoing; it would be useful if the pressure of medical images by storing information the basic picture of the restructuring of the Picture.

The processes of the pressure of the pictures consist of two stages

- Research on the characteristics of the image data, histogram gray-level, Photos of entropy, links, and functions.
- Finding suitable compression techniques to get a picture of those characteristics [3].

CT Image of Spine Lateral

CT Image of Spine PA (quer)

MR Image of Spine

Fig.1. Medical Images

Region of Interest (ROI)

A partial space of the values of pixels/pixel resolution relating to the introduction of digital images can be considered to be volatile sector of pixels only part of the pictures introduced, depending on the specific task. Because of some limitations of compression algorithms either loss or loss, depending on the concept of ROI (Region of Interest) was introduced [4]. Through this application restriction could be imposed accuracy

homogeneous of others in various parts of the picture in addition to compression the entire picture, this feature is particularly important in the process of the encoding used in the pressure of medical images and the use of rates of different bit [5]. Medical image consists of three parts in the picture: ROI region, non-ROI region and background region. Figure.2. Consist of Different parts of an image. Here's an effective and scientific methodology required to be modeled in order to keep the information without any loss of image data.

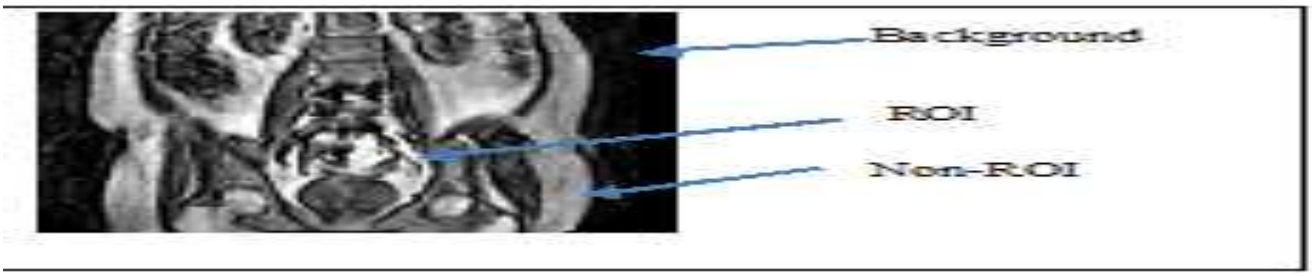


Figure 2: Consist of Different parts of an image

Frame Work

Previous Experiences

In recent years, many scientists work in the field of medical image compression. This aspect is highlighted in a review of important research pursuits. Ganguly et al. [6] Dealing with different aspects of medical imaging with exponential growth image technology and suffuse this medical imaging in the medical field. Wuet al. in2011 Innovated way to convert the wavelet space Color Space carefully and then came successively innovations to combine such transfers And improve the quality of the images that are reconstructed to evenly between the quantity of information to different colors. Although there is a lot of related research, which studied all the methods used in medical image compression and lossy operations and loss.

There is a problem experienced by previous experiences have part of the picture when the compression process for medical images so proposed tree context for the efficient compression. In this paper, we start addressing the preliminary medical spine images where you remove noise from an image and then divide the image into equal parts by segmentation (i.e. ROI and non ROI), Finally, so that we can reduce the network bandwidth and storage use compression, Here two compression the medical images effectively are used (Listless Speck (LSK) and fractal image compression) techniques.

Existing Systems

The establishment or strengthening of mechanisms in order to maximize the effective use of the existing systems under pressure medical images effectively using, LSK (Listless Speck) and fractal image compression techniques [7].

Fractal Image Compression

Fractal encoding: Mathematical technique to encode certain medical image into a set of mathematical data which show the typical encoding image repeated geometric characteristics (fractal image) [8]. The truth is that reliable Fractal encodes that all creatures consisting of information in the form of the relevant resolutions, and the process of replication of patterns called an attractor, Fractal encodes is used to convert the image into a symbol often fractional.

The encoding process extreme account is either IFS (Iterated Function Systems) or by PIFS (Partitioned Iterated Function Systems) are used to achieve FIC [9] the reason goes back to The large number of operations required to determine a fractal pattern of lines in the Picture. Iterated Function Systems Represents briefly mathematical steps the process of fractal image according to the theory of IFS [10]. An IFS is a series of transitions that have the following properties

- $W(x_w) = x_w$
- $x_w = lim_{n\to\infty} w^n (S_0)$,

Where w maps a metric space, $\{W: M \to M\}$: point, $S \subset M$, also to choose an initial image S_0 [11].

Depending on the characteristics of this theory, it attractor map of W to the original image to compress which can obtained

through any initial image form in accordance apply map W. Medical images in this research and previous research into equal sized blocks many of these blocks are similar, so you should avoid compression the corresponding blocks using optimization methods OF the fractal image compression [12]. This method depends on dividing the medical images into a set of blocks and these blocks sections is similar and after storing all the similar blocks start separate stack and describe that way:

Let us ponder the consideration of the following equation for a group of medical images

$$I = \{Ib_1, Ib_2, \ldots, Ib_p\} \quad 1$$

Where

- Set of medical image D {I_1, I_2 …IN} where I represent size image (MxN).
- The Division of the image to a number of PxP blocks of non-overlapping.
- NB refers to the final number of blocks in the image
- After splitting the blocks, you can identify similar blocks in the image by using the concept of the system fractal image compression.

Moreover, by applying the following equation distance is measured:

$$S_d = \sqrt{\Sigma(Ib_a - Ib_b)^2} \quad 2$$

Where Ib_a ,Ib_b , Referring to the current blocks in addition to contiguous blocks of this current blocks respectively, here b={1,2,…….,n}. Compared with the distance calculated S_d with a function of the threshold D_{tsh} is through the following equation

$$I_r^* = \begin{cases} I_r^* = I; & if\ S_d < D_{tsh} \\ I_r^* = 0; & otherwise \end{cases} \quad 3$$

Where b, F Refer to the image block and also indicate the value of knowledge for each block of the image sequence [13].This is shown in Figure 3

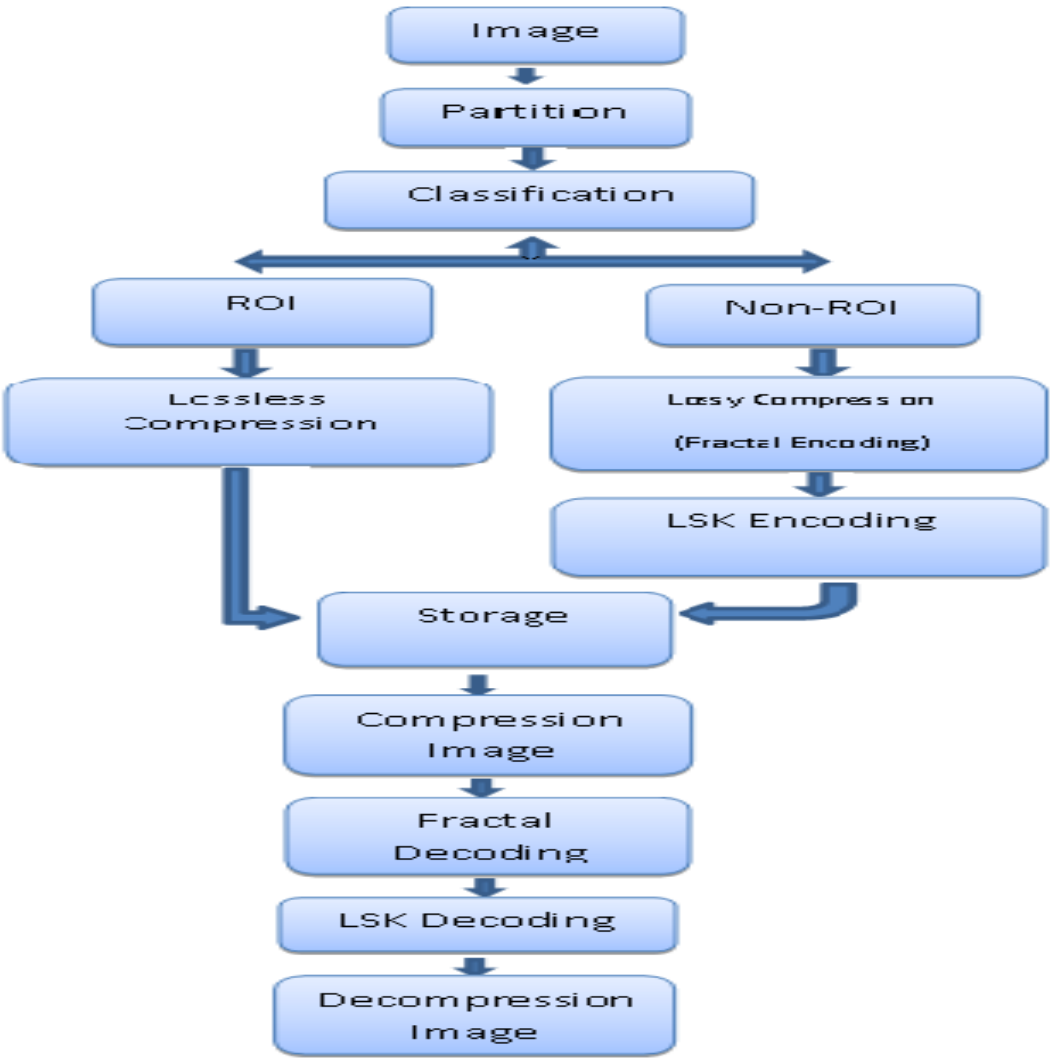


Figure 3: Flags assigned to each domain block

Listless Speck

Listless Speck refers to partitioning embedded block. Note that the same rules of split block used by LSK are also used by Speck, through the tagging of all initial pixels each sub band Ranges [11]. In order to illustrate the work Listless Speck by tacking the following:-

Storage

Observe that DC band, allow determine the transaction number as

$I_{dc} = R_{dc}C_{dc}$, $R_{dc} = R2^{-L}$, $C_{dc} = C2^{-L}$, L indicates the levels of decomposition Characterized by the number of sub-band. A method is used for the storage of these coefficients. This is done by using matrices. In order to apply LSK for the smooth functioning of the matrix system is used. (Array d max, has 1-14, array g max 1-16). For the following save tracks from set partition, the following specific array is as marked below:

- MIP: Pixels are not important.
- MNP: Newly important pixels
- MSP: Pixels are important.
- MS2: Skipped the block is of size 2×2,

Initialization

Note the conversion method coefficients to integers is done by turning the sub band image, Then the transform read, convert to linear array (L=5 level), To skip all the elements, can use procedure contains an additional indicator in the Algorithm

$$mark\ [i] = MIP \qquad 3$$

$$mark\ [i+j] = MS2 \qquad 4$$

Here, j = 1, 2, e and elog2 (m/2L). During the initialization process are marked some all size blocks, the indices in above, although they are small pre computed and can be avoided from the image.

Encoder Algorithm

In this paper, the main encoder algorithm is performed every bit plane, b, a beginner with B, and decreased to 0. Here in the algorithm, there are three tracks are as follows:

- Pass the little pixels
- Pass a small set
- Pass Refinement.

Where each bit plane, Importance level is given by $S = 2^b$

Moreover, we can start by passing the little pixels, and identify important new elements and mark as MNP. When you move to the next item, this can be described as a mark [i]=MIP When the mark is MNP on the elements in the state array

$$Output(d = S_b[val\ (i)]) \qquad 5$$

$$mark\ [i] = MNP \qquad 6$$

Note here the increased memory requirements and the main objective of this lies in the use of signs of table markers

Decompression Process

After the completion of the process of the compression of medical images and fulfilling, the goal of compression requires us to reverse process to remove the compression from medical images a process very easy. Therefore, we must get rid of fractal parameter and get the image, through this process the original image is obtained, By LSK decoding we get decompressed through transmission of fractal the approximation and Different image. This is shown in Figure 4.

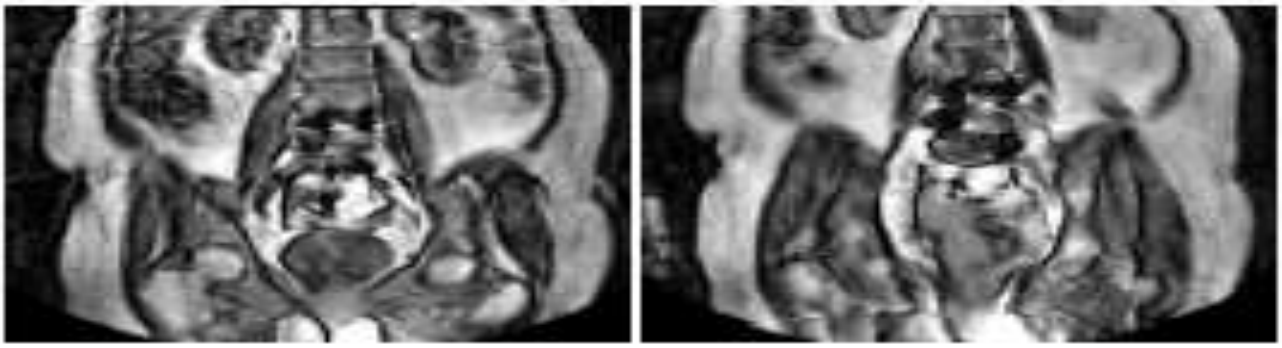
1	1	0
1	a	0
1	0	0

Fig 4: Block Diagram to explain of proposed the method

Results and Discussion

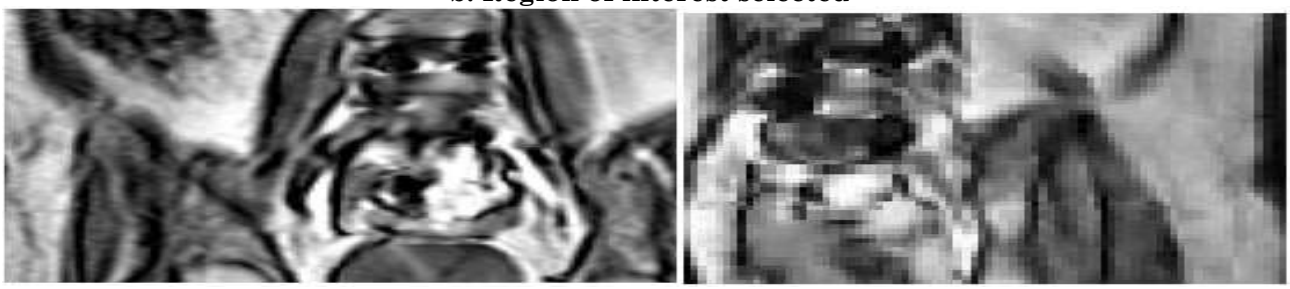
In this paper, Medical image chosen is the test on an Intel (R) core (TM) i5, 2.53 GHz PC using MATLAB 7.8.0. Stages of the steps of this work are through the input of the original medical image, which in its beginning is, applied the partitioning to dividing an image to ROI, non-ROI and background region by segmentation. Techniques used in segmentation explain that the ROI Lossless Compression (Context Tree) while non-ROI Lossy Compression (Fractal and LSK), which require high Compression. Medical images used in the test include vertebrae MRI images. Which used in Compression processes. Fig 5 shows specific areas in the image. Used Upon completion of the operation Division of the cluster, then the selected area of the image

input medical coding process of dividing into equal sized blocks, While medical images compression schema representation as in Fig 6.



a. Original image

b. Region of interest selected



c. ROI selected parts of the original images

Figure5: The sample output obtained from the ROI selection process in vertebrae MRI images

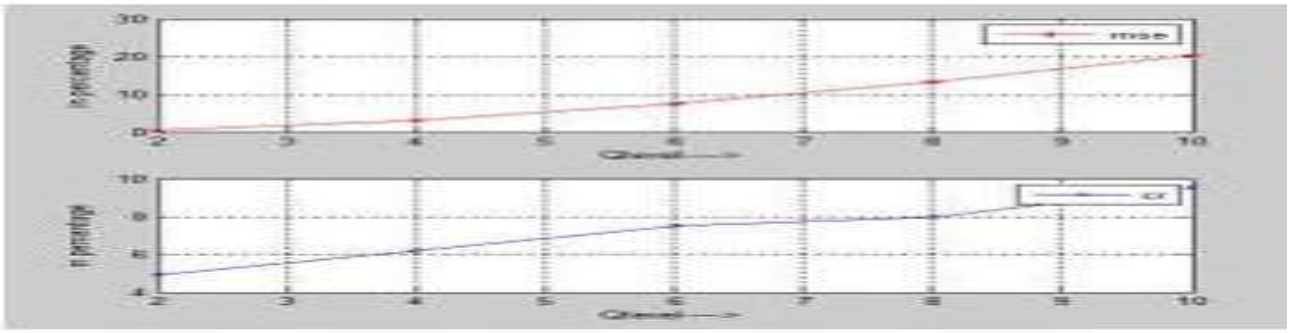


Fig 6: Draw a diagram of the output that apply to the compression of the medical images

$$CR = \frac{I}{O} \qquad 7$$

Where I Represent the original medical image size and O, Represent the original medical image decompression, and CR: Represents the percentage rate that we need when storing medical picture before pressing the percentage when storing the picture after pressure.

Conclusion

The application of medical images, coding in the area of telemedicine in this research with compression system. When the user begin the selection the ROI, start the ROI coding, By using fractal encoding the select similar groups in the input medical image, Well, when we use LSK encoder. We get ROIs different are encoded, In the end, all encoded

data gathered through the integration of all ROI medical image data that is encoded, as well as similar blocks different blocks. The focus should be on that a medical image used in pressure is not deformed after compression. The methods proposed in this paper have a high proportion of pressure when compared with the techniques used in the past, In addition to technology Fractal, LSK and Context tree faster and more accurate than the previous techniques.

References

1. Lim Sin Ting, David Yap, Fook Weng, Nurulfajar Bin, Abdul Manap "A Novel Approach for Arbitrary-Shape ROI Compression of Medical Image Using Principal Component Analysis (PCA)", Trends in Applied Sciences Research, 68-76, Academic Journals Inc, 20, 15.
2. Manpreet Kaur, Vikas Wasson (2015) "ROI Based Medical Image Compression for Telemedicine Application" in 4thInternational Conference on Eco-friendly Computing and Communication Systems, ICECCS 2015, Procedia Computer Science 70, 579 – 585.
3. K Somasundaram, S Domnic (2006)Modified Vector Quantization Method For Image Compression, Proceedings Of World Academy Of Science, Engineering And Technology13, ISSN 1307-6884]
4. R shah, P Sharma (2014) "Performance Analysis of Region of Interest Based Compression Method for Medical Images", Proceedings of the Fourth International Conference on Advanced Computing & Communication Technologies.
5. Ahmed Abu-Hajar and Ravi Shankar (2004) Region of Interest Coding using Partial –SPIHT‖, IEEE.
6. Ganguly D, Chakraborty S, Kim T (2010) "A Cognitive Study on Medical Imaging," International Journal of Bio-Science and Bio Technology, 2(3): 1-18.
7. Abdulbaki S Azmi "Hybrid suggested security model for identification and verification OF illicit objects threats in scanned images", International Journal of Advanced Computer Technology (IJACT), ISSN: 2319-7900.
8. Gray R, Neuhoff D (1998) "Quantization," IEEE Transaction Information Theory 44, 6.
9. Wang Z, Bovik A, Sheikh H, Simoncelli E "Image Quality Assessment: From Error Visibility to Structural Similarity," IEEE.
10. Fisher Y (1995) Fractal Image Compression, Springer, New York.
11. TMP Rajkumar1, Mrityunjaya Latte2 (2015) "An Efficient ROI Encoding Based on LSK and Fractal Image Compression", THE International Arab Journal of Information Technology, 12, 3.
12. Balraju M, Govardhan A, Chandra N, Basha S, Srinivas P (2009) "Loss Controllable Image Compression for Color Images using Block Based Binary Plane Technique," International Journal of Engineering Studies, 1, (1): 59-70.
13. MF Barnsley, V Ervin, D Hardin, J Lancaster (1986) "Solution of an inverse problem for fractals and other sets", communicated by Richard J. Duffin, 12, 1985, 83, 1975-1977.

