International Journal of Emerging Technology and Advanced Engineering
Website: www.ijetae.com (ISSN 2250-2459 (Online), An ISO 9001:2008 Certified Journal, Volume 3, Special Issue 1, January 2013)

International Conference on Information Systems and Computing (ICISC-2013), INDIA.

INTELLIGENT COMPRESSION OF MEDICAL IMAGES BASED ON MULTI ROI

Lavanya. M[1], M. SureshKumar[2]

[1] *PG Student, ME Computer and Communication, Sri Sai Ram Engineering College, Chennai 44;*
[2] *Asst. Professor, Department of IT, Sri Sai Ram Engineering College, Chennai 44.*

mahendranlavanya@gmail.com
suresh.priya.kumar@gmail.com

Abstract

Storage space demands in hospitals are continuously increasing the compression of recorded medical image. In Medicine Field Medical imaging has a great impact on medicine, especially in the fields of diagnosis and surgical planning. However, imaging devices continue to generate large amounts of data per patient, which require long-term storage and efficient transmission compression schemes produce high compression rates if loss of quality is affordable. However, in most cases physicians may not afford any deficiency in diagnostically important regions of images; called regions of interest (ROIs). In order to bring that, a high compression ratio with good quality in the ROI is thus needed. The general theme of this paper is to preserve quality in region of interest while allowing lossy encoding of other region apart from region of interest . The aim of this paper is to increase the compression ratio and to obtain good quality in region of interest. This technique will reduce the storage space, transmission cost, diagnostic analysis cost.

Keywords**-- ROI, compression ratio**

I. INTRODUCTION

When a more number of particular images is compressed, then more number of new images can acquire memory. In order to achieve this, a very high compression ratio is needed. This paper deals with intelligent compression based on MROI technique, in which SPIHT algorithm is used to increase the compression ratio of the particular image. It reveals the benefits of high compression ratio in an image and quality of image in ROI region. The SPIHT algorithm is commonly used on DICOM (Digital Imaging and Communication in Medicine). DICOM has been keeping pace with the standardization in representation of any medical images. This paper presents a method of employing both methods of lossy and lossless compression in an intelligent manner to achieve high compression ratio and good quality in region of interest. In lossy methods, some information is lost as the high compression ratio is the main target. In lossless methods, the exact original image is reconstructed from the compressed image. Thus, the compression rate is modest but quality will be good. In this compression technology, a region of interest (ROI) feature is introduced to overcome the loss of information in parts of an image which are more important than others. ROIs can be defined by the user and they are encoded with better quality than the rest of the image. In this technique the medical image is divided into three region primary, secondary and background.

The region that undergoes diagnostic analysis is considered as the primary region and other region are secondary and background. Lossless compression is applied over primary region and secondary and background undergoes lossy compression. Edges is also detected and preserved here.

ORGANISATION

This paper is organised as follows: section 2 consists of working model, results and analysis are in section3and finally the conclusion of this paper in section4.

II. WORKING MODEL

In this paper CT image is discussed to explain the concept of intelligent compression. CT image is divided into three regions. Such as primary region, secondary region, and background region. Two types of compression carried over here (i.e.) lossy compression and lossless compression. Lossless compressions are applied over primary and lossy to secondary and background. Then two types of coding is used here for encoding and decoding. Huffman coding is applied over the primary region, The DWT and SPIHT algorithm is applied over the secondary and background region. After applying these coding's to the corresponding regions we can able to compress the input image and get the high quality region of interest with edge detections.

International Journal of Emerging Technology and Advanced Engineering
Website: www.ijetae.com (ISSN 2250-2459 (Online), An ISO 9001:2008 Certified Journal, Volume 3, Special Issue 1, January 2013)
International Conference on Information Systems and Computing (ICISC-2013), INDIA.

Since lossless and lossy compression methods are used to get high compression ratio & high quality image, Efficient edge information is obtained by making use of sobel operator and it is fused with compressed image using fusion techniques are the advantages of this paper.

2.1 Spiht overview

SPIHT (Set Partitioning in Hierarchical Trees) is a lossy compression technique which can be adapted to lossless compression. It has an efficient combination with error protection and good image quality with high PSNR, Fast coding /decoding.SPIHT codes the individual bits of the image wavelet transform coefficients following a bit-plane sequence. Thus, it is capable of recovering the image perfectly (every single bit of it) by coding all bits of the transform.

However, the wavelet transform yields perfect reconstruction only if its numbers are stored as infinite-precision numbers. These principles are partial ordering by magnitude with a set partitioning sorting algorithm, ordered bit plane transmission, and exploitation of self-similarity across different scales of an image wavelet transform. The coding and decoding procedures are extremely fast, and they can be made even faster, with only small loss in performance. .

For SPIHT algorithm it can be seen that the compression ratio increase, when the levels of decomposition is increased. This is because, when the levels of decomposition are increased, coefficients with higher magnitude concentrate mostly on the root levels. Also most of the coefficients will have low magnitudes. These coefficients require only less number of bits to be transmitted. Hence the compression ratio will increase when decomposition level is increased. Encoding and decoding process occur at a faster rate when SPIHT is combined with discrete wavelet transform

2.2 Block diagram:

The image to be compressed is transformed into frequency domain using discrete wavelet transform. In the discrete wavelet transform the images are divided into odd and even components and finally the image is divided into four levels of frequency components. The four frequency components are LL, LH, HL, HH, and then the image is encoded using SPIHT and Huffman coding. Then the bit streams are obtained. The obtained are decoded using Huffman first and then using SPIHT. Finally inverse wavelet transform is taken and the compressed image will be obtained.

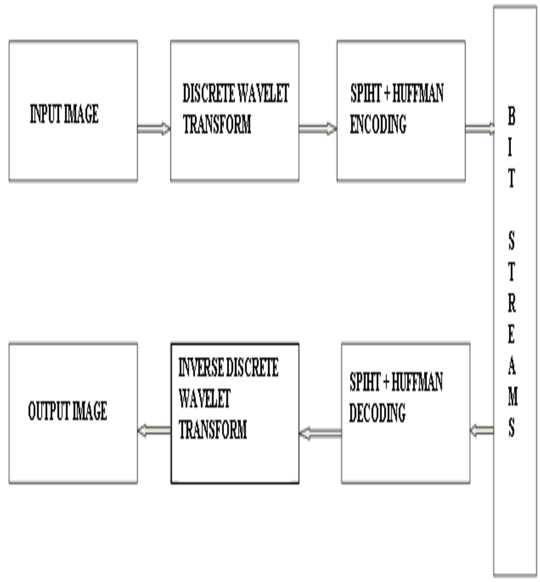

Fig.1Block diagram

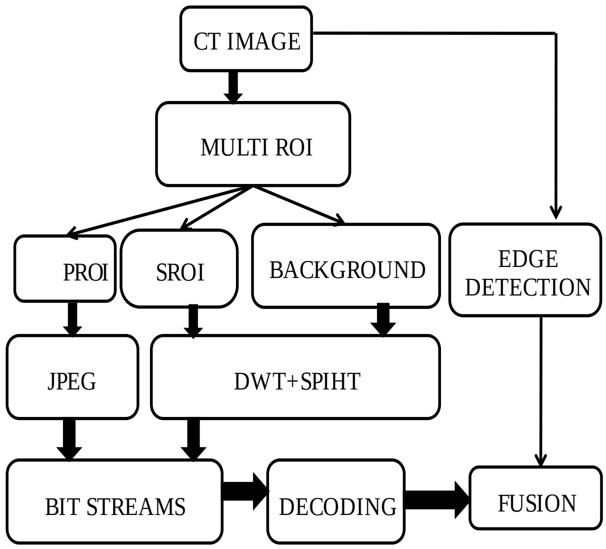

Fig.2Block diagram

2.3 Multi ROI

Multiple Region of Interest is a combination of three regions namely primary, secondary and background. The CT images are divided like an above regions and then compressed.

International Journal of Emerging Technology and Advanced Engineering
Website: www.ijetae.com (ISSN 2250-2459 (Online), An ISO 9001:2008 Certified Journal, Volume 3, Special Issue 1, January 2013)
International Conference on Information Systems and Computing (ICISC-2013), INDIA.

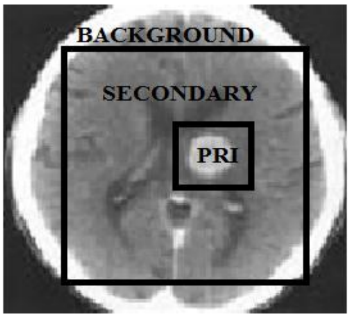

Fig.3.a.Multiple region of interest

Fig.3.b. Edge preserved image

Edges are those places in an image that correspond to object boundaries. Edges are pixels where image brightness changes abruptly. To avoid ringing artifacts we use edge detection. Edge preserving algorithm is applied to detect the edge.Sobel operator is used to detect the edges of the images.

III. Results And Analysis

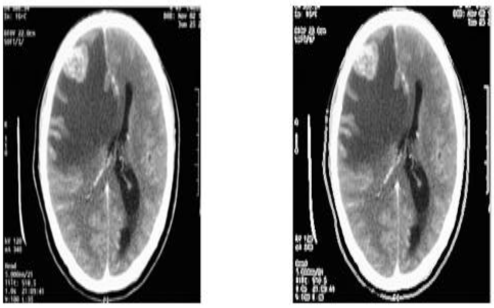

Fig2(a):size of image before compression:654KB Fig2(b):size of image after compression:14.8KB
Fig .2Meningioma

Table.1
Quality ratio

Quality Measures	**Fig.1**
Input image size	654KB
Output image size	14.8KB
Compression ratio	44:1
PSNR	51.9301

This image obtain good quality when the PSNR(Peak signal to noise ratio) is greater than 40

IV. Conclusion

Thus this paper proposed a technique of lossy and lossless compression over multiple region of interest to obtain high compression ratio and good quality in primary region and edges are detected and combined by fusion techniques.

REFERENCES

[1] P.G. Tahoces, J.R. Varela, M.J. Lado, M. Souto,"Image compression: Maxshift ROI encoding options in JPEG2000", Computer Vision and Image Understanding, vol.109 no.2, p.139-145, February,2008

[2] M. A. Ansari , R. S. Anand, "Context based medical image compression for ultrasound images with contextual set partitioning in hierarchical trees algorithm", Advances in Engineering Software, vol.40 no.7, p.487-496, July, 2009

[3] A. Bradley and F. Stentiford, "JPEG2000 and region of interest coding," presented at DICTA2002, Melbourne, Australia, Jan. 2002.

[4] G. Anastassopoulos and A. Skodras, "JPEG2000 ROI coding in medical imaging applications," presented at 2nd IASTED Int. Conf. Visualization, Imaging and Image Processing (VIIP2002), Malaga, Spain, Sept. 2002.

[5] Z. Liu, J. Ha, Z. Xiong, Q. Wu, and K. Castleman, "Lossy-to-lossless ROI coding of chromosome images using modified SPIHT and EBCOT," in Proc. IEEE Int. Symp. Biomedical Imaging, Washington,

[6] Ko, Y. Chen, J.Wong, and G. Jan, "A wireless PDA-based physiological monitoring system for patient transport," IEEE Trans. Inf.Technol. Biomed., vol. 8, no. 4, pp. 439–447, Dec. 2004.

[7] X. Kai, Y. Jie, Z. Y. Min, and L. X. Liang, "HVS-based medical image compression," Eur. J.Radiol., vol. 55, no. 1, pp. 139–145, Jul. 2005.

[8] S. Bacchelli and S. Papi, "Image denoising using principal component analysis in the wavelet domain," J. Comput. Appl. Math., vol. 189, no. 1,pp. 601–621, Jun. 2005

[9] A. & Pearlman, W. A., A New, Fast, and Efficient Image CodecBased on Set Partitioning in Hierarchical Trees. I.E.E.E. Transactions onCircuits and Systems for Video Technology, Vol. 6, No. 3, pp. 243-250,(June 1996).

[10] Compression of digital medical images based on multiple regions of interest. 2010 Fourth International Conference on Digital Society. 2010 IEEE Medical Imaging Research Group, Faculty of Computing and Information System and Mathematics, Penrhyn Road, Kingston upon Thames, KT1 2EE, UKM. Firoozbakht, J. Dehmeshki.

[11] Image Compression Based on Biorthogonal Wavelet Transform. Communications and Information Technology, 2005 ISCIT 2005. IEEE International Symposium on 12-14 Oct 2005.

[12] Image Compression Based on Wavelet and Quantization with Optimal Huffman Code. International Journal of Computer Applications 2010 by IJCA Journal Year of Publication 2010. Authors AshantaRanjanRoutray, Munesh Chandra Adhikary.