International Journal of Computational Research and Development (IJCRD)
Impact Factor: 4.775, ISSN (Online): 2456 - 3137
(www.dvpublication.com) Volume 1, Issue 2, 2016

ROI BASED MEDICAL IMAGE EPITOMIZE USING SPECK AND AAC

P. John Vivek*, K. Elangovan, R. Jayaram** & B. Mohammed Javeeth****
* Assistant Professor, Paavai Engineering College, Tamilnadu
** UG Students, Department of ECE, Paavai Engineering College, Tamilnadu

Cite This Article: P. John Vivek, K. Elangovan, R. Jayaram & B. Mohammed Javeeth, "ROI Based Medical Image Epitomize Using Speck and AAC", International Journal of Computational Research and Development, Volume 1, Issue 2, Page Number 26-29, 2016.

Abstract:
This paper proposes the ROI based medical image compression using SPECK and AAC for telemedicine applications. This is the hybrid image compression model for efficient transmission of medical image using lossless and lossy compression techniques. In this Dual tree complex wavelet with AAC will be used for lossless compression and for secondary region based wavelet transmission with SPECK coding for getting high compression ratio with less error rate. The SPECK method of energy efficient compression, in order to reduce the battery consumption during the transmission of images. Finally the performance of this hybrid compression method will be evaluated through parameters like MSE, PSNR and compression ratio.

Index Terms: AAC, MSE, ROI & SPECK

1. Introduction:

A Variety of medical images such as MRI, CT, ultrasound produced in the field of medical imaging requires more storage space and bandwidth. If the bandwidth is reduced without degrading the quality of the image, an adequate space can be obtained. The image compression technique plays a vital role in reducing the image size and thereby removes the data redundancies present in it. In other words, the image compression can be defined as the process of reducing the amount of data needed to represent a digital image. The need for image compression is to reduce the file size upto 60-70% and hence many files can combined into one compressed data which make the sending easier. Here data is the one by which the information is conveyed. The objective of image compression is to decrease the no. of bits required to store and transmit images without any measurable loss of information. Image compression is needed because it helps to reduce the consumption of expensive resources such as hard disc space and transmission bandwidth. If the redundancy present in the image is removed first and then the compression is achieved. The compression can fit more data in small memory and thus it reduces the memory space required as well as cost of managing data. The image compression can be classified into two types viz. Lossless and lossy compression and it has two distinct components such as an encoder and a decoder. The coding representation is used to remove its coding redundancies. The Lossy compression technique can achieve high rates of compression. But they reduce the accuracy of the constructed images by producing some distortions. The distortions may be visible (or) invisible. Here quantization is needed while encoding. In lossless compression, the statistical redundancy of image is used and the accuracy of reconstructed image is more. There is no need for quantization. Lossless schemes are reversible so that original data can be obtained. Compression methods are capable of delivering high reconstruction and quality of medical images. Once the storage or transmission of the compressed image is done, decompression can be performed to reconstruct the image. The advantages of image compression is easy to manipulate, compact to storage, recovering of distorted data etc. The applications of image compression includes gamma ray imaging, X-ray imaging, remote sensing, document and medical imaging, Ultrasound imaging, Satellite communication. In this paper, the compression of Secondary region (other than tumor part) is encountered by using Lifting based wavelet transform and SPECK Coding thereby evaluating performance parameters such as MSE, PSNR and CR.

2. Region of Interest:

ROI is often abbreviated as Region of interest. For a particular purpose, samples in the subset within a data is needed. The ROI method is commonly used in medical fielding which requires more storage space. In medical imaging the surrounding of tumor may be defined in ROI or in volume for measuring the size. The region of interest concept is introduced in proposed application in which Primary ROI is compressed by lossless technique and the secondary region is compressed by lossy technique. JPEG 2000 technique supports ROI Method. The interval in the time and frequency on the waveform is depends upon ROI. It can be described by given boundaries on an image of an object. The contour or the surfaces of the physical object is also defined in Region of Interest. An ROI is a form of notation, often associated with information expressed as text or in the structural form which is categorical or quantitative. For most medical images stored in hospitals, the significant information is selected over relatively small regions near 5-10% of the entire area. In such cases, the encoding of the regions at higher quality are lesser important regions. ROI is most commonly used in hospital and medical imaging as a selected portion of 2D, 3D.

3. Hybrid Compression Method:

The hybrid compression technique is needed for DICOM or ULTRASOUND images to overcome problem encountered in image processing. Any ultrasound or DICOM image contains three regions viz…

- ✓ Background
- ✓ Primary Region
- ✓ Secondary Region

Here the back ground region represents the part of an image that forms a setting for the main figures or image or appears furthest from the viewer. Here the parts are located in rear. The primary region is considered here is the tumor region in the image. Secondary region is the region other than the tumor parts. Hence the image is to compresse without degrading the quality of the entire image. Here complete lossless or lossy compression is achieved. The ROI is detected automatically eliminating all other noisy regions. Depending upon the selected region, a ROI mask is obtained to show which is the tumor affected region and other than tumor affected regions. ROI based medical image compression through the following process viz….

Clustering Model for Region Selection:

The MRI brain tumour image is taken as input image for this region based image compression. The tumour region is selected using K means clustering model. Hence the tumour region is obtained exactly. The secondary ROI will be extracted through mapping and clustering process.

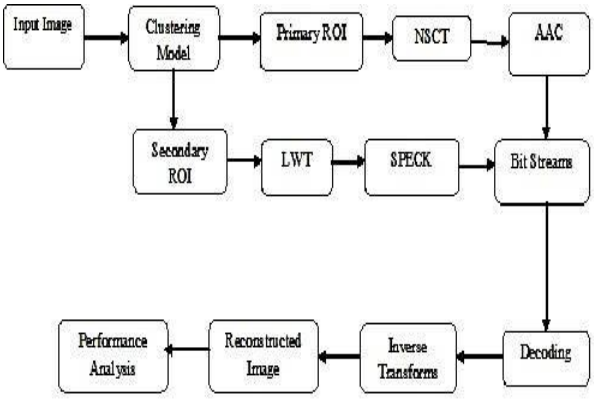


Figure 1: Block Diagram for Hybrid Compression Methods

The image other than tumour region (secondary region) to be compressed and transformed using Lifting wavelet Based transform. In wavelet transform the images are divided into sub band components and finally the image is divided into four levels of sub band components. The four sub bands components are LL, LH, HL, HH, and then the image is encoded using SPECK coding for non ROI part. As a result, the bit streams are obtained. The obtained bit streams are decoded using SPECK decoding to reconstruct the secondary ROI. In this paper, the performance parameters for Secondary ROI are evaluated and the output is shown. Finally inverse wavelet transform is taken to decoded coefficients and the decompressed image will be obtained.

A. Clustering Methods: The K-means algorithm is a step by step process that is used to divide an image into *K* clusters. The basic algorithm is:

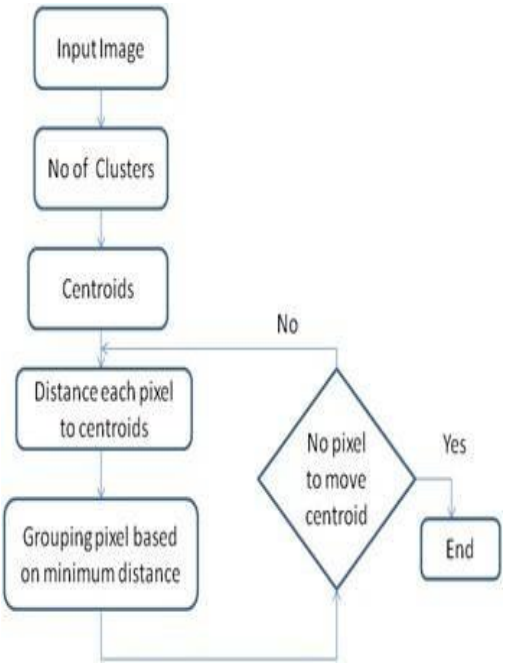
- ✓ *K* cluster centres are either picked by random process or based on process of heuristic
- ✓ Each pixel in the image is to be assigned to the cluster that reduces the distance between the pixel and the cluster centre.
- ✓ The cluster centres are recomputed by summing and averaging all of the pixels in that group.
- ✓ Repeat steps 2 and 3 until convergence is attained

(e.g. no pixels change clusters)

In this case, distance is the square of the difference or an absolute difference between a pixel and a cluster centre. The difference is typically based on colour of the pixel, intensity of image, texture position, and location, or a weighted combination of these factors. *K* can be selected manually, randomly, or by a heuristic.

B. SPECK: Set partitioning in embedded code Block is based on multi scale 2D DWT and exploits the self-similarity across scales by using set partitioning. The coefficients are ordered into a tree structure, called spatial orientation tree (SOT) after the transformation is completed. The SOT is defined by each wavelet coefficient (parent) in a certain decomposition scale has either no child (i.e., tree leave) or four children in the next finer scale and the coefficients in the low-frequency sub band are the tree roots. The SPECK is a most important image compression algorithm which generates a bit stream from the reconstructed images. The main characteristics of SPECK is the capability of progressive transmission and embeddedness. The progressive transmission represents the coefficients with higher magnitude is transmitted first. The Main aim is to

maintain the significant pixels and exploit clustering of energy in frequency and spatial in hierarchical structure of transformed image. The mean square error can be extracted at variety of bit rates. SPECK Coding algorithm contains four functions viz.. process {}, code{}, process I{}, code I{}. Previous work of the system is to improve the visual quality of embedded coders has applied just noticeable distortion thresholds for uniform noise in different sub bands to weight the transform coefficients but no distinction made between coefficients belonging to different activity regions inside a sub band. Hence the noise generated must be removed from the process.



4. Result and Discussions:

A. Quality Measures for Image: The Quality of the reconstructed image is measured in terms of mean square error (MSE) and peak signal to noise ratio (PSNR) ratio. The MSE is often called reconstruction error variance q^2. contains the tumour region and other regions. The input image is first pre processed to remove the noise and the same the quality should not be degraded. After pre processing, the image is divided into primary and Secondary ROI by using clustering method. After Partitioning, the secondary image is undergoing Lifting Wavelet Based Transformation where the image is divided into LL, LH, HL, HH. This process is to be done to obtain exact compressed image after the transformation process. By using SPECK, the Secondary region is reconstructed with better performance parameters.

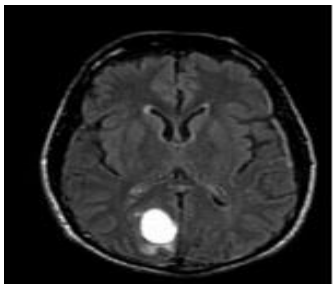


Figure 4.1: Input image

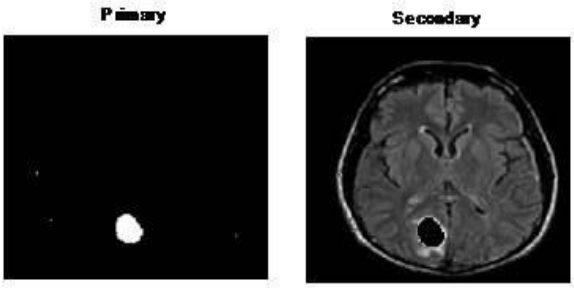


Figure 4.2: Selected Regions

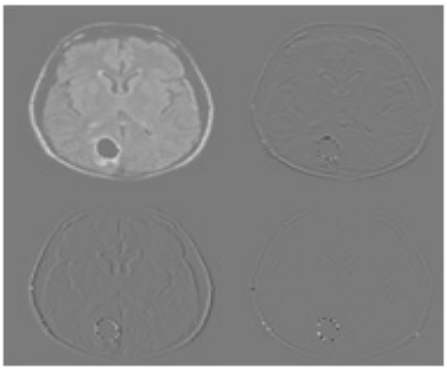


Figure 4.3: Image obtained using LWT

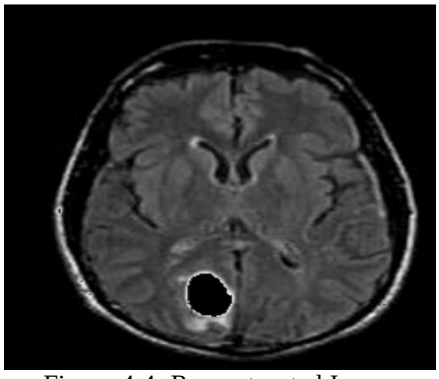


Figure 4.4: Reconstructed Image

The reconstructed image is only the secondary region which does not have the tumour region (primary region) which is exactly the image we required. For all the test images the parameters are evaluated which is shown in the following table.

5. Conclusion:

This paper describes about the ROI based medical image compression. The SPECK coding used here is to obtain better compression ratio which is improved from 0.9 to 1.6 compared to the existing techniques without changing the quality of the image. SPECK and AAC are used to get high compression ratio & high quality image. The future work of this project includes the compression of primary region by using Adaptive arithmetic coding (AAC) and Non subsampled countor transform (NSCT) technique and hence the performance parameters are evaluated

6. References:

1. Bairagi. V. K, Sapkal. A. M, "Automated region-based hybrid compression for digital imaging and communications in medicine magnetic resonance imaging images for telemedicine applications" published in IET Sci. Meas. Technol., 2012, vol. 6, Iss. 4, pp. 247–253
2. Sanchez.V, Abugharbieh.R, Nasiopoulos.P, "Symmetry- Based Scalable Lossless Compression of 3D Medical Image Data" IEEE Transactions on Medical Imaging, vol. 28, no. 7, July 2009.
3. Shaou-Gang Miaou,Fu-Sheng Ke, Shu-Ching Chen, "A Lossless Compression Method for Medical Image Sequences Using JPEG-LS and Interframe Coding", IEEE Transactions on Information Technology in Biomedicine, vol. 13, September 2009.
4. Raviraj.P, Pria Angel, Dr. Sanavullah. M.Y, "An Efficient Ultrasound Image Compression and Decompression Using DWT and Bayesshrink Algorithm", Georgian Electronic Scientific Journal: Computer Science and Telecommunications 2009,No.6(23), pp. 44–60
5. Vijideva.R, "Neural Network- Wavelet Based DICOM Image Compression And Progressive Transmission", International Journal of Engineering Science & Advanced Technology Volume-2, Issue-4, 702 – 710.
6. Praveen Kumar. E, Dr. Sumithra, "Medical Image Compression Using Integer Multi Wavelets Transform For Telemedicine Applications", International Journal Of Engineering And Computer Science , Volume 2 Issue 5 May, 2013 pp. 1663-1669.
7. Sujitha Juliet Devara,. Kirubakaran Ezra, and A.Allvin., "3D Medical Image compression for Telemedicine Application", ELSEVIER Lt., International Conference on Modelling, Optimisation and Computing 2012, pp. 570–578
8. Ilias Maglogiannis,Charalampos Doukas, George Kormentzas, Thomas Pliakas, "Wavelet-Based Compression With ROI Coding Support for Mobile Access to DICOM Images Over Heterogeneous Radio Networks"., IEEE Transactions On Information Technology In Biomedicine, Vol. 13, No. 4, July 2009, , pp. 547–588
9. Sheng-Fuu Lin, Hsi-Chin Hsini, Chien-Kun Su, "HybridImage Compression Based on Set-Partitioning