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DETECTION OF TUMOR BY SALIENCY BASED REGION OF INTEREST HYBRID COMPRESSION IN DICOM USED FOR WIRELESS COMMUNICATIONS

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***Abstract*—The distributed modern medical imaging equipment require the operation of system that store to transmit and display images. Picture archiving and communication system via a digital networks to enumerate the service with higher quality. The flux is given by transfer of images in DICOM when transferred in the wireless transmission. This paper describes the development and implementation of new compression techniques in medical images using combination of region of interest, saliency, ASPIHT and JPEG 2000 algorithm that can be suitable for the wireless communication and by k-means medoids the MMSE and PSNR can be improved efficiently. At the end of the process the tumor is extracted from the MR image and exact position and shape is also determined.**

***Index terms* - Abnormalities, Brain Tumor, Region of Interest, K-Means Medoids, Saliency Detection.**

I. INTRODUCTION

This paper deals with the digital imaging and communication in medicine (DICOM) aims to detect and identify the MRI image. This is done by free open source tool software and next preferred with ASPIHT algorithm which will enhance the quality of the image. K-means clustering method is used before in which the centroids of the images are detected. In the proposed system this will be enlarges by using algorithm such as saliency, region of interest and with compression standards of ASPIHT and JPEG 2000. In which by using preferred k-means medoids techniques that is to process used to create images of the human body.

The detection of tumor is important for that treatment. They are mass and malignant. In medical image processing segmentation has been used for various purposes. It provides an easier way to analyze and represent an image.MRI is observed to play an important role in brain abnormalities research in determining size and location of affected tissues.

K-Nearest neighbor technique is the simple, conceptually and computationally that provides good classification accuracy. The K-NN algorithm is based on the distance function and a voting function in k-nearest neighbors, the metric employed is the Euclidean distance.

II. LITERATURE SURVEY

Image compression of medical images

Amandeep kanur and monica goyal [1] "A Review: ROI Based Image Compression Of Medical Images" (IJARCSMS) Vol. 2, Issue 11, Nov. 2014. This presents techniques give better performance in terms of computation and speed of computation is high. In which there is not a single algorithm for an optimized values.

Saliency in video compression

H. Hadizadeh and I. V. Baji'c, [2] "Saliency-aware video compression," IEEE Trans. Image Processing, Vol. 23, Jan. 2014. This presents that it provides additional side information for the decoder to identify the correct replacement blocks for concealment. In which the event that a perfectly matched blocks cannot be unambiguously identified.

Dicom using free open source software

L. R. Alvarez and R. C. Vargas Solis, [3] "DICOM RIS/PACS telemedicine network implementation using free open source software," IEEE Latin America Transaction, Vol. 11, No.1, Feb. 2013. This presents the transfer of images in DICOM to the various devices that make up a DICOM network. In which it does not perform any algorithm and follow any protocol this will reduce the efficiency of the images to be detected.
This method can be slightly altered to get the modified Itti-Koch algorithm in which the initial feature extraction process is carried out.

Dicom for telemedicine

V. K. Bairagi and A. M. Sapkal, [4] "Automated region-based compression for digital imaging and communications in medicine magnetic resonance imaging images for telemedicine applications". Institute of Engineering and Technology Jan. 2012. This presents the automated ROI- based medical image compression thus the image is reconstructed property with less complexity. In which it does not care about the ROI part in wavelet decomposition.

III. PROPOSED ARCHITECTURE

The step by step process is based on region of interest using saliency detection and segmentation is given in a form of block diagram as shown in figure 1.

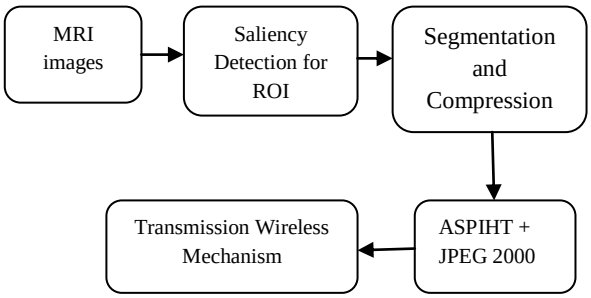

Fig. 1. Block Diagram of Proposed System

The MRI image to be detected is transformed to region of interest using saliency detection. In which there exist feature extraction process. The transformed image is segmented using k-means medoids method in which the portion of the image to be detected is accurately determined. Then the image is further given to advanced set partitioning in hierarchical trees (ASPIHT) and JPEG 2000 standards.

By using these standards we get more compression of the image to be transmitted in a wireless medium.

IV. ENCODING TECHNIQUES

a) Segmentation Of Brain Abnormalities Using K-NN

The proposed brain abnormalities segmentation method is based on k-NN. THE k-NN rule is used to construct important steps as below:

- A small value of k may influence the result by individual cases, while a large value of k may produce smoother classification outcomes.
- Image segmentation is typically used to locate and boundaries in image.
- It performs filtering of noise and other artifacts in the image and sharpening the edges in the images.
- The main objective of image segmentation is to partition an image mutually exclusive and exhausted regions.
- Such that each region of interest is spatially contiguous and the pixels within the region are homogeneous.

It is computationally efficient and the exact portion of the tumor id determined. During the image transmission for telemedicine purposes, these regions are required to be transmitted first or at higher priority. In addition to its remarkable compression gain, the algorithm is accurate, since there is no degradation of diagnostic quality of ROI.

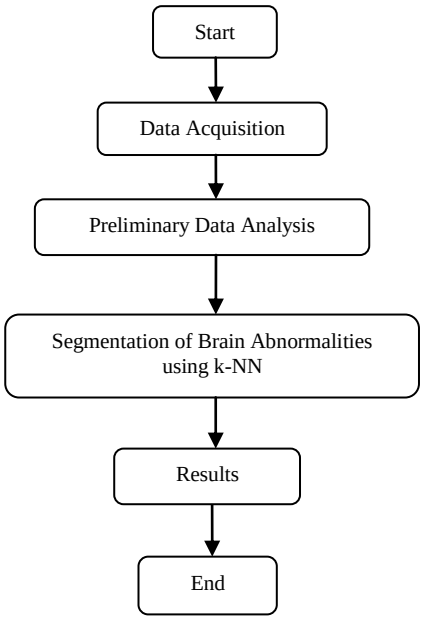

Fig. 2. Steps of K-NN Segmentation

The distance between the query instance and the training samples are executed. The formula of Euclidean distance is used as the objective function.

b) Saliency Detection

Saliency detection is important technique involved in the process of DICOM such that the region of interest for MRI images. Such that the part of region of interest and part of non-region of interest are trap down separtely. In which the image compression process is carried out it is mainly useful in reducing the storage and transmission bandwidth requirements of medical images.

Our detection algorithm on the premise that we can mahe assumptions about the scale of the object of

detection based on its position in the image. However central a pixel can be inside an object is limited by how far the pixel is from theboundary. A pixel belonging to a salient object near the boundary will be less central inside the object.

c) Region Of Interest

MRI images possess high amount of contrast for soft yisues such as tumors. The basis of the algorithn is on the grey level intensity variation of the image. The ROI is blacker than the surrounding part. It is used fo construction which uses adaptive thresholding to pop out the important regions. The main intention of using saliency map on a medical image is to have an effect of blurring n the image is as shown in figure 3.

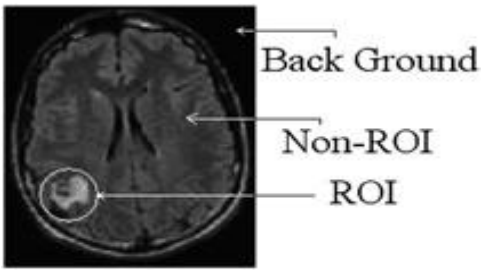

Fig. 3. Different parts of the medical image

So that the prominent regions containing most of the diagnostically important information can be recognized. The principle used here is based on human visual perception. Since the application is that of medical diagnosis, human perception is of utmost importance. The main objective of the salience map is to highlight any pixels that vary from the rest of the background and catch the human attention.

K-means clustering classifies n voxels into K clusters or classes. This algorithm chooses the number of clusters (K) then randomly generates k clusters and determine the cluster centers. The next step is assigning each point in the volume to the nearest cluster center and signal with localization in both time and frequency. Clustering technique is based on multi threshold values which can be set depending on the image histogram. This is the process of classifying each group of pixels in an image into one class, each class has the same or similar properties which evaluate a specific part of an image.

Steps to find ROI

The following are the steps involved in the ROI extraction process:
Step 1. Read image and get its dimension.
Step 2. Transformation: HSI transformation is performed. The HSI model is more consistent with human space model an visual perception than the RGB color.
Step 3. The regions in medical images with high contrast have rich information and are most likely to attract human attentions.
Step 4. Calculate the salience and segmentation is done using threshold.

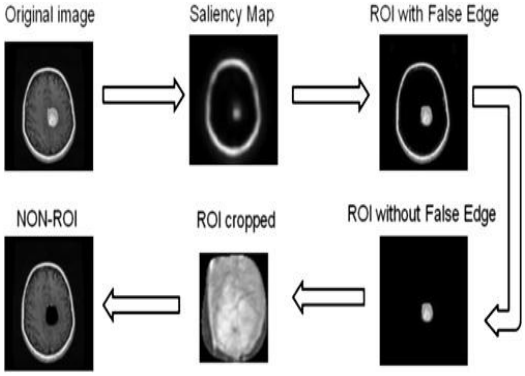

Fig. 4 ROI extraction process

K-MEANS MEDOIDS

In some applications each centre to be its points itself. This is were k-medoids is similar to k-means algorithm, except when fitting the centre $C_1,\ldots C_k$ we restrict our attention to the point themselves. The distance may be of simple Euclidean distance function. Then is to cluster the data and is of simplest partitions clustering method. If the distance is near to the centre then move to that cluster.

K-means and K-medoids in R

The K-means algorithm is part of the based distribution in R, given by the k-means function
e.g

```
km=k means ( x, centers=k,
nstart=10,algorithm=”Lloyd”)
```

The K-medoids algorithm is implemented by the function PAM (Partition around medoids) in the package cluster. It starts by partitioning the input points into k initial sets, either at random or using some heuristic data.

V. COMPRESSION STANDARDS

a) ASPIHT

Advanced set portioning in hierarchical trees, it is main feature of the proposed coding method is that the ordering data is not explicitly transmitted. It is based on the fact that the execution path of any algorithm is defined by the results of the comparisons on its branching points. So, if the

encoder and decoder have same sorting algorithm, then the decoder can duplicate the encoder's execution path if it receives the results of the magnitude comparisons and the ordering information can be recovered from the execution path.

The coder is an enhanced image compression algorithm from which the best reconstructed images can be extracted at various bit rates. To reduce the number of magnitude comparisons it is defined by set of partitioning rule that uses an expected ordering in the hierarchy defined by the sub-band pyramid. To indicate the significance of coordinates T, the formula is shown in figure 5.

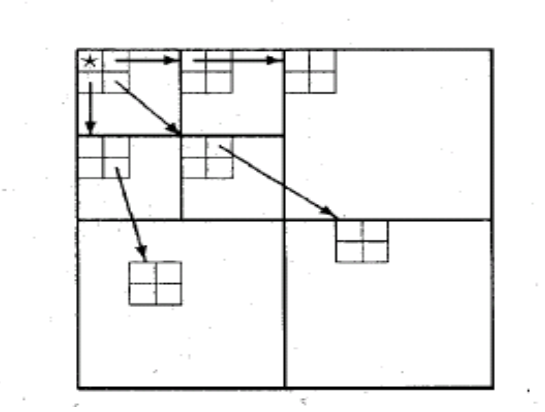

Fig.5 Spatial orientation tree

b) JPEG 2000

This compression standard consists of encoder and decoder. At the encoder, the discrete transform is first applied on the source image data. The transform coefficients are then quantized and entropy coded before forming the output stream. At the decoder side, inverse DC level shifting is performed on reconstructed samples of components that are unsigned only. If used it is performed after the computation of the inverse component transform.

Arithmetic coding is used in the last part of the encoding process. The MQ coder is adopted in JPEG 2000. This coder is basically similar to the QM-coder adopted in the original JPEG standard. The JPEG 2000 specifies scaling-based ROI coding only for rectangular or elliptic areas of a 2-D image, the concept of scaling-based ROI coding can be easily extended to arbitrary shape ROI coding, shape information has to be transmitted to the decoder unlike the max-shift ROI coding.

c) Comparison Of Jpeg With Jpeg 2000

JPEG 2000 offers both lossy and lossless compression. It has high compression ratio. It has ability to display images at different resolution and sizes it can handle file size up to 256 channels of information compared to current JPEGstandard. JPEG does not offer lossless compression. It does not have high compression ratio. It displays at its same input.

VI. RESULTS AND DISCUSSION

The result shows the discussion of the how an image with tumor is detected and transmitted through a wireless medium with the following steps:

- Input image.
- Resized input image.
- Filtered image.
- Enhanced image.
- Non-ROI region.
- K-means medoids
- Compressed image.

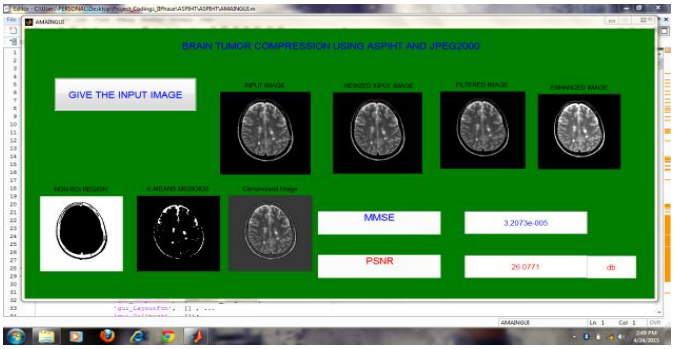

Fig.6 Simulation of DICOM through a wireless transmission

A) Performance Evaluation

The performance evaluation of the transmitted gives the ROI and non- ROI region in which the exact portion of the infected tissues or areas are removed effectively. It can be calculated mathematically by MMSE and PSNR values. The ratio gives the performance ability of the standards.

The result of comparison between previous value and obtained value of MMSE and PSNR are discussed below:

Input image	**Performance**	**MMSE**	**PSNR**
MRI image	Existing system	4.4654	50.717
MRI image	Proposed system	0.00532	26.0771

Table 1. Performance Evaluations

From the above result the detection of the accurate position and size of the image can be determined much more accurate than the technique preferred before it. It is that before they have been preferred to use K-means clustering method to find the abnormality part. This has less efficiency. So K-means medoids method is preferred in order to increase the efficiency of the image for accurate determination of the affected part in medical image. The MMSE and PSNR ratio are much reduced when compared to the previous techniques.

VII. CONCLUSION

This project presented ways to improve the estimation of the MRI images such that they are compressed and are transmitted through a wireless transmission medium. The proposed techniques of saliency, ASPHIT and k-means medoids method has been used such that the ratio and noisy environment is reduced. Accuracy is much more than the previous one. Unlike the PSNR and MMSE ratio is decreased. And also the distortion in the images is reduced in the wireless transmission. In this project, performance will be analyzed through determining the image quality after decompression, compression and execution time.

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