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Segmentation and Extraction of Brain Disease in an MRI Image

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ABSTRACT*:* There are plenty of researches are done on medical imaging system, in this field brain disease extraction in Magnetic Resource Imaging (MRI) is a standard process. From MRI brain images will extract the information regarding disease, during extraction will do detection, localization, tracking, enhancement and recognition of brain disease, this help in finding exact location and size of a tumor or other diseases causing elements. MRI technique helps in collecting the best information about the human soft tissue anatomy. We are adoptive Histogram equalization technique for image enhancement for better picture quality. Adaptive k-means clustering is using for image segmentation, it is used to extract various features of the image, in order to build objects of interest segmented images are merged or split, on these merged and split images analysis and interpretation can be performed. The approach concentrates on the detection of brain diseases part in MRI images.

KEYWORDS*:* Histogram equalization technique, Adaptive k-means clustering.

I. INTRODUCTION

There are plenty of researches are done on medical imaging system, in this field brain disease extraction in Magnetic Resource Imaging (MRI) is a standard process. In medical imaging, many image analysis applications developed for medical diagnosis involves segmentation of tissues and structures. Image segmentation helps in diagnosis of brain diseases and helps in quantitative analysis of MR images such as measuring accurate size and volume of extracted portion. Exact identification in brain diagnosis is complicated because of different shapes and sizes of tumor. There will be loss and abnormalities during treatment plans and evaluation of disease progression of that disease affect specific tissues or structures. Manual segmentation is tedious and time consuming but it is accurate but can't use it practically. For clinical applications automatic segmentation techniques will be useful if they have ability to segment like an expert, excellent performance for diverse datasets and reasonable processing speed for large datasets because it is tedious and time Consuming. Digital Image processing is an emerging field in which doctors and surgeons are getting different easy pathways for the analysis of complex disease such as cancer, brain tumor, breast cancer, kidney stones, etc. The detection of brain disease is a very challenging task, in which special care is taken for image segmentation. A particular part of body is scanned in the discussed applications of the image analysis and techniques such as MRI, CT scan, X rays. MRI technique helps in collecting the best information about the human soft tissue anatomy. We are adoptive Histogram equalization technique for image enhancement for better picture quality. Adaptive k-means clustering is using for image segmentation which is used to extract various features of the image. Image segmentation is a technique of portioning of an image into groups of pixels which are homogenous with respect to some criterion. Different groups must not interact with each other, and adjunct groups must be heterogeneous. Segmentation algorithms are area oriented instead of pixel oriented. The result of segmentation is the splitting up of the image into connected areas. Thus segmentation is concerned with dividing an image into meaningful regions.

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II. LITERATURE SURVEY

Abidin Altıntaşet Et.al [1] Extracorporeal Shock Wave Lithotrispy(ESWL) is a procedure based on sound waves to crash kidney stones on the focus. The sound waves are sent to the body of patient when the kidney stone is not even on the focus. A.R Kavita Et al. [2] has proposed an effective modified region growing technique for detection of brain tumour. They modified region include comparative for modified region growing using both the Feed Forward Neural Network (FFNN) and Radial Basis Function (RBF) neural network. The MRI image dataset taken from the publicly available sources contains 40 brain MRI images in which 20 brain images with tumour and the other 20 brain images without tumour. J.Mehena Et al. [3] has proposed a model on brain tumor segmentation and extraction of MR images based on improved watershed transform. In this they have done improvement to the watershed transform in this paper for the extraction of brain tumor based on segmentation and morphological operator. The tumor may be benign, pre-malignant or malignant and it needs medical support for further classification. V. Grau Et.al [4] has proposed a system on improved watershed transform for medical image segmentation using prior information. In this they have considered watershed transform to detect the medical image and for segmentation, there will be a less efficiency in the proposed system so they enhanced the technique which they used.

III. METHODOLOGY

Figure 1 represents the proposed architecture. Initially will consider patient brain scanned imaged as input image, these images is then pre-processed into gray scale conversion and will resize the image according to our input variability. Next, Histogram equalization technique is used for image enhancement, after enhancement done we have to remove unwanted distractions like noise in the enhanced image will apply non-local mean filtering technique, then the noise free image is subjected to segmentation by applying adaptive k-means clustering method, in order to find out the region of interest in an segmented image will make use of segmentation done on the image and segments which contain diseases part is used to detect the tumor part in the image and considering the location and size of the tumor will analyze the result.

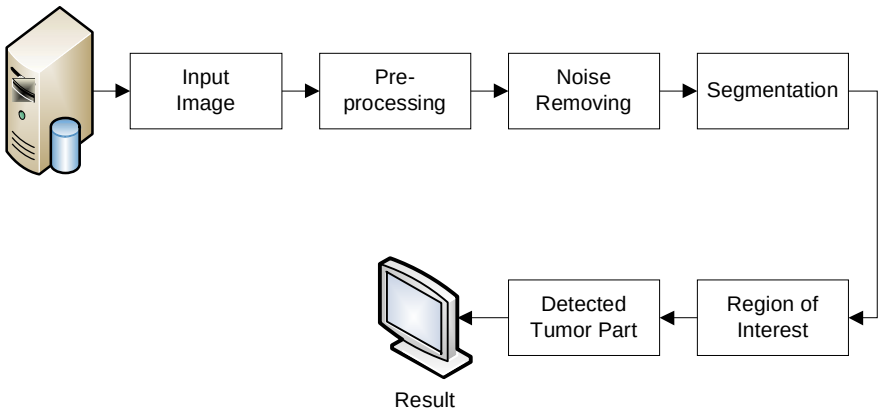

Fig. 1. Block Diagram of proposed system.

A. PRE PROCESSING

Pre-processing is mainly used to convert the image into grace scale image and to adjust the size of the image and removal of noise. Pre-processing is any form of signal processing for which the output is an image or video, the output can be either an image or a set of characteristics or parameters related to image or videos to improve or change some quality of the input. This process will help to improve the video or image such that it increases the chance for success of other processes. In this paper we considered image as input and these images are subjected to pre-processing this

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will resulting in gray scale conversion and resizing. In pre-processing will use histogram equalization technique for image enhancement.

B. NOISE REMOVEL

In order to get noise free images we are implementing non-local means filtering method. The non-local mean filtering is used for de-noising the image in image processing field. It considers a mean of all pixels in the considered image, weighted by how similar these pixels are to the comparing image. By using this method will get greater post-filtering clarity of an input image and loss will be very negligible. There are many noise removal techniques are available but when compare those with the method which we are using is the best among all because in this method noise looks like white noise which can be negligible.

The algorithm is defined as

$$u(p) = \frac{1}{c(p)} \int_{\Omega}^{0} v(q) f(p,q) dq \quad (1)$$

Where Ω is the area of an image, and p and q are two points within the image, u(p) is the filtered value of the image at point p, v(p) is the unfiltered value of the image at point q, f (p, q) is the weighting function, and the integral is evaluated over $\forall q \in \Omega$.

$$u(p) = \frac{1}{c(p)} \sum_{q \in \Omega} v(q) f(p,q) \quad (2)$$

$$c(p) = \sum_{q \in \Omega} f(p,q) \quad (3)$$

C. ADAPTIVE K-MEANS CLUSTERING

In order to generate a segmented image knowing the number of classes in the beginning itself the popular K-means clustering method is implemented in this paper. According to the criterion of minimizing the Euclidian distance between feature vectors this clustering method is implemented, the fused features must be necessarily normalized. The normalization should comply with a rule that each feature component should be treated equally for its contribution to the distance. This method is implemented to prevents certain features from dominating distance calculations merely because they have large numerical values. As the feature vectors for segmentation are spread due to the presence of subclasses, it can be quite inappropriate to normalize the feature vector to be of zero
mean and unit variance. This paper uses a linear stretch method to normalize each feature component over the entire data set to be between zero and one. As the number of texture features used for fusion is overwhelmingly larger than the number of tonal features, it is reasonable to assign different weights to cases where the texture and tonal features are combined so that the contribution of tonal features is similar to that of texture features. After done with segmentation of the noise free image in order to find out the region of interest will consider the segmented images which are having disease part and will mark those place in the image and will subject those images for result analyze on the basis of efficient image segmentation will find out the tumor in the mage.

IV. EXPERIMENTAL RESULT

The experimental result for the above discussed methodology is discussed in this section. Figure 2 represents the overall experimental results. Figure 2 (a) represents input image this image is preprocessed and enhanced by using histogram equalization technique shown in Figure 2(b). Next will apply non-local means filtering algorithm as shown in Figure 2(c) for de-noising, after de-noising will go for segmentation and for region of interest will get tumor detection region as shown in Figure 2(d), finally will get marked tumor region and will take image of marked tumor region as shown in Figure 2(e).

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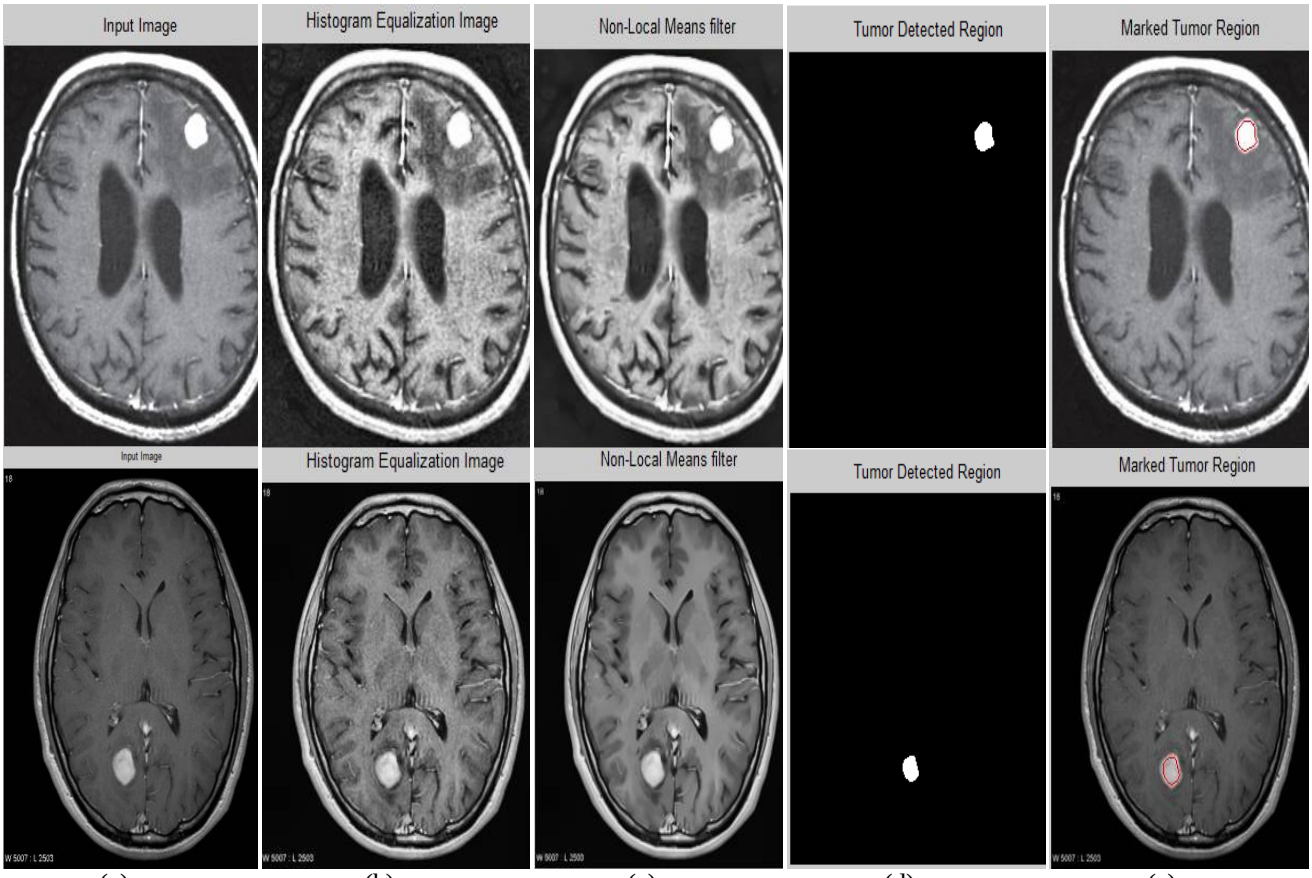

(a) (b) (c) (d) (e)

Figure 2: (a) Input image; (b) Histogram equalization Image; (c) Non-local Means Filter; (d) Tumor Detected Region; (e) Marked Tumor Region.

Figure 3 represents the performance analysis of the proposed architecture. In the existing system, images is taken from the database and subjected to tumor detection. The acquired ultrasound (US) image consists of speckle noise and is of low contrast, to overcome speckle noise, and low contrast, pre-processing of image restoration is required. The very purpose of image restoration is to reduce the degradations that are caused during acquisition of US scanning. In the existing system for proper orientation, level set function was used and segmentation is done using threshold and tumor part has been detected. Main objective of our proposed work is to detect disease part in an image using efficient approaches. We initially take an input image and apply pre-processing step which includes resizing and color conversion followed by noise removal using filtering algorithm. We use segmentation In order to obtain the region of interest in an image. Segmented image is then used for the detection disease part in an image. The efficiency in the experimental results of proposed system demonstrate how effective we can find the tumor part from brain images.

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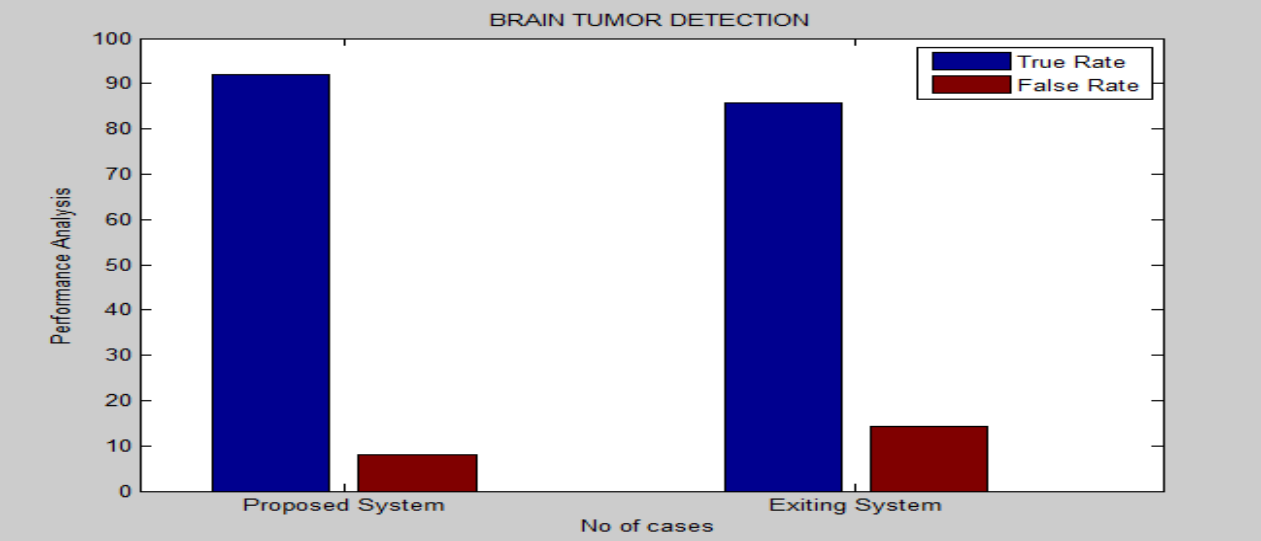

Figure.3: Performance Analysis Graph

V. CONCLUSION

There are plenty of researches are done on medical imaging system, in this field brain disease extraction in Magnetic Resource Imaging (MRI) is a standard process. MR image segmentation is an important but inherently difficult problem in medical image processing. In general, it cannot be solved using straightforward, conventional image processing techniques. Due to the characteristics of MR images, development of automated algorithms is challenging. There is a significant inter-patient variation of signal intensities for one same tissue type because of partial volume effect, inherent noise and wide range of imaging parameters, which affect the tissue intensities. We have proposed an efficient classification system based on Adaptive k-means clustering approach to detect the brain tumor and effective use of non-local mean filtering algorithm for noise removal in an images gives the more clarity in an images. The brain tumor detection is a great help for the physicians and a boon for the medical imaging and industries working on the production of CT scan and MRI imaging.

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