An Automatic Brain Tumor Detection Using Clustering Technique

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Abstract- *Brain is a important part of the body. Brain tumor is an mass of tissue in which some cells grow abnormally. The growth of a tumor takes up space within the skull and interferes with normal brain activity. So detection of the tumor is very important in earlier stages. Various techniques were developed for detection of tumor in brain. This paper focused on survey of well known brain tumor detection algorithms that have been proposed so far to detect the location of the tumor. The main concentration is on those techniques which use image segmentation to detect brain tumor. These techniques use the MRI Scanned Images to detect the tumor in the brain. Differences between some well-known techniques are also considered in this paper.*

Keywords- MRI Image, Brain Tumor, Image processing Technique.

I. INTRODUCTION

In medical imaging technique, magnetic resonance imaging (MRI) images are used to provide detailed information about the internal tissue of respective image. In the diagnosis of brain tumor, determination of the exact location is an important task, using which helps to find out the shape &size of tumor. In brain tumor detection techniques, image segmentation plays an vital role there are many image segmentation methods are used to extract tumor from magnetic resonance imaging (MRI) images of brain. Whereas segmentation provides the detailed information about the soft brain tissues such as gray matter(GM), white matter(WM), cerebral spinal fluid (CSF)etc. There are two types of segmentation involves a manual segmentation and automatic segmentation. Manual segmentation technique depends on experience or expert knowledge of human and time consuming technique but reduces the computational efficiency. Whereas automatic segmentation deals with histogram. Which is only based on the intensity of pixels. In this review paper, some image segmentation techniques are introduced as, SOM clustering, k-means clustering and fuzzy c-mean algorithm etc. And also a comparative study of different techniques of brain tumor detection using MRI images. Medical imaging is useful to diagnose the non-invasive possibilities. The various types of medical imaging technologies based on non-invasive approach like; MRI, CT scan, Ultrasound, SPECT, PET and X-ray. In the field of medical diagnosis systems (MDS), Magnetic resonance Imaging (MRI), gives the better results rather than Computed Tomography (CT), because Magnetic resonance Imaging provides greater contrast between different soft tissues of human body [3]. In MRI-scan is a powerful magnetic fields component to determine the radio frequency pulses and to produces the detailed pictures of organs, soft tissues, bone and other internal structures of human body. The MRI-Technique is most effective for brain tumour detection. The brain tumour detection can be done through MRI images. In image processing and image enhancement tools are used for medical image processing to improve the quality of images. The contrast adjustment and threshold techniques are used for highlighting the features of MRI images. The Edge detection, Histogram, Segmentation and Morphological operations play a vital role for classification and detecting the tumour of brain. The various steps of MR imaging like; pre-processing, feature extraction, segmentation, post-processing, etc. which is used for finding the tumour area of MRI-images. The Fig.1 shows basic structure of feature extraction through digital image processing.

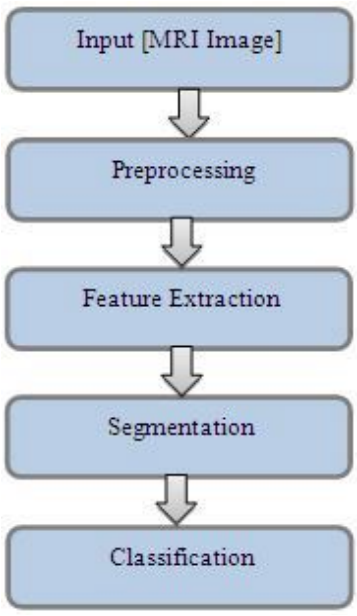

Figure. 1 Flow chart

II. LITERATURE REVIEW

The following techniques have been developed for detection of brain tumour. Nemir Ahmad Al-Azzawi et al, described approach for detection and extraction brain tumour from MRI scan images of brain. Asymmetry of brain is uses for detection of abnormality, after detect of the tumor. The segmentation based on F-transform (Fuzzy transform) and morphological operations are performing to delineating brain tumour boundaries and calculate the area of the tumour. The F-transform is a professional intelligent method to handle uncertain information and to extract the silent edges. Accuracy and precision are co-dependent [1].

Paul Kleihues et al, states that histological typing of tumors of the central nervous system reflects. The progress in brain tumor classification which was achieved. Several new tumor entities have been added, including the pleomorphic xanthoastrocytoma, central neurocytoma, the infantile desmoplastic neuro, a strycytoma / ganglioma and the dysembryoplastic neuroepithelial tumor. The WHO grading scheme was revised and adapted to new entities but its use, as before, remains optional [2].

D.Judehemanth et al, states that the clustering approach is widely used in biomedical application particularly brain tumor detection in MR images. Fuzzy clustering using fuzzy C- means algorithm proved to be superior over the other clustering approaches in terms of segmentation .But the major drawback of the FCM algorithm huge computational time required. computational rate is improved by modifying the cluster center and membership value updation criteria[3].

Charutha S. et al,demonstrated that brain tumor is the most life threatening diseases and hence its detection should be fast and accurate. The modified texture based region growing and cellular automata edge detection are efficient techniques, incorporation of both enhance the efficiency of brain tumor detection. It is understood that the modified texture based segmentation integrated with the cellular automata edge detection is better when compare to the one with the incorporation of classical edge detection methods[4].
Azian Azamimi Abdullah et al, proposed a brain tumor detection method based on cellular neural network. To examine the location of tumor in the brain, MRI is used. This procedure is really time and energy consuming. To overcome this problem, an automated detection method for brain tumor using CNN is developed[5]. Ishita Maiti et al, proposed watershed method is used in combination with edge detection operation for brain tumor detection. It is color based brain tumor detection using color brain MRI image in HSV color space. The RGB image is converted into HSV color image. After combining the three images final brain tumor segmented image is obtained[6]. R. preetha et al, states that the boundary of tumor tissue is highly irregular. Deformable model and region based methods are extensively used for medical image segmentation, to locate the boundary of the tumor. Clustering of brain tumor images using, fuzzy C-means is robust and effective for tumor localization. Even though the proposed method has high computational complexity, it shows superior result in segmentation[7].

ArjunNichal et al. states that For detection of unusual growth of tissues and blocks of blood in nervous system can be seen in an MRI Images. The first step of detection of brain tumor is to check the symmetric and asymmetric Shape of brain which will define the abnormality. After this step the next step is segmentation which is based on two techniques 1) F-Transform (Fuzzy Transform) 2) Morphological operation. These two techniques are used to design the image in MRI. Now by this help of design we can detect the boundaries of brain tumor and calculate the actual area of tumor [8].

Different techniques were described for brain tumor detection purpose mentioned as above. But the proposed system has better performance as compared to these techniques. Developing an algorithm for the brain tumor detection and segmentation in order to overcome the accuracy and computational problems. There are two main stages for proposing an algorithm. First stage is based on study of asymmetry of the brain. A healthy human brain is roughly symmetrical bilaterally with respect to the midsagittal plane, so this system will use symmetry analysis of grey level to detect the existence of tumor. The second stage is segmentation based on edge detection. System will introduce an edge detection based on F-transform model which capture the silent edges .After edge extraction, a morphological operation for the final stage to show only tumor[1].

III. IMAGE PROCESSING TECHNIQUES

A. Median Filtering for Noise Removal

Median filter is a non-linear filtering technique used for noise removal. Median filtering is used to remove salt and pepper noise from the converted gray scale image. It replaces the value of the center pixel with the median of the intensity values in the neighborhood of that pixel. Median filters are particularly effective in the presence of impulse noise. Impulse noise is also called as salt and pepper noise because of its appearance as white and black dots covered on image.

B. Image Enhancement

Poor contrast is one of the defects found in acquired image. The effect of that defect has great impact on the contrast of image. When contrast is poor the contrast enhancement method plays an important role. In this case the gray level of each pixel is scaled to improve the contrast. Contrast enhancements improve the visualization of the MRI images. [8] contrast enhancement technique is used for enhance the MRI image is shown in figure 3.

Fig.3 (a) Reduced Contrast **Fig. 3 (b)** Increase contrast

C. Edge Detection

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision. Common edge detection algorithms include methods like Sobel, Canny, Prewitt, Log, and Zero cross. Edge detection methods are used for finding object boundaries from MRI images and the results are shown in figure 4.

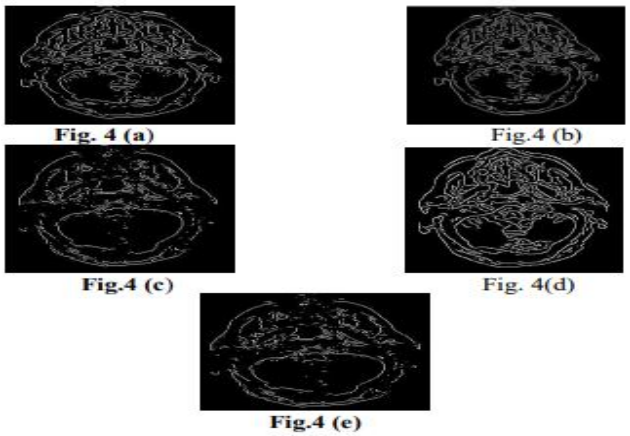

Figure.4(A) Log operator (B) Sobel operator (C) Canny operator (D)Prewitt operator

IV. CONCLUSION

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

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