An Automatic Brain Tumor Detection Using Clustering Technique

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Abstract— **Brain tumor detection in image processing in MRI images. The method of brain tumor segmentation is the separation of tumor area from Brain Magnetic Resonance (MR) images. There are number of methods already exist for segmentation of brain tumor efficiently. 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. the brain tumors are detected easily from brain MR image using region based approach but required level of accuracy, abnormalities classification is not predictable. The segmentation of brain tumor consists of many stages. Manually segmenting the tumor from brain MR images is very time consuming hence there exist many challenges in manual segmentation. In this research paper brain tumor detection is implemented by use of c means clustering and also the tumor area is calculated**

Keywords- MRI Image, Brain Tumor, C-mean, Segmentation.

I. INTRODUCTION

Anatomical structure for human body overcomes different modalities, for instance, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and so on. Pictures as of modalities will be used as examination reason. MRI Brain images are used by the doctors for proper treatment. Cerebrum tumor segmentation from MRI brain pictures is truly a troublesome assignment. The size and state of cerebrum tumor have numerous varieties. Furthermore, brain. tumor can be situated at any locale and has distinctive power of pictures. The segmentation of cerebrum tumor is critical for surgical arranging. Generally, the tumor area in attractive reverberation imaging was followed by hand. This strategy is infeasible when managing extensive information set. This strategy requires extensive measure of master mediation and adequate data about the object of interest. This process is very difficult and also time consuming. Image segmentation will be the expansive & dynamic field at medicinal imaging. To extract the tumor region the level set segmentation method is used for discovering tumor part out of provided MRI images.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 a 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 fuzzy c-mean algorithm etc.

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.

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].

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].

2.1 Database Collection

2.1.1 CT Scan

CT scans are a specialized type of x-ray. The patient lies down on a couch which slides into a large circular opening. The x-ray tube rotates around the patient and a computer collects the results. These results are translated into images that look like a "slice" of the person. Sometimes a radiologist will decide that contrast agents should be used. Contrast agents are iodine based and are absorbed by abnormal tissues. They make it easier for the doctor to see tumors within the brain tissue. There are some (rare) risks associated with contrast agents and you should make sure that you discuss this with the doctor before arriving for the examination. CT is very good for imaging bone structures. In fact, it's usually the imaging mode of choice when looking at the inner ears. It can easily detect tumours within the auditory canals and can demonstrate the entire cochlea on most patients.

2.2.2 MRI:

MRI is a completely different. Unlike CT it uses magnets and radio waves to create the images. No x-rays are used in an MRI scanner. The patient lies on a couch that looks very similar the ones used for CT. They are then placed in a very long cylinder and asked to remain perfectly still. The machine will produce a lot of noise and examinations typically run about 30 minutes. The cylinder that you are lying in is actually a very large magnet. The computer will send radio waves through your body and collect the signal that is emitted from the hydrogen atoms in your cells. This information is collected by an antenna and fed into a sophisticated computer that produces the images.

These images look similar to a CAT scan but they have much higher detail in the soft tissues. Unfortunately, MRI does not do a very good job with bones. One of the great advantages of MRI is the ability to change the contrast of the images. Small changes in the radio waves and the magnetic fields can completely change the contrast of the image. Different contrast settings will highlight different types of tissue. Another advantage of MRI is the ability to change the imaging plane without moving the patient. If you look at the images to the left you should notice that they look very different. The top two images are what we call axial images. This is what you would see if you cut the patient in half and looked at them from the top. The image on the bottom is a coronal image. This slices the patient from front to back.

Most MRI machines can produce images in any plane. CT cannot do this. Contrast agents are also used in MRI but they are not made of iodine. There are fewer documented cases of reactions to MRI contrast and it is considered to be safer than x-ray dye. Once again, you should discuss contrast agents with your physician before you arrive for the examination.

3.Proposed Work

The Brain tumor detection by use of MRI or CT scan images. The Brain tumor process flow chart is shown in fig.1. The process consisting of binarization, thresholding and Fuzzy c mean clustering process. The

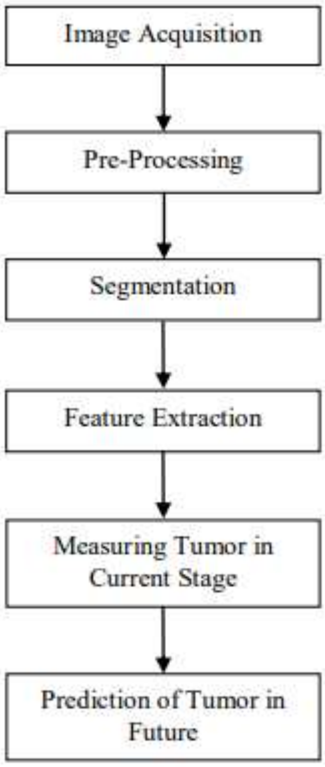


Fig. 1 Brain tumor Detection and Prediction

3.1 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.

3.2 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

3.3 . FUZZY C MEANS ALGORITHM

The goal of a clustering analysis is to divide a given set of data or objects into a cluster, which represents subsets or a group. The partition should have two properties: 1. Homogeneity inside clusters: the data, which belongs to one cluster, should be as similar as possible. 2. Heterogeneity between the clusters: the data, which belongs to different clusters, should be as different as possible. The membership functions do not reflect the actual data distribution in the input and the output spaces. They may not be suitable for fuzzy pattern recognition. To build membership functions from the data available, a clustering technique may be used to partition the data, and then produce membership functions from the resulting clustering. Clustering is a process to obtain a partition P of a set E of N objects Xi (i=1, 2,…, N), using the resemblance or dissemblance measure, such as a distance measure d. A partition P is a set of disjoint subsets of E and the element Ps of P is called cluster and the centers of the clusters are called centroid or prototypes. Many techniques have been developed for clustering data. In this report c-means clustering is used. It's a simple unsupervised learning method which can be used for data grouping or classification when the number of the clusters is known. It consists of the following steps. Step 1: Choose the number of clusters - K Step 2: Set initial centers of clusters c1, c2… ck; Step 3: Classify each vector x [x , x ,....x] T into the closest centre ci by Euclidean distance measure ||xi-ci ||=min || xi -ci|| Step 4: Recomputed the estimates for the cluster centers ci Let ci = [ci1 ,ci2 ,....cin] T cim be computed by, cim = ∑xli ∈ Cluster(Ixlim) Ni Where, Ni is the number of vectors in the i-th cluster. Step 5: If none of the cluster centers (ci =1, 2,…, k) changes in step 4 stop; otherwise go to step 3.

3.4 BRAIN MRI IMAGE PREPROCESSING

In order to improve the visual effects of the image for further image recognition, MRI image pre-processing is needed, mainly including colour image grayscale, image smoothing and sharpening and so on. Image smoothing is to eliminate noise and improve image quality. The purpose of image sharpening is to make the tumor edges, contour lines and image details clearer. Same process will be applied to the real target image.

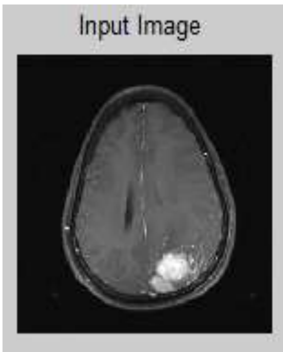


Fig.2 Input Image

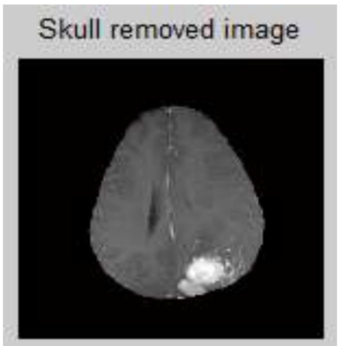
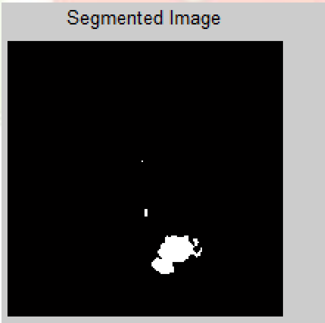


Fig.3 Skull Remove Image

The input image is filtered which reduces the noise and improve the quality shown in fig.1 To calculate the size of tumor it is necessary to remove skull area from a tumor. So the skull is removed which is shown in fig 3.After the skull removal Fuzzy c mean clustering is applied. The segmented image is shown in fig.4. The ground truth image is shown in fig.5.The tumor area is calculated as 930. In terms of percentage it is find out to be 3.3436%.



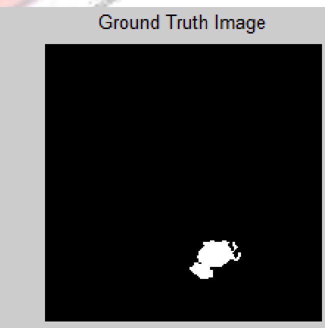


Fig.4 Segmented Image **Fig. 5** Ground Truth Image

II. CONCLUSION

A Brain Tumor detection and segmentation by use of fuzzy c mean clustering technique is studied and implemented and calculate the area of tumor. The technique is very effective to calculate the abnormal tissue. In future the same tumor is calculated by using various technique.

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