Brain Tumor Detection Software Using MRI Image

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***Abstract* - Brain is the first and the foremost controller of the human system. Excess cells growing in an uncontrolled manner in brain is called as brain tumor. In this paper the tumor part is identified by various levels starting from image acquisition, pre-processing, edge detection, modified histogram clustering and morphological operations. First the input taken is tumor affected MRI image. These MRI images obtained are stored in the database in JPEG format. Pre-processing generally means removing noise for improving image quality. Edge detection is used to determine the boundaries of the object. Modified histogram clustering technique is used to identify the position of the tumor. After morphological operations, tumors appear as pure white color on pure black back grounds. For segmentation and all the above said process is done with the help of software tool MATLAB**

I. INTRODUCTION

Brain is the first and the foremost controller of the human system. Excess cells growing in an uncontrolled manner in brain is called as brain tumor. In this paper the tumor part is identified by various levels starting from image acquisition, pre-processing, edge detection, modified histogram clustering and morphological operations. First the input taken is tumor affected MRI image. These MRI images obtained are stored in the database in JPEG format. Pre-processing generally means removing noise for improving image quality. Edge detection is used to determine the boundaries of the object. Modified histogram clustering technique is used to identify the position of the tumor. After morphological operations, tumors appear as pure white color on pure black back grounds. For segmentation and all the above said process is done with the help of software tool MATLAB. We know that our brain consist of many cells. When brain cells lose the ability to control their growth, they divide too often and without any order. The extra cells form a mass of tissue called a tumor. MRI acts as an assistant diagnostic tool for the doctors during disease diagnosis and treatment. This imaging technique produces images of soft tissues. The acquired medical images show the internal structure, but the doctors want to know more than peer images, such as emphasizing the abnormal tissue, quantifying its size, depicting its shape, and so on. If such tasks are covered by the doctors themselves, it may be inaccurate, time consuming and burden them heavily. Great knowledge and experience on radiology are required for accurate tumor detection in medical imaging. Automation of tumor detection is required because there might be a shortage of skilled radiologists at a time of great need. We propose an automatic brain tumor detection and localization framework that can detect and localize brain tumor in magnetic resonance imaging. Recent researches and trials have extremely helped in advancing diagnostic tools for medical purposes but still, the fact that gains in survival need to be achieved by better diagnostic tools. To overcome all the current defects, we introduce an automatic brain tumor detection and localization system that is able to accurately detect and localize brain tumor in magnetic resonance imaging. The efficacy and efficiency of our five-step brain tumor detection and localization approach and motivate us to extend this framework to detect and localize a variety of other types of tumors in other types of medical imager

II. PROPOSED TECHNIQUE

This section illustrates the overall technique of our proposed Brain Tumor Detection and Segmentation Using Histogram Thresholding and Artificial Neural Network Techniques. In this paper, the proposed system is a modified version of the Artificial Neural Network. The modification is based on automatic utilization of specified regions of interest (ROIs) within the tumor area in the MRI images using Histogram Thresholding technique. Form each ROI, set of extracted features include tumor shape and intensity characteristics are extracted and normalized. Each ROI is then given a weight to estimate the PDF of each brain tumor in the MR image. These weights are used as a modeling process to modify the Artificial Neural Network. The presented work is based upon Histogram Thresholding and Artificial Neural Network for brain image segmentation and brain tumor detection. The image of the brain is acquired through MRI technique. If the histograms of the images corresponding to the two halves of the brain are plotted, symmetry between the two histograms should be observed due to symmetrical nature of the brain along its central axis. On the other hand, if any asymmetry is observed, the presence of the tumor is detected. After detection of the presence of the tumor, Thresholding can be done for segmentation of the image. Segmentation is done by calculating the threshold point. The differences of the two histograms are plotted and the peak of the difference is chosen as the threshold point. Using this threshold point, the whole image is converted into binary image providing with the boundary of the tumor. The binary image is now cropped along the contour of the tumor to calculate the physical dimension of the tumor. The whole of the work has been implemented using MATLAB 2012.There are four major steps in the proposed approach for brain tumor classification:

(a) Preprocessing
(b) Edge Detection
(c) Segmentation
(d) Modified Histogram Clustering
(e) Morphological Operations

1. PREPROCESSING

Preprocessing is the process of removing noise from the input magnetic resonance image. The preprocessing is mainly consist of two stages they are noise removal and the gray scale conversion. In this module first it perform the gray scale conversion after performing gray scale conversion it will perform the noise removal process such as removing noise like the hospital names, image number etc.

Canny‟s edge detection algorithm is computationally more expensive compared to Sobel, Prewitt and Robert‟s operator. However, the Canny‟s edge detection algorithm performs better than all these operators under almost all scenarios. A color in the RGB color model is described by indicating how much of each of the red, green and blue is included. The color is expressed as an RGB triplet (R,G,B) , each component of which can vary from zero to a defined maximum value. If all the components are at zero the result is black; if all are at maximum, the result is the brightest represent able white. RGB to gray converts RGB values to grayscale values by forming a weighted sum of the R, G and B components.The equation for gray scale conversion is

0.2989 * R + 0.5870 * G + 0.1140 * B

2. EDGE DETECTION

The purpose of edge detection in general is to significantly reduce the amount of data in an image, while preserving the structural properties to be used for further image processing.Finds boundaries between regions and Removes unwanted regions. Let us consider an image with resolution of x×y and the image has to be cluster into k number of cluster. Let p(x,y)be an input pixels to be cluster and ck be the cluster centers.

3. SEGMENTATION

Involves the partitioning of an image or volume into distinct (usually) non-overlapping regions in a meaningful way. A set of markers, pixels where the flooding shall start, are chosen. Each is given a different label.The neighboring pixels of each marked area are inserted into a priority queue with a priority level corresponding to the gray level of the pixel.The pixel with the lowest priority level is extracted from the priority queue. If the neighbors of the extracted pixel that have already been labeled all have the same label, then the pixel is labeled with their label. All non-marked neighbors that are not yet in the priority queue are put into the priority queue.

4. MODIFIED HISTOGRAM CLUSTERING ALGORITHM

Histogram is one of the powerful techniques in image enhancement. The histogram of an image represents the relative frequency of occurrence of the various gray levels in the image. This is useful in stretching low-contrast levels of images with narrow histograms. Clustering in which similar neigh- bored bits are grouped together and finally thresholding is set in order to detect the tumor. Histogram Thresholding based image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyze. Histogram Thresholding-based methods are very efficient when compared to other image segmentation methods because they typically require only one pass through the pixels. In this technique, a histogram is computed from all of the pixels in the image, and the peaks and valleys in the histogram are used to locate the clusters in the image.Image size is the big problem in the Matlab. In our proposed approach we first considered that the MRI scan images are either color, Gray-scale or intensity images herein are displayed with a default size. In proposed work the MR image are always taken as default size, so this is free from the size of the database images. Erosion combines two sets using vector subtraction and is the dual operator of dilation.Both are not invertible transforms. The image E=I-S is the erosion of image I by structuring elements

5. MORPHOLOGICAL OPERATIONS

Morphological operation involves dilation and erosion. Dilation combines two sets using vector addition. The image D=I+S is the dilation of image I by structuring element S.Erosion combines two sets using vector subtraction and is the dual operator of dilation.Both are not invertible transforms. The image E=I-S is the erosion of image I by structuring elementS

III. EVALUATION AND RESULTS

To verify the effectiveness (qualities and robustness) of the proposed tumor detection, we conduct several experiments with this procedure on several images. In this work we load an MRI image and apply the different technique on loaded image in the Image Processing Toolbox under the Matlab Software. Below steps of our proposed work is given: Phase 1: Firstly we develop a particular GUI for this implementation. After that we develop a code for the loading the MR image in the Matlab database. Phase 2: Develop a code for the Gaussian filter and Average filter.. Phase 3: Develop a code for the segmentation using histogram thresholding. Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. So we apply the segmentation on the MR image.

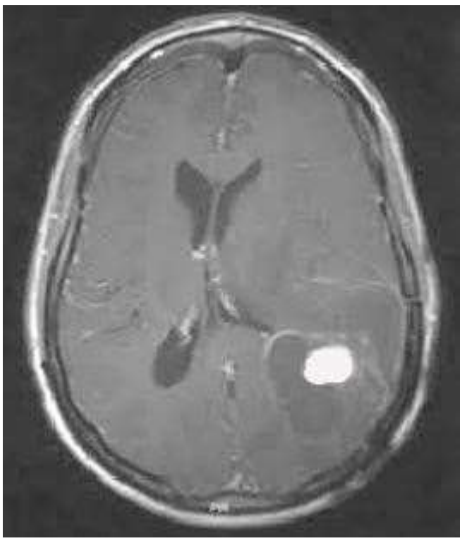

Fig.1 Input Image

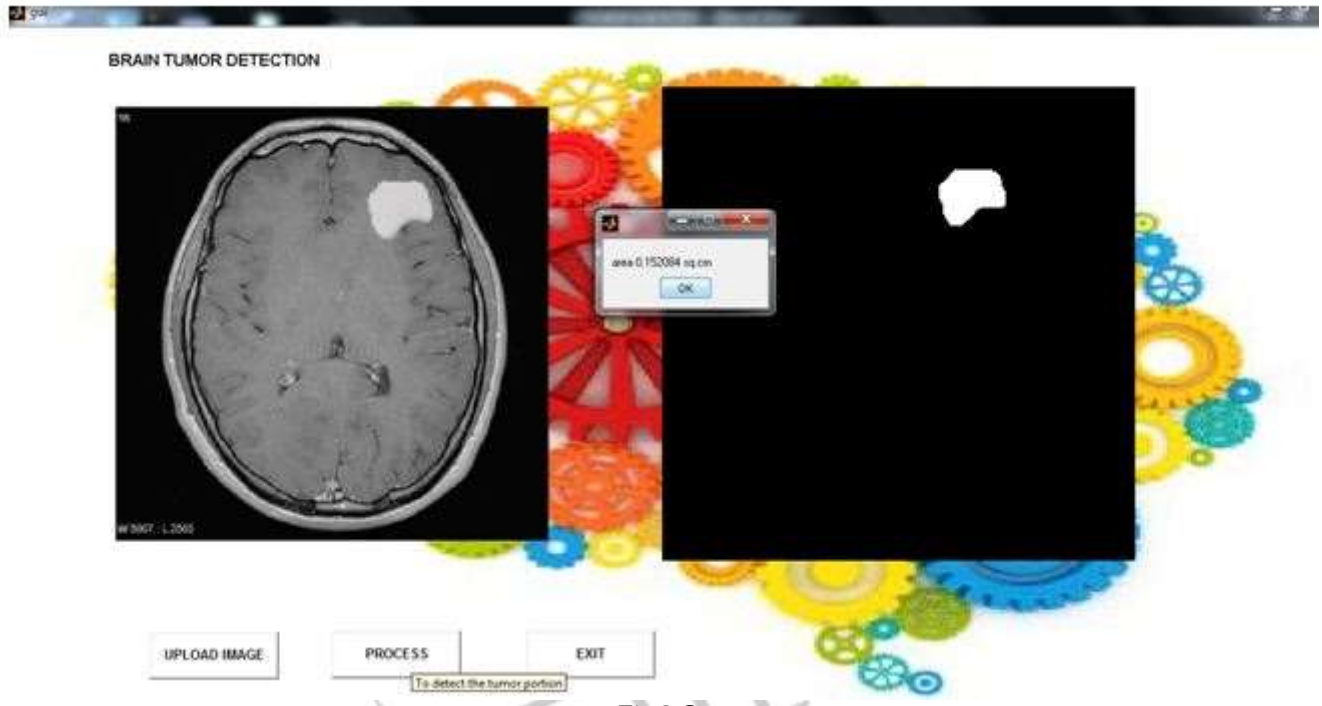

Fig.2 Out put

IV. CONCLUSION AND FURURE SCOPE

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 density-based clustering approach to detect the brain tumor. 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.We propose an automatic brain tumor detection and localization framework that can detect, localize and classify brain tumor in magnetic resonance imaging.The proposed framework comprises of following steps: image acquisition, pre-processing, feature extraction, classification, modified histogram clustering and morphological operations. After morphological operations tumors appear as pure white color on pure black back grounds. It also displays the area of the tumor affected portion.

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