Brain Tumor Detection Using Segmentation & Morphological Operators

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Abstract- *Medical Image processing is a fast growing and demanding field. Early detection of brain tumor is a challenging task as symptoms appear in the advanced stages of tumor. Brain tumor is a serious life threatening disease. Tumor detection helps to find the location and size of tumor. Brain tumor detection mainly involves four stages namely Image pre-processing, Image segmentation, optimization and feature extraction. In this paper we proposed an efficient method for tumor detection based on segmentation and morphological operators. Segmentation method is used to separate the tumor area from background and then morphological operators are applied to detect the tumor in the Magnetic resonance imaging(MRI).*

Keywords- Tumor detection, MRI , Segmentation, Morphological operators .

I. INTRODUCTION

Brain is the most complicated part of our body. Brain tumor is abnormal growth of cells in the brain. It is one of the most unsafe diseases over past decades. There are two types of tumors one is fast growing tumor called as malignant and other one is slow growing tumor called benign. Tumors are the second cause of cancer related deaths in children. Over the years it may even lead to vision loss. This facts increases the importance of the research on the brain tumor detection.

Image processing techniques are available for brain tumor detection. Imaging plays an very important role in the diagnosis of brain tumors. In medical imaging , 3D segmentation of images plays a important role in stages which occur before implementing object recognition. It also helps in automated diagnosis of brain diseases and helps in qualitative and quantitative analysis of images such as measuring accurate size and volume of detected portion. Accurate and perfect measurement of tumor in brain are quite difficult because of irregular shape , sizes and appearance of tumors in brain. Hence an effective and efficient technique is required to detect the exact location and size of tumor in the brain. In this paper, we proposed an effective technique for brain tumor detection which utilizes both segmentation and morphological operators

II. PROPOSED METHOD

A. Image Acquisition:

Images are obtained using MRI scan and these scanned images are displayed in a two dimensional matrices having pixels as its elements. These matrices are dependent on matrix size and its field of view. Images are stored in MATLAB and displayed as a gray scale image of size 256*256. The entries of a gray scale image are ranging from 0 to 255, where 0 shows total black color and 255 shows pure white color. Entries between this range vary in intensity from black to white.

B. Preprocessing:

In this phase image is enhanced in the way that finer details are improved and noise is removed from the image. Most commonly used enhancement and noise reduction techniques are implemented that can give best possible results. Enhancement will result in more prominent edges and a sharpened image is obtained, noise will be reduced thus reducing the blurring effect from the image. In addition to enhancement, image segmentation will also be applied. This improved and enhanced image will help in detecting edges and improving the quality of the overall image. Edge detection will lead to finding the exact location of tumor. Following steps will be followed in the preprocessing stage

The acquired MRI scanned image is converted to gray scale image of size 256*256 and then image is processed to remove any noise represent. Visual quality of noisy image will not be satisfactory the noiseless, high quality image is then operated by a high pass filter for sharpening and edge detection. The obtained sharpened image is then added to original image for further enhancement.

a) **Noise Removal:** Many filters are used to remove the noise from the images. Linear filters can also serve the purpose like Gaussian, averaging filters. For example average filters are used to remove salt and pepper noise from the image. In this paper we used Median filter to remove the noise from input image.

b) Image Sharpening: Sharpening of the image can be achieved by using different high pass filters. As now noise is been removed by using different low pass filters, we need to sharpens the image as we need the sharp edges because this will help us to detect the boundary of the tumor.

In this paper we used Gaussian high pass filter is used to enhance the boundaries of the objects in the image. Gaussian filter gives very high rated results and used very widely to enhance the finer details of the objects.

c) Processing: 1) Segmentation: Image segmentation is based on the division of the image into regions. Division is done on the basis of similar attributes. Similarities are separated out into groups. Basic purpose of segmentation is the extraction of important features from the image, from which information can easily be perceived. Brain tumor segmentation from MRI images is an interesting but challenging task in the field of medical imaging.

d) Post-Processing:

In processing segmentation is done using following methods.

1) Threshold Segmentation: Threshold segmentation is one of the simplest segmentation methods. The input gray scale image is converted into a binary format. The method is based on a threshold value which will convert gray scale image into a binary image format. The main logic is the selection of a threshold value. Some common methods used under this segmentation include maximum entropy method and k- means clustering method for segmentation. In this paper we used maximum entropy method for threshold segmentation.

2) Watershed Segmentation: It is one of the best methods to group pixels of an image on the basis of their intensities. Pixels falling under similar intensities are grouped together. It is a good segmentation technique for dividing an image to separate a tumor from the image Watershed is a mathematical morphological operating tool. Watershed is normally used for checking output rather than using as an input segmentation technique because it usually suffers from over segmentation and under segmentation.

For using watershed segmentation different methods are used. Two basic principle methods are given below: 1) the computed local minima of the image gradient are chosen as a marker. In this method an over segmentation occurs. After choosing marker region merging is done as a second step; 2) Watershed transformation using markers utilizes the specifically defined marker positions. These positions are either defined explicitly by a user or they can be determined automatically by using morphological tools.

3) Morphological Operators: After converting the image in the binary format, some morphological operations are applied on the converted binary image. The purpose of the morphological operators is to separate the tumor part of the image. Now only the tumor portion of the image is visible, shown as white color. This portion has the highest intensity than other regions of the image.

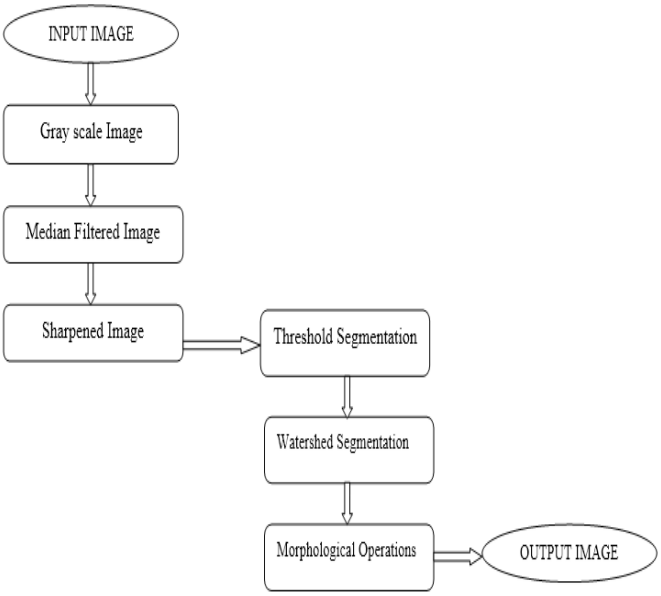


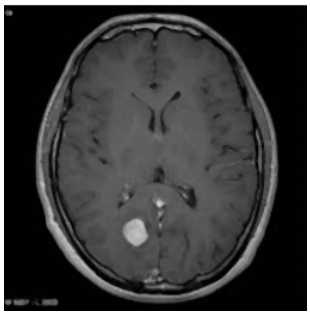
Figure 1. Tumor Detection Process

III. EXPERIMENTAL RESULTS

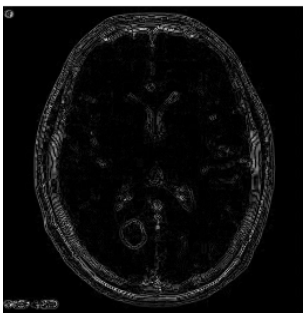
The work is executed on MATLAB Software. The MRI image is of size 256x256,Taken from the internet source.

A. BRAIN MRI IMAGE:

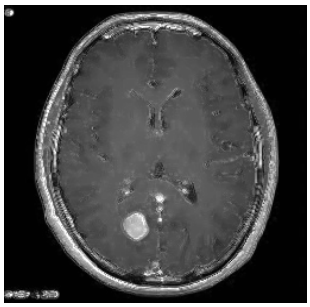
Original MRI image of Brain



Result of Median filter

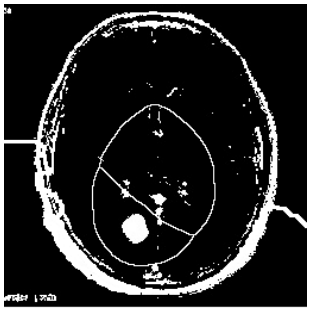


Result of Gaussian filter



Sharpened Image

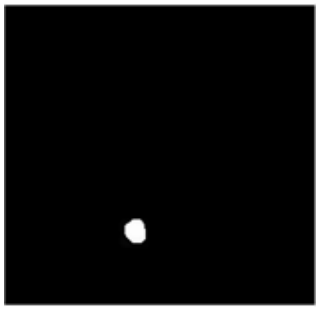
Result of Threshold segmentation



Result of Watershed segmentation

Result of Erosion

Result of dilation



Resultant Tumor

Figure 2. Results of our proposed method on input MRI Image of Brain

IV. CONCLUSION

In this Work we applied our proposed technique to detect brain tumor using Image processing techniques. The results of our proposed method are better compared to previous research methods. By using our proposed method we

can obtain exact size and location of tumor in the given input Image. The proposed method is easy to understand and execute.

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