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Efficient detection of Brain Tumor in MRI using Non Intelligent based techniques

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Abstract:

Brain Tumor is a fatal disease which cannot be confidently determined without MRI. Earlier detection, diagnosis and proper treatment of brain tumor are essential to prevent health. Abnormal cell growth leads to a tumor are essential to prevent human death. An effective brain tumor segmentation of MR image is an essential task in medical field. Extracting or grouping of pixels in an image based on intensity values is called segmentation. Image segmentation can be achieved in different ways like thresholding, region growing, water sheds and contours. The drawbacks of previous methods can be overcome through proposed method. To extract the information regarding tumor, at first in the pre-processing level, the image was filtered using Anisotropic Diffusion filter to remove noise and then the extra parts which are outside the skull and the area that does not have any helpful information are removed. After that a difference image is found to highlight the tumor. Then the image is resized and the image was converted to a threshold image. On this semi processed image morphological operations have been applied and information on solidity and areas of the plausible locations was determined. Then it was used to detect the tumor. This method can be implemented by MATLAB. Experimental results show high precision and dependability of the proposed algorithm. The results are also highly helpful for specialists and radiologists to easily estimate the size and position of a tumor.

Keywords — **MR Images, Anisotropic Diffusion Filter, Brain Tumor Detection.**

I. Introduction

The brain tumor segmentation on MRI images is a predominant task in surgical and medical planning and assessments. Manually segmentation will be time-consuming. Therefore, automatic segmentation and without any interference can be done in propose methods and systems. Medical image segmentation plays a predominant role in Medical diagnosis. An ideal medical image segmentation scheme should handle with the most preferred properties such as minimum user interaction, fast computation, and accurate and robust segmentation results. The propose techniques can be mainly divided into two groups; Intelligent based and non-intelligent based. Most of the leading intelligent based systems are artificial neural networks, fuzzy c-means (FCM), fuzzy connectedness, support vector machine (SVM), particle swarm optimization (PSO), and Genetic algorithm and hybrid methods. On the other hand, the leading non-intelligent techniques include thresholding and region growing etc. Usually the combinations of these algorithms are used to achieve better results. Purpose of image segmentation is Magnetic Resonance Imaging (MRI) has become a widely high quality medical imaging nowadays in the field of tumor detection. Brain tissue and tumor segmentation in MR images have become a vital area of discussion.

II. Research Objectives

The main objective of this is to detect the Tumor in MRI image and locating it. Anisotropic Diffusion Filter used to smooth the image and also to enhance the contours in an image and also used to remove the noise from the image. Morphological operations done by the collection of non linear operations related to the shape or morphology of features in image.

III. Methodology

A. Anisotropic Diffusion Filter

In image processing and computer vision anisotropic diffusion filter is also called Perona-Malik diffusion is a technique aiming at reducing image noise without removing significant parts of the image content typically edges, lines or other details that are important for the interpretation of the image. This diffusion process is a linear and space-invariant transformation of the original image.

Anisotropic diffusion is a generalization of this diffusion process it produces a family of parameterized images but each resulting image is a combination between the original image and a filter

that depends on the local content of the original image. As a consequence anisotropic diffusion is a non-linear and space-variant transformation of the original image.

B. Thresholding

Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images .

The simplest thresholding methods replace each pixel in an image with a black pixel if the image intensity is less than some fixed constant T , or a white pixel if the image intensity is greater than that constant.

C. Masking Images

Masking involves setting the pixel values in an image to zero, or some other "background" value. Masking can be done in one of two ways:

Using an image as a mask. A mask image is simply an image where some of the pixel intensity values are zero, and others are non-zero. Wherever the pixel intensity value is zero in the mask image, then the pixel intensity of the resulting masked image will be set to the background value (normally zero). You might for example, create a mask image using the Particle Analysis tool.

Using a set of ROIs as the mask. The ROIs for each slice are used to define the mask.

IV. Discussion

The original image is applied to an anisotropic diffusion filter. Anisotropic diffusion filter is a technique aiming at reducing image noise without removing significant parts of the image content typically edges, lines or other details that are important for the interpretation of the image.

To create the mask image we first need to crop the head region in image without the extra black background.

To find the difference image we have to divide the image into two equal halves which are named as subimage1 and subimage2.Then subimage2 is flipped horizontally. Later a difference operation is done between subimage1 and flipped subimage2.subimage1-subimage2 gives dif-half1 and subimage2-subimage1 gives dif-half2. Again the dif-half2 is flipped horizontally. Finally by combining the dif-half1 and flipped dif-half2 images, we get the required resultant difference image.

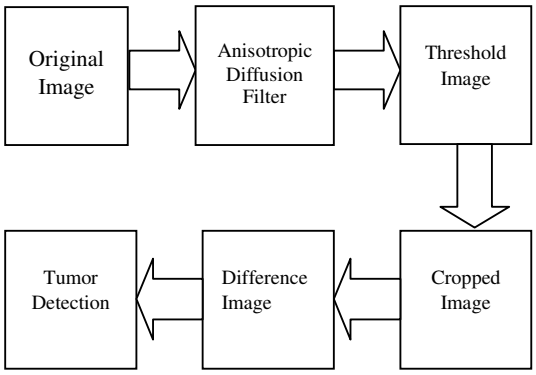

Figure 1: Box scheme for proposed method.

Then we apply thresholding to the difference image, and remove the small objects which appear in it using morphologic operations. Morphology is a broad set of image processing operations that process images based on shapes. Morphological operations apply a structuring element to an input image, creating an output image of the same size. In a morphological operation, the value of each pixel in the output image is based on a comparison of the corresponding pixel in the input image with its neighbors. By choosing the size and shape of the neighborhood, you can construct a morphological operation that is sensitive to specific shapes in the input image.

Erosion removes the small scale details from the binary image but simultaneously reduces the size of region of interest. By subtracting the eroded image from the original image boundaries of each region can be found. Image shrinking can be observed in erosion.

Finally tumor is detected. Tumor is an abnormal mass of tissue. Tumors are a classic sign of inflammation, and can be benign or malignant. There are dozens of different types of tumors.

Their names usually reflect the kind of tissue they arise in, and may also tell something about their shape or how they grow. A brain tumor occurs when abnormal cells from within the brain. There are two main types of tumors: malignant or cancerous tumors and benign tumors. Cancerous tumors can be divided into primary tumors that start within the brain and secondary tumors that have spread from

somewhere else known as brain metastasis tumors. All types of brain tumors may produce symptoms that vary depending on the part of the brain involved.

V. Experimental Results

Automatic Brain Tumor Detection In MRI Using Image Processing Techniques is an approach based on several steps which has demonstrated great potential and usefulness in MRI tumor segmentation and detection. We apply Anisotropic

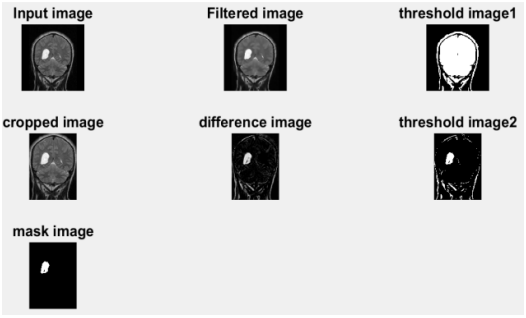

Figure 2: Steps followed in masking an image

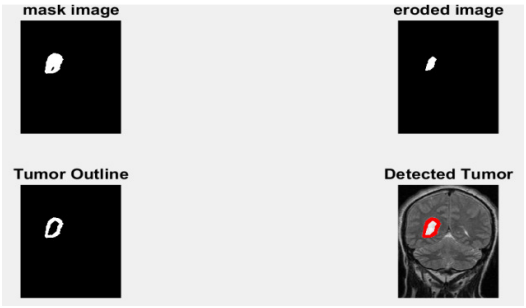

Figure 3: Detected Tumor of MR Image

Diffusion Filter for smoothing the image without disturbing the remaining details of image. After that we cropped the image and find the difference image and finally detected the tumor.

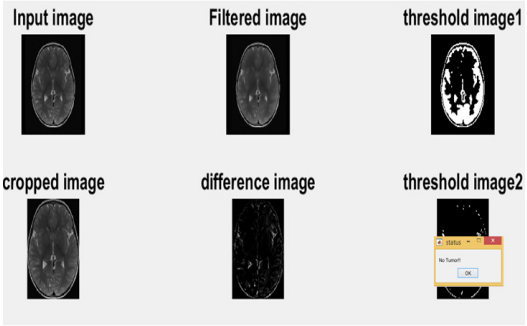

Figure 4: Results of No tumor detection

VI. Conclusion

This approach based on several steps has demonstrated great potential and usefulness in MRI tumor segmentation and detection. We apply Anisotropic Diffusion Filter for smoothing the image with remaining the details of image. Then the extra parts which are outside the skull and the area that does not have any helpful information are removed. After that a difference image is found to highlight the tumor. Then the image is resized and the image was converted to a threshold image. Then this image is processed by using morphological operations to detect the tumor accurately.

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