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BRAIN MR IMAGE TUMOR DETECTION USING WATERSHED SEGMENTATION

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Abstract

Today, in the medical field image processing plays a vital role. And medical imaging technology is an evolving and demanding technology. Medical images that helps to diagnose diseases. Brain tumor is a serious and dangerous disease sometimes it causes to persons death. Medical image gives a correct treatment of brain tumors. So many techniques are available for detection of brain tumors from MRI images. All these methods face challenges such as finding the position and proportion of the tumor. Detection of tumor from the brain images that are the most important and difficult part, for this image segmentation is used. There are so many algorithms are developed for image segmentation.

Keywords: *MRI Brain Images, brain tumor, Brain Image Segmentation.*

I. INTRODUCTION

In medical field, MRI images are important to diagnose disease. Abnormal growth of cell tissues in brain is brain tumor.
Phases of brain tumor:-
1) Initial phase
2) Second phase

Symptoms of brain tumor are such as weakness, difficulty in walking, headaches, vomiting, blurry vision, and change in person's mental capacity, memory, speech and personality.

In initial phase the tumors are surgically removed, but in secondary phase, tumor disease increases, because of after surgical removal of tumor tissues still stays and they restore again so, this is huge problem in second phase tumor.

These problems arise due to inaccurately position of tumor. Brain tumor detection can be done by-
1) MRI scanning
2) CT scanning

II. RELATED WORK

Image processing is the technique which is used to get an enhanced image by converting an image into digital form. Image processing is achieved by applying operations on image so as to get some useful information from that image. Image Processing Toolbox which is providing different algorithms, functions, and applications for the processing of the images, analyzing them, visualizing them, developing algorithm and applying algorithm over it. Various techniques like image analysis, segmenting the image, enhancement of the image, reducing noise from the image, geometric transformations of the image, and also image registration can be performed using Image Processing Toolbox. It is one of the most rapidly growing technologies nowadays.

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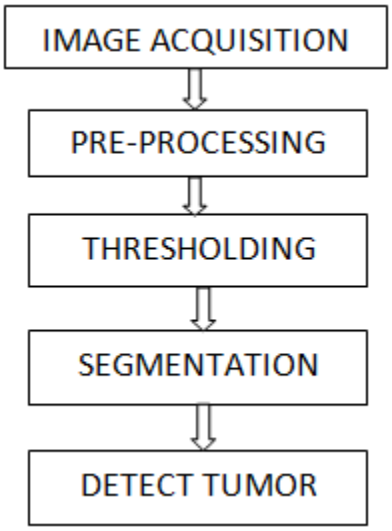

Fig: - Architecture of the System

1. Image Acquisition: - MRI images which are scanned of a patient brain or body are Gray-scale images. All images are of different size. The default size of images is 220×220. If the image is color image, then that image is converted into a Gray-scale image which is done by using matrix whose values are numerical values and the range of numerical values are occurs between 0 to 255, where 0 indicates black and 255 indicates white. There are two phases of detection technique of brain tumor are image segmentation and edge detection.

2. Pre-processing:- This is used for noise removal and noise removal is done by using linear (Spatial Filter) or non-linear filter (Median Filter). And other processing like removal of text is done by using morphological operation.
In this stage reshaping and conversion of RGB to grayscale occurs here. This phase includes a median filter for noise removal.
a) Gray level conversion: - Gray scale imaging is known as "black and white," technically this is misconception. Black and white, are known as halftone, pure black and pure white are the only possible shades. In halftone image illusion of gray shading is obtained by rendering the image as a grid of black dots on a white background (or vice-versa), with the sizes of the individual dots determining the apparent lightness of the gray in their vicinity. Photo printing in newspaper halftone technique is used.
b). High Pass Filter:- In digital image processing to perform image modifications, enhancements, noise reduction, High pass and low pass filters are used. For neighbor pixels high pass filter uses negative weighting coefficients, this effectively enhances the area of the high intensity gradient in the image, thereby emphasizing finer detail.
c). Median Filter: - It is a nonlinear method. Noise could be removed by nonlinear method. It is very effective at noise removal while saving edges. Especially it is effective for removing of 'salt and pepper' noise. Working of this filter is done by moving pixel by pixel through image, replacement of each value with median value of neighbor pixels. This type of neighbor patter is called "window", which moves, pixel by pixel, over the whole image.

3. Thresholding:-Thresholding is the simplest method of image segmentation. For creation of binary image from grayscale image thresholding is used. For partitioning of an image into a foreground and background thresholding is simple and effective way. Thresholding is a technique of image segmentation which separate objects by converting grayscale images into binary images.

4. Segmentation: - Segmentation is a partition of the digital images into the various segments.

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5. Morphological Operations:-

After segmentation, unwanted parts are removed by using Morphological operations. This operation contains the operation of image opening, image closing, dilation, erosion. After all operations and after result the decision has taken that the MRI images consist of tumor or not if in any case it's a tumor then is it normal or abnormal.

This operation takes input like in binary image and a structuring element and combines both images using operators like intersection, union, and complement operator. Morphological operator woks on input images according to their size shape and feature and encode them in structure element. [1]

III. LITERATURE REVIEW

In Image segmentation images are bisect into different regions that contain each pixel with similar properties. For detection of disease, for face detection and for detection and measurement of bone and tissues in medical images Image segmentation technique is used for those applications. Digital images are divided into many areas by using image segmentation. Conversion of an image into a valid object is only the main aim of segmentation. To determine image segmentation is quiet simple and easy way. In medical field, for diagnosis of disease image segmentation plays a vital role; main issue of images which occurs are: images which have poor contrast, and noise issue.

Pre-processing step is used for removal of noise from MRI images. There are two fundamental property of image intensity on which image segmentation algorithm works 1. Discontinuity of image and 2. Similarity of image. For this type of segmentation there are two ways to do, first pixel sharpness in the image, such as edges and corners and second is based on the bisection of image within areas.

In MRI images asymmetrical border of tumor cells can be seen. Problem in MRI images are undefined location undefined size of tumor tissue. By using this algorithm the size and the location an also edges of boundary are seen. And then tumor cells can be remove.

Pratik et al [2] introduce a paper that remark and determine the position of tumor from MRI Images. The basic MR image is full memory of input images. To make a noise free image, input image is turn into a conversion from RGB to Gray scale format. By using the linear filtering method and sobel mask, magnitude of tumor cells is computed. Linear filtering and sobel masks are 2D vector which refers to the direction from where the fastest image intensity comes.

The concept of watershed segmentation is to change the slope of a gray level image in a topographic surface. The disadvantage of watershed segmentation is that it build a number of segmented area in image and that segmented region are most significant to over segmentation at each local minima of image.

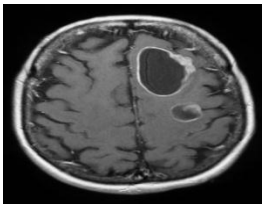
Kavitha et al [3], For segmentation of brain tumor in MRI images used multilayer perceptron on combination of watershed and thresholding algorithm. 2D MRI color image is an input which has size 256*256 loaded in the database. By Gaussian smoothing the unwanted signal are removed. Combination of thresholding and morphological operations are the improved watershed segmentation. The conversion of gray image to binary image and the produced image which display the affected tumor area. The Light particles which are generated by thresholding are distinct from darker shades and put to black. In neural network Multilayer Perceptron (MLP) is a method on which classification is based. In a directed graph, MLP consists of multiple nodes to set a map of input data onto set of proper output. By using mean squared error (MSE) Peak signal to noise ratio are defined.

The cumulative squared error between the compressed image and the original image is represented by MSE, while PSNR represents the measurement of the peak error. If the value of MSE is lower then the error is also lower. For better and accurate tumor part the PSNR is used for analysis. From the literature, the observation is the mixture of algorithms and uses of PSNR results that are the accurate calculation of affected tumor area. [1]

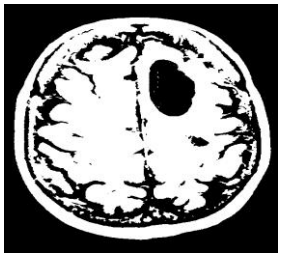
IV. EXPERIMENTAL IMAGE

In this, we use image of magnetic resonance images (MRI) by using processing of the image. In MR Image of the picture of a brain tumor does not appear to be at exact location of a tumor in the brain. We found the accurate spot of the tumor in an MRI image using various techniques like the segmentation and the threshold Techniques.

Input Image:-



Output Image: - After all the operation performed the exact tumor location is detected.



Huge black circle area is the exact location of tumor.

V. CONCLUSION

To exact treatment of the brain tumor, the genuine method is needed to detect brain tumor from MRI images. Information which is taken by many MRI images from various parts is needed for accurate diagnosis, accurate planning and treatment purpose. The goal is to improvise the information get from the images through the parts and improve the segmentation process to get an exact image of brain tumor.

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