DETECTION OF TUMOUR FROM MRI SCAN IMAGES OF BRAIN USING IMAGE PROCESSING TECHNIQUES BY MATLAB

Chaudhari Divyalata R [#1], Himanshu A patel[*2], Tejas V Bhatt[#3]

1-3Biomedical Engineering M.tech, (U. V. Patel College of Engineering, Ganpat University, Mehsana, Gujarat-(384012)

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**Abstrac*— *Tumour detection is a one of the medical issue that is still challenging for medical field. A brain tumour is a mass of nerve tissues that have grown uncontrollably .There are two main types of tumour malignant and benign tumours. Medical image processing techniques plays a most significant role in the diagnosis of brain tumours. In this diagnosis the medical image data obtained from various biomedical devices. This data is acquired from various imaging techniques like X-ray, CT-scan and MRI. Radiologist perform tumour extraction on data acquire from magnetic resonance imaging (MRI) which is very time consuming. Brain tumour segmentation is a significant process to extract information from complex (MRI).Medical image processing is the most useful and developed field now a day. In this paper mentioned the strategy to detect and extraction of brain tumour from MRI scan images of the brain. This method incorporates with some noise removal filters, histogram equalization, segmentation unit and morphological operations and these all are the basic concept of image processing. Using MATLAB it takes less time to detect tumour.*

*Key words— **Brain tumour, MRI image, Histogram equalization, Watershed segmentation, MATLAB.**

1. INTRODUCTION

The brain is a soft mass of tissue which is cover by the bones of the skull, and fine layers of tissue called meninges and cerebrospinal fluid. Sometimes in the brain occurs abnormal growth of tissues causing brain tumour. Epilepsy is a brain disorder in which clusters of nerve cells occurs and the brain signals became abnormally. Here, neurons produce electrical impulses that act on various neurons, glands and muscles to produce human thoughts, feelings and actions. Here, the normal pattern of neuronal activity became disturbed causing strange sensations, emotions, behavior and loss of consciousness. Tumour are classify basically into two types:

1.1 Benign Brain Tumour: The benign tumour has uniformity in cell structure and does not contain cancer cells. They don't rise to other parts of the body. The benign tumours can grab sensitive areas of the brain and cause serious health issues. Benign tumors can be removed, and they are rarely grown back.

1.2 Malignant Brain Tumour: Malignant brain tumours have a heterogeous structure of cells. They are likely to grow fast and raid into the nearby healthy brain tissue.

❖ MRI is an advanced medical imaging technique used to examine several regions of the human body. MRI imaging is used when treating brain tumours, ankle, and foot. From these high-resolution images, we can conclude detailed anatomical information to examine human normal brain and detect abnormalities. Nowadays there are various techniques for classifying MR images, which are fuzzy methods, neural networks, atlas methods, knowledge based techniques, variation segmentation. MRI consists of T1 weighted, T2 weighted and PD (proton density) weighted images.

2. PROPOSED METHODOLOGY:

This block diagram has two stages, first is pre-processing unit of given MRI image and after that segmentation and then performs morphological operations.
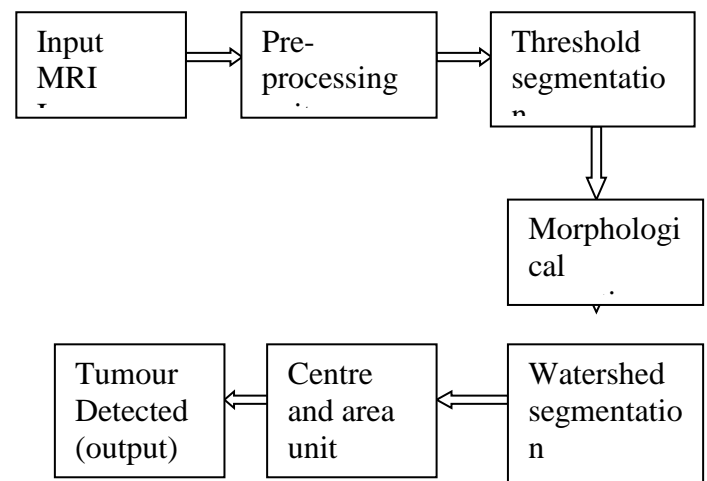
Fig. 1. Block Diagram for Brain Tumour Extraction

2.1 Gray scale imaging

RGB image provides computational complication and it does not provide guaranteed better results. Therefore Grayscale images are preferred in image pre-processing. The RGB to grayscale image conversion is done by using the function **rgb2gray (image).**

MRI images are magnetic resonance images which can be taken on computer when a patient is scanned by MRI machine. We can acquire MRI images of particular part of the body by test. Mainly, when we see MRI images on computer they look like black and white images. In analog practice, gray scale imaging is sometimes called black and white image but in technical form this is a misnomer. The true black and white, also known as halftone, here the possible shades are pure black and pure white. The visualization of gray shading in a halftone image is acquire by describe the image as a uniformly spaced of black dots on a white background, with the sizes of the individual dots determining the apparent lightness of the gray in their proximity. The halftone technique is most common used for printing photographs in newspapers and as MRI image is taken on computer then. In the some case of transmitted light the brightness levels of the red (R), green (G) and blue (B) elements are each represented as a number from decimal 0 to 255, or binary 00000000 to 11111111. The darkest shade is black, which is the total absence of transmitted light. The lightest shade is white, the total transmission of light and because of that all wavelengths are visible. So we firstly convert our MRI image to grayscale image.

2.2 Pre-processing of Gray scale Image

Pre-processing of MRI images is the first step in image analysis which performs image enhancement and noise reduction techniques to enhance the quality of image. The accuracy and conjunction rate of such techniques must be high in order to ensure the success of the steps. In this work, the significance of such method is highlighted in the medium of Magnetic Resonance (MR) brain image classification and segmentation. In this paper, applicable pre-processing techniques are evolved to remove the skull portion surrounding the brain tissues. The observational results are analysed in terms of segmentation effectiveness for pre-processing and distance measure for feature extraction techniques. For the pre-processing following two filters are uses:

2.2.1 Low Pass Filter: Firstly image is given as an input to low pass filter for smoothening. A low-pass filter, also known as "blurring" filter, averages is out because rapid changes in intensity. The absolute low-pass filter is just calculates the average of a pixel and all of its eight nearby neighbours. The result displaces the original value of the pixel. The process is continually repeated for every pixel in the image.

2.2.2 Median Filter: After that the image is passed through median filter for noise reduction. Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges and removing noise. Median filter runs through the signal entry one by one and this filter replacing all entry with the median of neighbouring entries.

2.3 Image Segmentation

After pre-processing segmentation technique is applied to divide the image into various segments to simplify the representation of an image into something that is more meaningful and easier to analyze. Image segmentations mostly used to locate lines, curves and boundaries etc.

2.4 Threshold Segmentation

The process of thresholding involves, comparing each pixel value of the image to a specified threshold. Hence this method is based on a threshold value to convert a gray-scale image into binary image. Thresholding method is a simplest method of image segmentation. The aim of segmentation is to simplify the representation of an image into something that is easier to analyse. This segmentation is basically used to locate objects and boundaries in images. More of the, image segmentation is the process of appoint a label to every pixel in an image such that pixels with the same label share certain graphical characteristics. Every pixel in a region is similar with some computed property, such as color, intensity, or texture.

2.5 Histogram equalization

A histogram is a graphical representation of the intensity distribution of an image and Histogram equalization is a computer image processing technique and it spreading out most frequent intensity values to improved contrast of an image, Better contrast is acquire from histogram of the image, after that using histogram equalization that permit low contrast area to gain higher contrast by stretching out the intensity range of the image. For create a histogram from an image, the (hist) function is used. Haste function is used to perform Contrast enhancement. Firstly the gray scale image is taken and its histogram plot is evolved, after

that using haste function to produce histogram equivalent for that image.
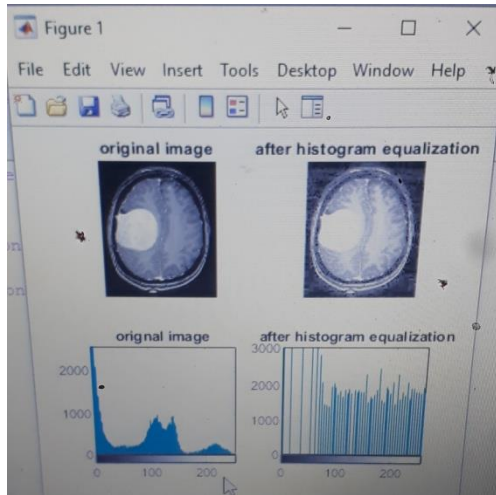

Fig 2 . Histogram equalization

2.5 Watershed segmentation

Here, for medical image segmentation the watershed technique is widely used. This method used to segment gray matter, white matter and cerebrospinal fluid from MRI images of brain. A drop of water falling on a one side of the watershed, it will reach a local minimum. The watershed of a relief agrees to the limits of the adjacent catchment basins of the drops of water. In image processing other watershed elements may be computed. In graphs, some of defined on the nodes and on the edges. Watershed is also defined in the continuous domain. Various algorithms are present to compute watershed.

Meyer's flooding Watershed Algorithm

The watershed algorithm was introduced by F. Meyer in the early 90's. The algorithm works on a gradient image. During the back to back overflow of the gray value relief, the regions that the watershed separates are called catchment basins. The basins should come up with the edges. Because of that generally an over-segmentation of the image is happened, mostly for noisy image material, like CT data. Here, the image must be pre-processed or the regions must be merged on the basis of a similarity criterion afterwards.

Here, set of markers and pixels are given as a different label, where the process of flooding shall start. The neighbouring pixels of each marked area are injected into a right of way with a priority level corresponding to the gray level of the pixel. The pixel with the highest level is extracted from the priority queue; here extracted pixel and

neighbouring pixel have already been labelled all have the same label, now all non-marked neighbours are put into priority queue. This process is continuing until the priority queue is empty. The non-labelled pixels are the watershed lines.

2.6 Morphological Operations

Morphological operation is a collection of non-linear operations related to the morphology of specific in an image. Morphological operations can also be applied to grayscale images because of that their light transfer functions are unknown and their absolute pixel values are minor interest. Morphological techniques examination an image with a small shape called a structuring element. The structuring element is fix at all possible locations in the image and it is compared with the matching neighbourhood of pixels. Some operations test whether the element laid within the neighbourhood, while others test divide the neighbourhood:

The structuring element is a small matrix of pixels, each with a value of zero or one.

- The size of the structuring element is the specify by the matrix dimensions.

- In the structuring element pattern of ones and zeros are present.
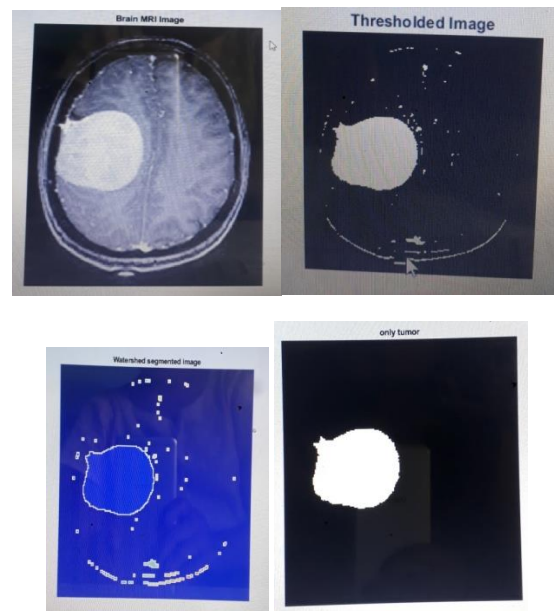
OUTPUT

Fig.3 (A) Brain MRI image (B) Threshold image (C) Watershed segmentation (D) Only tumour.

RESULT

From the results we can intermediate that this process can be used to identify the tumour from an MRI image. The processing time of code to detect tumour from MRI image is very less. We can use this application in real time approach which will very helpful to radiologist and in field of medicine.

CONCLUSION

The aim of this paper is to detect brain tumour from MRI images. Pre-processing, histogram equalization and watershed segmentation is performed on image to extract the tumour. Most challenging part of image segmentation is segmenting complicated structure with different properties. In this condition it is better to use edge detection algorithm such as unsupervised methods. For correct diagnosis of tumour patients, good segmentation method is required to processing MRI images to an improved diagnosis and treatment. The brain tumour detection is a good help for the doctors and for the medical imaging and industries.

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