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EXTRACTION & SEGMENTATION OF BRAIN TUMOR FROM MRI IMAGES: MATLAB IMPLEMENTATION

Rakesh Kumar[1], Raj Kumar Paul[2]

Research Scholar, Department of CSE, Vedica Institute of Technology, Bhopal (India)

Professor, Department of CSE, Vedica Institute of Technology, Bhopal (India)

ABSTRACT

Now a day, one of the many active researches in the field of medical image processing is the automatic extraction of brain tumor using magnetic resonance images. This study is the study of brain tumor extraction and its location from the MRI images. The basic objective of this study is that how can obtained or how efficiently detect and locate the tumor from the MRI images .The basic concept of MRI images processing are noise removal function, segmentation and morphological operation.

Keywords: ***Brain Tumor, Morphological Operations MRI, Watershed Segmentation*.**

I. INTRODUCTION

A tumor is abnormal growth of tissues within the brain or central spine which will cause improper brain function.

Tumor is classified as two varieties, one of them is benign and another one is malignant. Benign is non-cancerous and fewer harmful whereas malignant is cancerous and spreads quickly about to alternative brain tissue with deadly nature. Further malignant tumor area unit classified into two varieties as primary and secondary. Primary tumors area units are those who originate within the brain. The Secondary tumor area units are those who originate in another part of the body finally reaching the brain through the method of metastasis.

The proper detection and examination of the brain tumor it's vital to spot and discover the precise location of its existence. There square measure various methodologies like CT scan, X-ray, and MRI etc. There in gift era for brain tumor detection however tomography (Magnetic resonance imaging) could be a non-invasive methodology and uses powerful magnet and radio waves to provides visual details concerning the anatomy conjointly the overall structure of the brain and may be accustomed examine the blood provide within the brain for investigation. Abnormality is also pursuit the progress or growth of the illness.

Normally a magnetic resonance imaging image is unclear having noise that leaves the health professional unsure concerning the precise proximity of the brain tumor. This paper mainly deals with sweetening of the magnetic resonance imaging image victimization noise removal functions, segmentation and morphological operations which can give the clear contour concerning the brain tumor.

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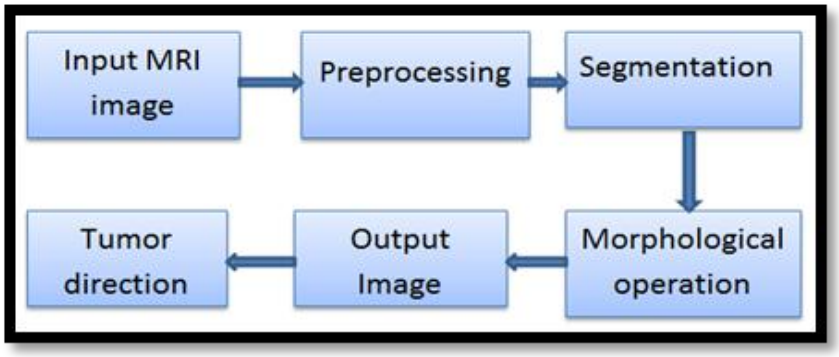
II. PROPOSED METHOD



The major steps to detect a brain tumor from MRI image are-

A. Grayscale Imaging

MRI pictures are resonance pictures which may be acquired on laptop once a patient is scanned by imaging machine. We will acquire imaging pictures of the part of the body which is beneath take a look at or desired. Usually after we see MRI images on laptop they appear like black and white pictures. In analog observe, grey scale imaging is usually called "black and white," however technically this is often a name. In true black and white, additionally referred to as halftone, the sole possible shades are pure black and pure white. The illusion of gray shading in a very halftone image 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 determinative the apparent lightness of the grey in their locality. The half tone technique is often used for printing images in newspapers and as imaging image is taken on laptop. In the case of transmitted lightweight (for example, the image on a computer display), the brightness levels of the red (R), green (G) and blue (B) elements are every depicted as a number from decimal zero to 255, or binary 00000000 to11111111. For each picture element in a very red-green-blue (RGB) grayscale image, R = G = B. The lightness of the grey is directly proportional to the quantity representing the brightness levels of the first colors. Black is represented by R = G = B = zero or R = G = B = 00000000, and white is depicted by R = G = B = 255 or R = G = B = 11111111. Because there is eight bit s within the binary illustration of the gray level, this imaging methodology is termed 8-bit grayscale. Grayscale may be a vary of reminder grey while not apparent color. The darkest doable shade is black, that is the total absence of transmitted or mirrored lightweight. The lightest doable shade is white. The slightest degree visible wavelengths. Thus due to the top of reasons first we convert our imaging image to be pre-processed in gray scale image.

B. High Pass Filter

After that the image is given as associate degree input to high pass filter. A high pass filter is that the basis for many sharpening strategies. An image is sharpened once distinction is increased between adjoining areas with very little variation in brightness or darkness. A high pass filter tends to retain the high frequency information at intervals a picture whereas reducing the low frequency data. The kernel of the high pass filters is designed to extend the brightness of the centre picture element relative to neighbor pixels. The kernel array typically contains a single positive worth at its centre, which is completely surrounded by negative values.

ISBN: 978-93-86171-74-0

C. Median Filter

In signal process, it's typically fascinating to be ready to perform some quite noise reduction on a picture or signal. The median filter may be a nonlinear digital filtering technique, often accustomed take away noise. Such noise reduction may be a typical pre-processing step to enhance the results of later processing (for example, edge detection on associate image). Median filtering is a very wide employed in digital image process as a result of, under certain conditions; it preserves edges whereas removing noise. The main plan of the median filter is to run through the signal entry by entry, replacement every entry with the median of neighboring entries. The pattern of neighbors is named the "window" that slides, entry by entry, over the whole signal. For 1D signals, the foremost obvious window is simply the primary few preceding and following entries, whereas for second (or higher dimensional) signals like pictures, a lot of complicated window patterns area unit attainable (such as "box" or "cross" patterns). Note that if the window has associate odd variety of entries, then the median is easy to define: it's simply the center price after all the entries within the window area unit sorted numerically. For an even variety of entries, there's quite one possible median. This filter enhances the standard of the tomography image.

D. Threshold Segmentation

The simplest technique of image segmentation is called the thresholding technique. This technique relies on a clip-level (or a threshold value) to show a gray-scale image into a binary image. The key of this technique is to pick out the edge price (or values once multiple-levels are selected). Many popular methods are employed in trade as well as the utmost entropy method, Otsu's technique (maximum variance), and etall. K-means cluster also can be used. In computer vision, Segmentation is that the method of partitioning a digital image into multiple segments (sets of pixels, additionally called super pixels). The goal of segmentation is to alter and/or change the illustration of a picture into one thing that is more purposeful and easier to investigate.[1] Image segmentation is usually wont to find objects and bounds (lines, curves, etc.) in pictures. a lot of exactly, image segmentation is the method of distribution a label to each picture element in associate image such that pixels with a similar label share bound visual characteristics. The results of image segmentation could be a set of segments that collectively cowl the whole image, or a set of contours extracted from the image (see edge detection).Each of the pixels during a region are similar with relevance some characteristic or computed property, like color, intensity or texture. Adjacent regions are considerably totally different with respect to a similar characteristic(s).[1] once applied to stack of pictures, typical in Medical imaging, the resulting contours once image segmentation is wont to produce 3Dreconstructions with the assistance of interpolation algorithms like walking cubes.

E. Watershed segmentation

A grey-level image is also seen as a topographical relief, where the gray level of a picture element is understood as its altitude in the relief. A drop of water falling on a topographical relief flows on a path to finally reach a minimum area. Intuitively, the watershed of a relief corresponds to the limits of the adjacent construction basins of the drops of water. In image process, completely different watershed lines could be computed. In graphs,

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some is also outlined on the nodes, on the edges, or hybrid lines on each nodes and edges. Watersheds may be outlined within the continuous domain. There are many alternative algorithms to compute watersheds.

Meyer's flooding Watershed formula

One of the foremost common watershed algorithms was introduced by F. Meyer within the early 90's.The formula works on a grey scale image. Throughout the successive flooding of the gray worth relief, watersheds with adjacent construction basins are created. This flooding process is performed on the gradient image, i.e. the basins should emerge on the perimeters. Ordinarily this can result in an over-segmentation of the image, particularly for hissing image material, e.g. medical CT information. Either the image should be pre-processed or the regions should be integrated on the premise of a similarity criterion afterward.

1. A collection of markers, pixels wherever the flooding shall begin, are chosen. every is given a unique label.
2. The neighboring pels of every marked space are inserted into a priority queue with a priority level corresponding to the grey level of the pixel.
3. The pel with the very best priority level is extracted from the priority queue. If the neighbors of the extracted pixel that have already been tagged all have constant label, then the pel is tagged with their label. All non-marked neighbors that don't seem to be nonetheless within the priority queue area unit put into the priority queue.
4. Redo step three till the priority queue is empty.

The non-labeled pixels area unit of the watershed lines.

F. Morphological Operations

Morphological image process may be a assortment of non linear operations associated with the form or morphology of features in a picture. Consistent with Wikipedia, morphological operations believe solely on the relative ordering of pel values, not on their numerical values, and thus area unit particularly suited to the process of binary pictures. Morphological operations also can be applied to grey scale pictures such their light-weight transfer functions are unknown and thus their absolute pel values area unit of no or minor interest. Morphological techniques probe a picture with a little form or template referred to as a structuring component. The structuring component is positioned in the slightest degree attainable locations within the image and it's compared with the corresponding neighborhood of pixels. Some operations take a look at whether or not the component "fits" within the neighborhood, whereas others take a look at whether or not it "hits" or intersects the neighborhood.

A morphological operation on a binary image creates a new binary image within which the pel incorporates a non-zero price solely if the take a look at is undefeated at that location within the input image. The structuring component may be a tiny binary image, i.e. a small matrix of pixels, every with a worth of zero or one:

•The matrix dimensions specify the dimensions of the structuring component.
•The pattern of ones and zeros specifies the form of the structuring component.
•An origin of the structuring component is typically one of its pixels, though usually the origin will be outside the structuring component.

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G. Direction determination

This step determines the direction of the growth in the MRI Scan. I.e. whether the imaging scan has growth in left face of the brain or right face of the brain.

In case the growth is found within the middle then the algorithmic rule would show as can't say

III. RESULT AND DISCUSSION

The following figures shows the input imaging scan is been treated through varied method to notice and extract the growth from imaging Scan.i.e grayscale image, high pass filtered image , threshold image, watershed mesmeric image, Finally input image and extracted growth from imaging image. For this purpose real time patient information is taken for analysis. As growth in imaging image have intensity quite that of its background thus it become terribly simple to locate and extract it from a MRI image.

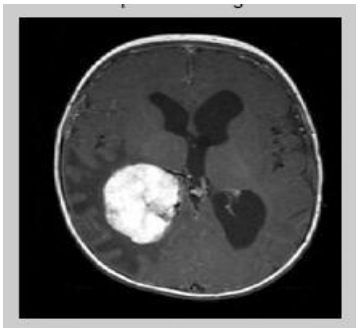

Fig. 1 Input MRI image of tumor affected brain

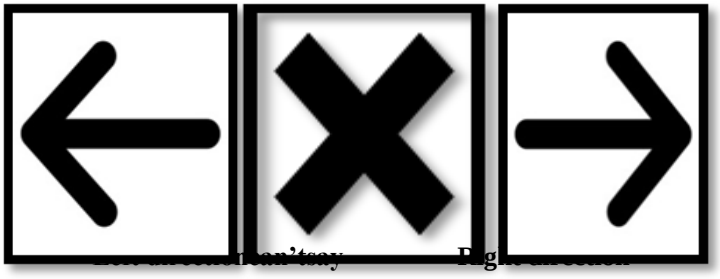

Fig. 2 Input direction image of the tumor (i.e. left direction, can'tsay and right direction)

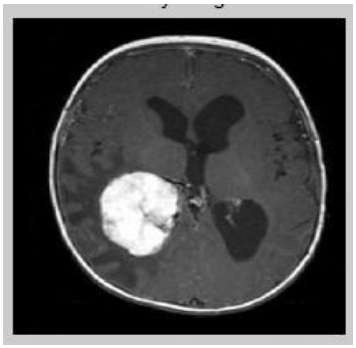

Fig. 3 Grayscale image of the fig

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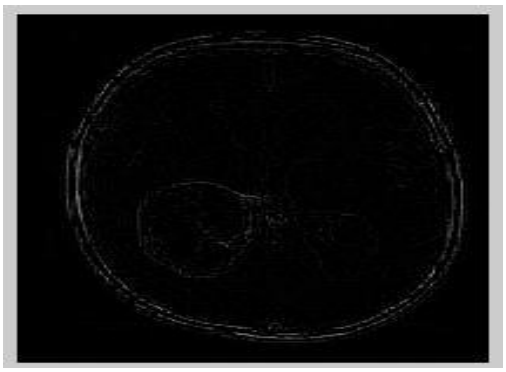

Fig. 4 HPF output of fig.3 image

Fig. 5 Enhanced MRI image of fig.4

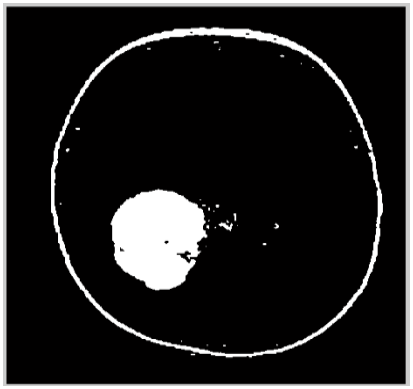

Fig.6 Threshold segmented image of i/p image

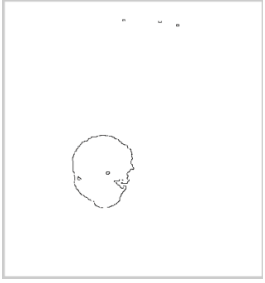

Fig.7 Watershed segmented image of i/p image

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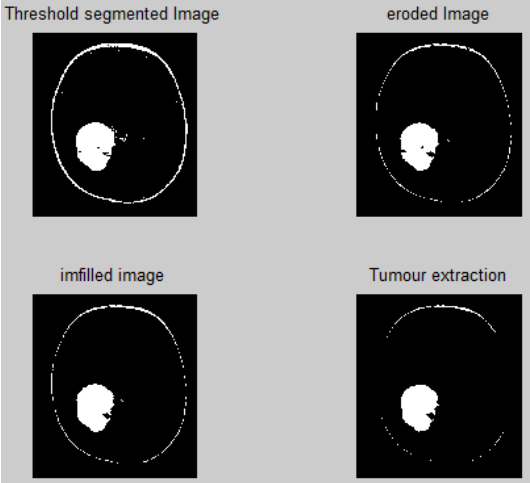
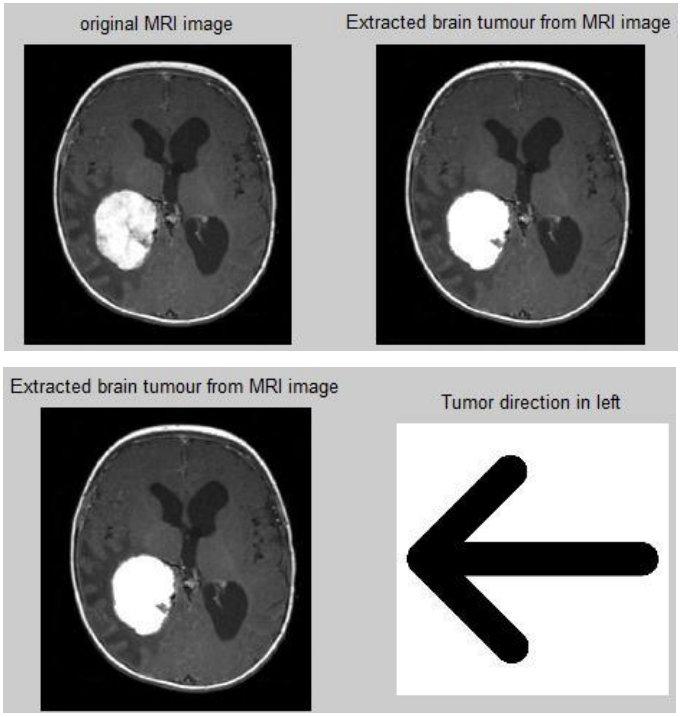


Fig. 8 Morphological operation



IV. FUTUREWORK

In future this programmer can be done more advanced so that tumor can be classified according to its type and its mass can be determined.

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