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Tumor Detection In Brain Using Morphological Image Processing

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Abstract: -

In developing countries like India the causes of disease like cancer will degrade the economy of the country. Image processing is the field to detect these kind of unwanted cells and reviles the amount it spreads. In this paper the detection of tumor in brain, either malignant tumor or non- malignant tumor is done. The morphological image processing is to be used in order to locate and identify the size of tumor. The image from MRI scan will tell the presence of tumor in the brain, but we have to find the size of that tumor. The recent technology came for finding the size, shape, type and other important specification regarding the tumor like CT scan. This paper will show how the image from MRI scan is adjusted to suitable contrast and tumor is separated from the original image.

Keywords: - malignant, tumor, MRI scan, CT scan, morphological image processing, separate

Introduction:

Image processing is the field were the information from images can be retrieved using suitable algorithm. In this paper the morphological image processing is used to detect the tumors from the brain either malignant or non-malignant tumors. The brain tumors some times change to malignant will leads to cancer. There are several techniques to capture image of brain like MRI, CT scan etc… A tumor is a mass of tissue that grows out of control of the normal forces that regulates growth. The multifaceted brain tumors can be split into two common categories depending on the tumors beginning, their enlargement prototype and malignancy. Primary brain tumors are tumors that take place commencing cells in the brain or commencing the wrapper of the brain. In this paper, the morphological operations like dilation, erosion etc… was done to remove the tumor from the MRI Image. Recent techniques achieved in researches for detection of brain tumor can be broadly classified as

1. Histogram based method.
2. Morphological operation is applied to MRI images of Brain.
3. Edge base segmentation and color base segmentation.
4. Cohesion self-merging based partition K-mean

Algorithm. We are going to use only the morphological operation.

Magnetic Resonance Imaging (MRI):

MRI is basically used in the medical field to detect, estimate the effects of disease and analyse the internal structure of the body. This technique is basically used to detect the differences in the tissues which have a far better technique as compared to computed tomography. So this makes this technique a very special one for the brain tumor detection and cancer imaging.

Work flow:

The flow chart Fig (1) below will express the operation.

From the flow chart the image is read, converted to intense, resized, contrast adjusted, eroded and threshold to separate the tumor from the MRI image using MATLAB tool. One of the journal papers Doi:01.0401/ijaict.2014.03.08 Published Online 05 (08) 2014 uses the watershed algorithm and edge detection algorithm to Get the tumor out. But in this paper the watershed algorithm is neglected, and the erosion (morphological algorithm) is used to separate the tumor. The size of the image can be detected. If the tumor is fully spherical then we can find the volume of that tumor approximately.

Proposed work:

I) Preprocessing:

The pre-processing involves the resizing, image conversion, image contrast adjustments etc… the image from the MRI cannot be directly used for this operation so some process has to be done to ensure the operation. The first thing has to be done is to resize the image to standard size. Here the images are resized to the standard size of **120*120.** Then the image in the form of RGB color standards is converted to intense image. Then the contrast of the image is adjusted to particular extend. This is because the obtain image from source may contain the noise so these noises has to be removed to improve the quality of output. Thus the preprocessing was done. The Fig (2.a) shows the preprocessed output and Fig (2.b) represents the workspace showing the specification of the outputs.

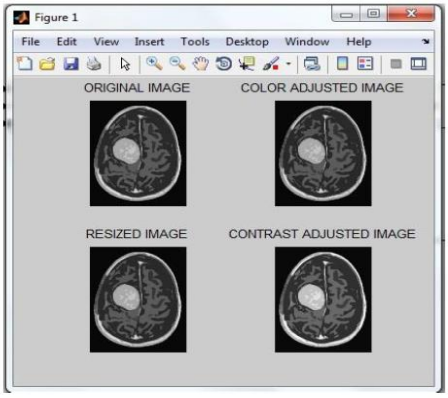


Fig 2.a

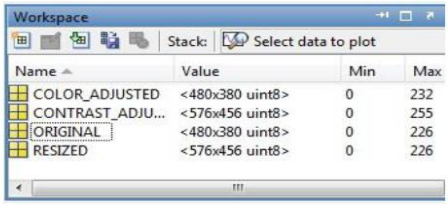
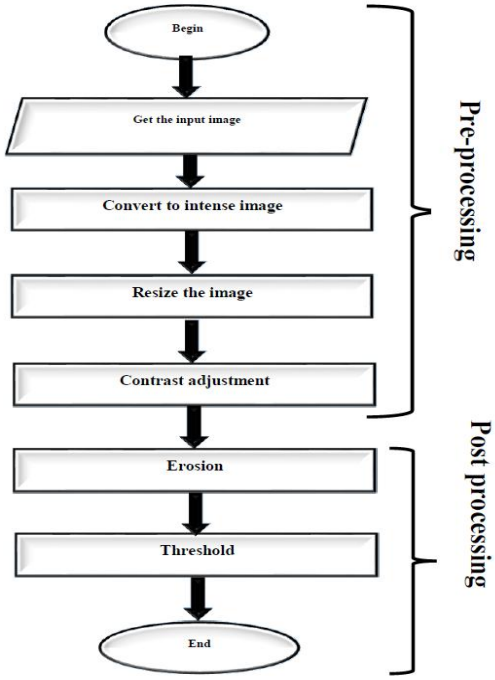


Fig (2.b)



II) Post processing:

This process involves the erosion and threshold

Erosion:

Erosion of the image by flat structure b at any location (i, j) is defined as the minimum value of the image in the region coincident with b when the origin of b is at (i, j). Let f be the image and (i, j) be the coordinates then erosion be states as

$$[f(-)b](i,j) = \min(s,t) \in b \{f(i+s, j+t)\}$$

where b is the structural element. The Neighbourhood or structuring element parameter is used to define the neighbourhood or structuring element that the block applies to the image. A neighbourhood is specified by entering a matrix or vector of ones and zeros. The **strel** function is used to specify a structuring element. Here the disk shaped structural element was created by using the keyword **'disk'.** Radius is set to be **20** for this operation. Based on the specification and input image obtain, the radius and structural element is to be changed. Refer Fig (3.a) left image for erosion output.

Threshold operation:

In this process the eroded image was converted from an intensity image to a binary image. This process uses Otsu's method, which determines the threshold by splitting the histogram of the input image such that the variance for each of the pixel groups is minimized. The thresholded image (binary image) was defined as

$$g(x,y) \begin{cases} a \text{ if } f(x,y) > T \\ b \text{ if } f(x,y) >= T \end{cases}$$

Where a=1(white)
b=0(black)

This operation uses the second portion that b if f(x, y)>=T. let T is to be found from the histogram of input pre-processed image. After this step the output is noted to be the tumor. Thus the tumor is separated from the MRI image. The Fig (3.a) right image shows threshold image. The Fig (3.b) shows the workspace of post processing

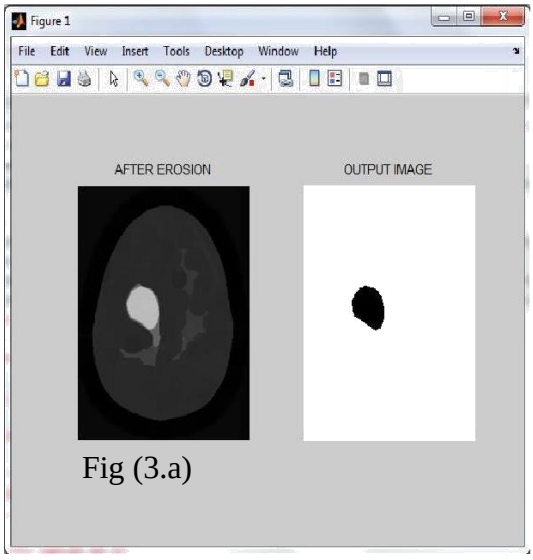


Fig (3.a)

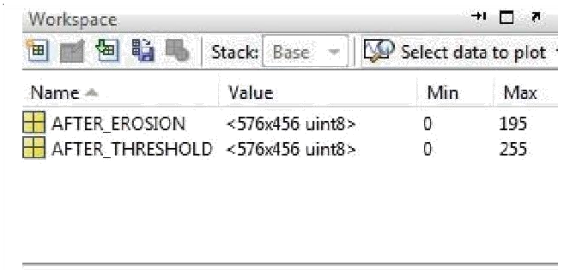
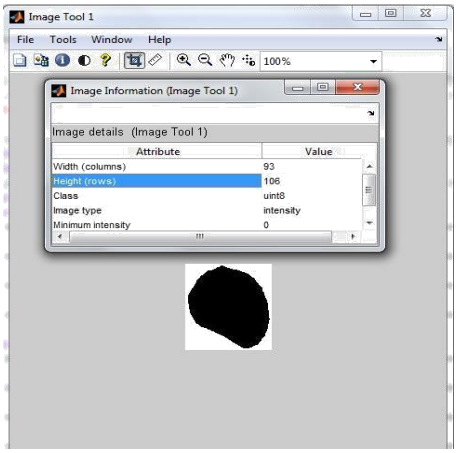


Fig (3.b)

Object	Image size	Pixels
Brain	<576x456 uint8>	262656
Tumor	<93x108 uint8>	5669

Finding size:

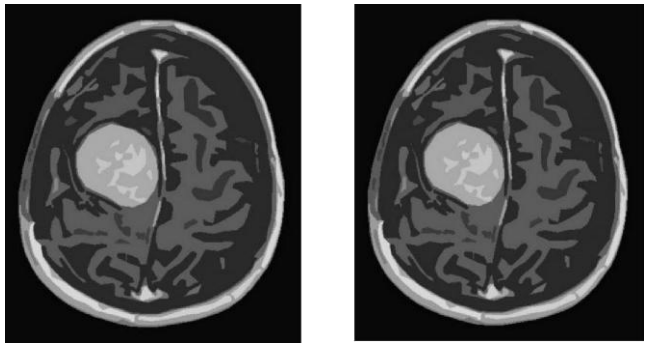
The size of the detected tumors can be found using the specifications in the workspace. Here imtool is used to find the size of the tumor(93*108).



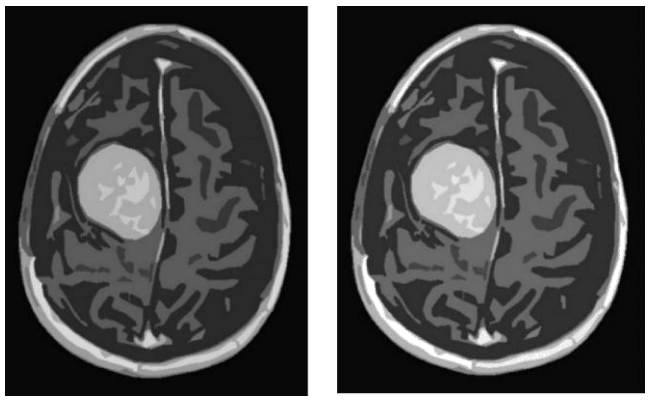
Results:

From the above experiments proved that the tumor is detected and size is found using morphological image processing techniques. The images below shows the processing steps.

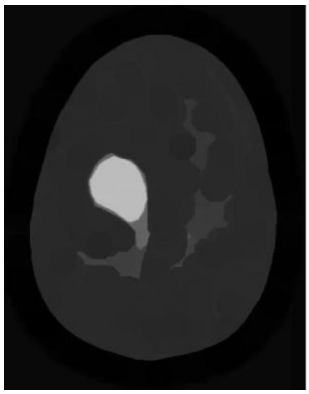
ORIGINAL IMAGE **INTENSE IMAGE**



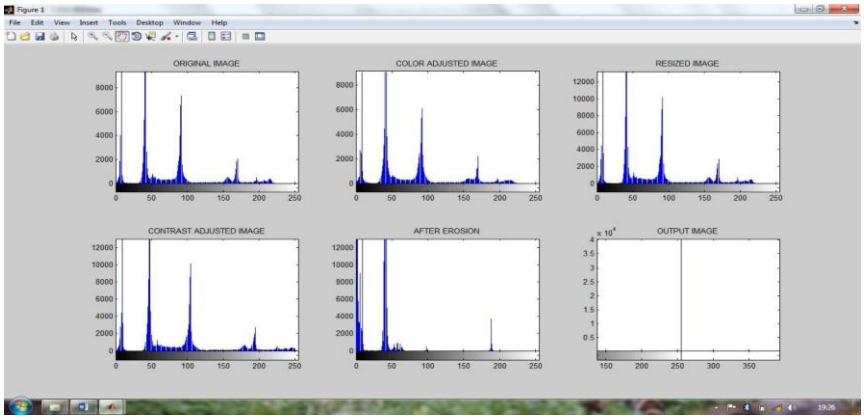
AFTER RESIZE **AFTER CONTRAST ADJUSTMENT**



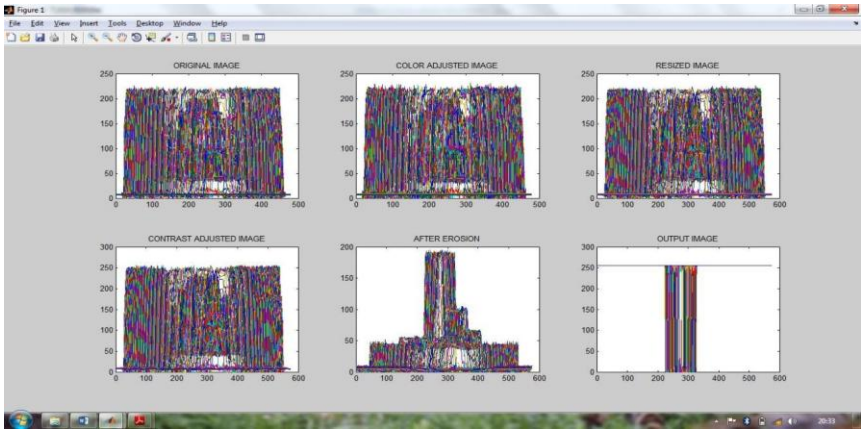
AFTER EROSION **AFTER THRESHOLD**



HISTOGRAM OF ALL OUTPUTS



PLOTS OF ALL OUTPUT



CONCLUSION:

Thus from the histogram output the improvement of the outputs step by step is shown. The final output shows that the tumor would be in the region of 250 to 300. The plot also shows the presence of tumor between the regions 250 to 300.

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