Brain Tumor Detection from MRI Images Using MATLAB

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Abstract:-

Computerized or Automatic detection of tumors in medical images is motivated by the necessity of high accuracy when dealing with a human life. The computer assistance is also demanded in medical institutions because it could improve the results of disease identification and negative cases should be very low. So, the Processing of Magnetic Resonance Imaging (MRI) images is one of the techniques to diagnose the brain tumor. This paper describes the strategy to detect and extract brain tumor from patient's MRI scanned images. In this the Steps includes are pre-processing, segmentation, morphological operation, and determination of the tumor location and this Application is Developed using Matrix Laboratory (MATLAB).

I. INTRODUCTION

Brain tumor is abnormal growth of tissues which grow uncontrollably and unchecked by the check points which control the growth of cells normally. It is one of the likely causes of mortality among children and adult. Brain Tumor is a fatal disease which cannot be confidently detected without MRI. MRI is used for anatomical analysis of brain development and brain abnormalities. These MRI images are pre-processed so that further morphological operations can be performed on these images for the detection of size, shape and location of tumor. Pre-processing of MRI images is done for noise removal and image enhancement while morphological operations are performed using MATLAB algorithms to separate and detect tumor in brain. The ultimate goal of segmentation is to extract important features from the image data. MATLAB is fast algorithm used for detection of tumor from MRI images in a very short time.

In this project, it is tried to detect whether patient's brain has tumor or not from MRI image using MATLAB simulation. To pave the way for morphological operation on MRI image, the image was first filtered using Anisotropic Diffusion Filter to reduce contrast between consecutive pixels. After that the image was resized and utilizing a threshold value image was converted to a black and white image manually. This primary filter the plausible locations for tumor presence. On this semi processed image morphological operations have been applied and information on solidity and areas of the plausible locations was obtained. A minimum value of both of this characters has been determined from statistical average of different MRI images containing tumor. Then it was used to deliver final detection result.

Keywords: Anisotropic Diffusion Filter, MRI images, Morphological Processing, Segmentation

II. LITERATURE SURVEY

Rasel Ahmmed Anirban Sen Swkshar, Md. Foisal Hossain, Md. Abdur Rafiq [4] proposed method which include stages like image pre-processing, segmentation, feature extraction, SVM classification and tumor stage classification using Artificial Neural Network (ANN). Key image processing techniques for brain MRI image segmentation is classified

as SVM, FCM.

Swapnil R. Telrandhe, et. al [5] Proposed tumor detection inside which Segmentation separates an image into parts of regions or objects. In this it has to segment the item from the background to browse the image properly and classify the content of the image strictly. During this framework, edge detection is a vital tool for image segmentation. In this paper their effort was made to study the performance of most commonly used edge detection techniques for image segmentation and additionally the comparison of these techniques was carried out with an experiment. Preliminary results show that our approach has achieved good segmentation results. Also this approach was reduces a large quantity of calculation.

Rajeshwari G tayade et.al [13], in their paper they gave a mixture of wavelet statistical features and co-occurrence wavelet texture feature obtained from two level distinct riffle remodel was used for the organization of abnormal brain matters in to benign and malignant. The planned system was consists of four stages: segmentation of region of interest, separate ripple disintegration, feature abstraction, feature choice, organization and analysis. The support vector machine was used for tumor segmentation. A grouping of WST and WCT was used for feature extraction of neoplasm region extracted from second level separate ripple remodel. Genetic algorithm was used to choose the best texture options from the set of well-mined options.

III. METHODOLOGY

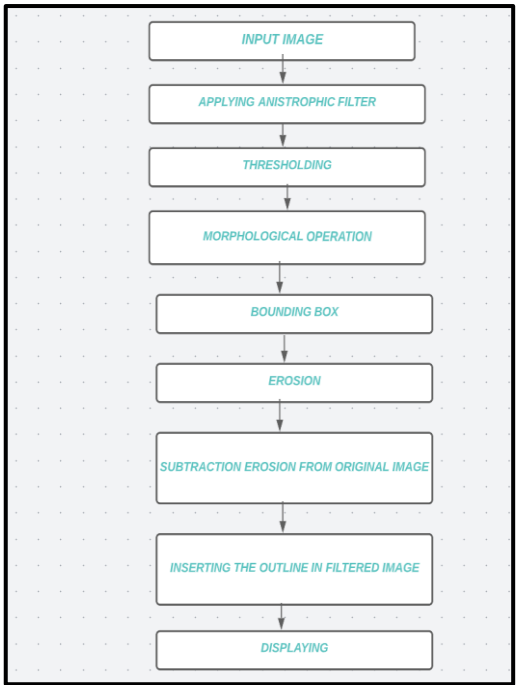


Figure 1 (Methodology used)

INPUT IMAGE:

This is the first step of the proposed system.
The resulting MRI images may not be of very good quality for analysis. Images can be noisy, blurry, low-contrast. The area of interest can be difficult to extract .Here, grayscale MRI images are provided as input to the system

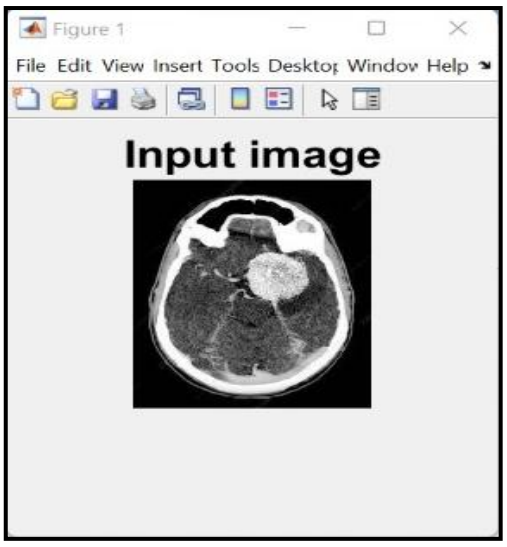


Figure 2 (Input Image)

PREPROCESSING:

This is the initial processing of data in order to prepare them for primary processing or further analysis. The preprocessing phase of our project mainly includes those operations that are usually necessary before the target analysis and extraction of the necessary data and usually geometric corrections of the original image.

These improvements include correcting information for jaggedness and unwanted noise in an area, removing an image of a non-brain element, and transforming the data so that it reflects correctly in the original image. The first preprocessing step is to transform this input MRI image into a suitable form with which further work can be done.

Figure 3 (Filtered Image)

FILTER USED

ANISOTROPHIC FILTER

In 3Dcomputergraphics, anisotropic filtering (abbreviated AF) is a method of enhancing the image quality of textures on surfaces of computer graphics that are at oblique viewing angles with respect to the camera where the projection of the texture (not the polygon or other primitive on which it is rendered) appears to be non-orthogonal.
Like bilinear and trilinear filtering, anisotropic filtering eliminates aliasing effects,[3][4] but improves on these other techniques by reducing blur and preserving detail at extreme viewing angles.Anisotropic filtering is now common in modern graphics hardware (and video driver software) and is enabled either by users through driver settings or by graphics applications and video games through programming interfaces.

FEATURE EXTRACTION:

It is the process by which certain features of interest in an image are detected and presented for further processing. This is an important step in most computer vision and imaging solutions. Based on the results obtained during the extraction of signs, the tumor is classified. When extracting, certain parameters are taken into account: size, shape, composition, image location. This step extracts the Features of the given input image. Based on these characteristics, the image is analyzed and the area of the tumor is determined. In this process using segmentation and morphological processing , the tumor alone, the bounding box for the tumor detected, the eroded image for the tumor and the tumor outline are obtained.

Figure 4 (Tumor alone)

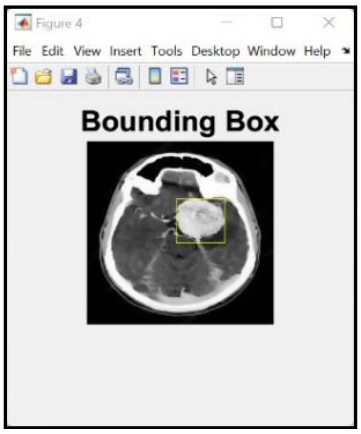


Figure 5 (Bounding Box)

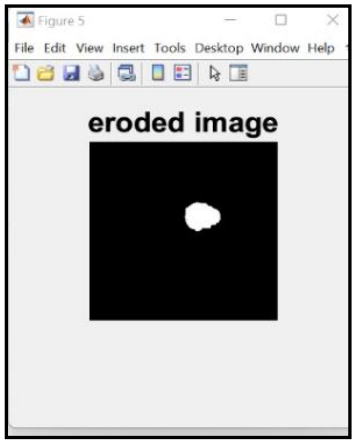


Figure 6 (Eroded Image)

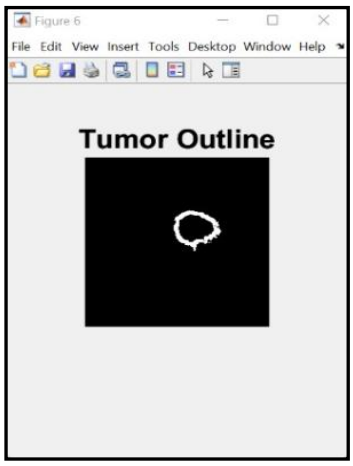


Figure 7 (Tumor Outline)

IMAGE ANALYSIS:

This is the final stage of the brain tumor detection process. The output is analyzed and the result is displayed either as no tumor or tumor detected with its output. The detected tumor is highlighted in the output image.

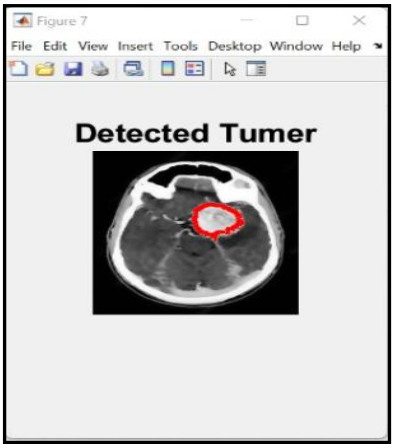


Figure 8 (Detected Tumor)

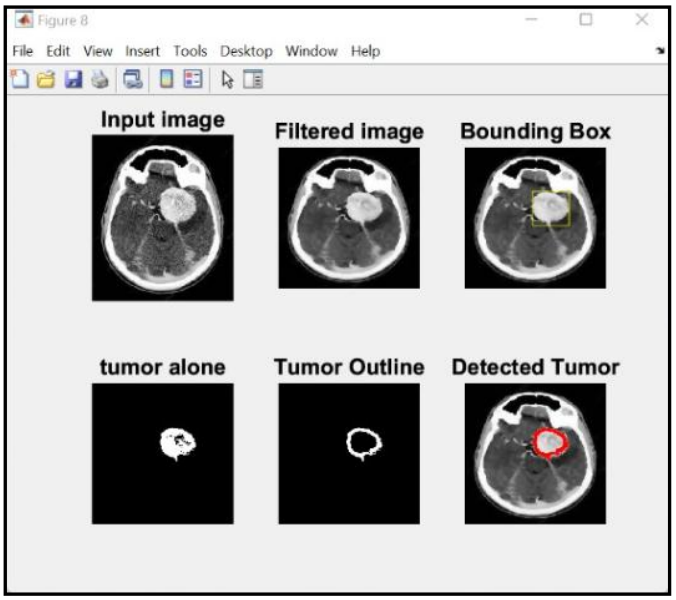


Figure 9 (Output of all stages)

OUTPUT

FOR TUMOR NOT DETECTED

INPUT IMAGE

The MRI image is given as input

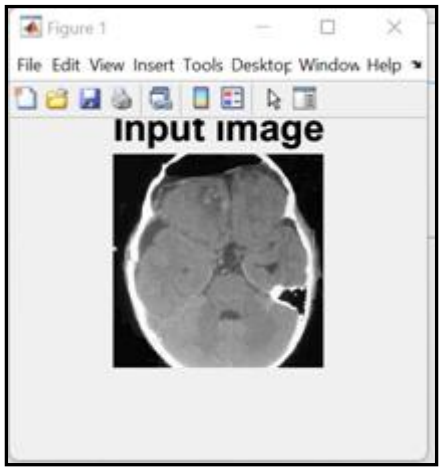


Figure 10 (Input image)

PREPROCESSING

The image is pre-processed with the anisotropic filter.

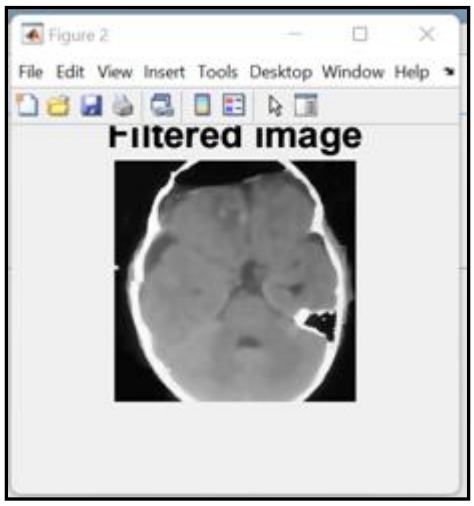


Figure 11 (Filtered Image)

IMAGE ANALYSIS

The input image is analyzed and the output is detected as no tumor detected

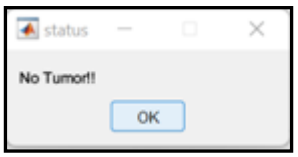


Figure 12 (Tumor not detected)

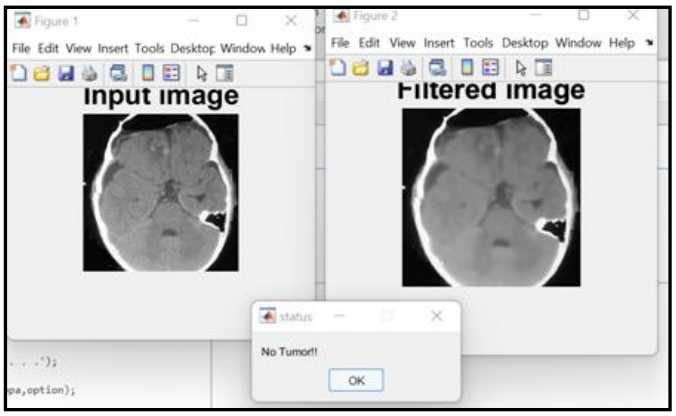


Figure 13(Output of all three stages)

IV. FUTURE WORK

From the observation results, it can be clearly expressed that the detection of brain tumor is fast and accurate when compared to the manual detection carried out by clinical experts. The proposed methodology results in accurate and speedy detection of tumor in brain along with identification of precise location of the tumor. With the above results, we conclude that our proposed method clearly distinguishes the tumor into tumor detected and no tumor which helps in taking clear diagnosis decisions by clinical experts. In the future work, different classifiers can be used to increase the accuracy combining more efficient segmentation and

feature extraction techniques with real- and clinical-based cases by using large dataset covering different scenarios. Though this simulation routine can give correct result most of the time, it fails to perform when tumor's size is too small or tumor is hollow. The larger goal of the project is to build a data base of 2D image data of tumor from the MRI images taken from different angle of a particular human and by analyzing them to point out the exact 3D location of the tumor .

V. CONCLUSION

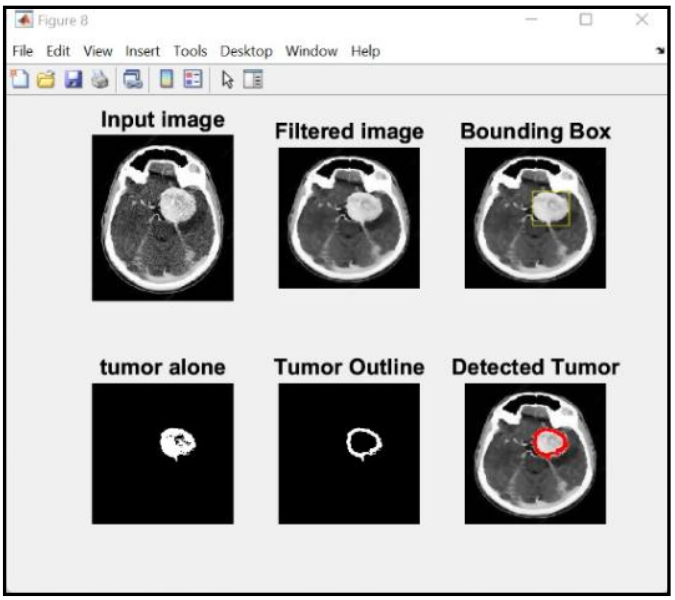
In this project, we have used brain MRI images, segmented into normal brain tissue (unaffected) and abnormal tumor tissue (infected). To remove a noise and smoothen the image, preprocessing is used which also results in the improvement of signal-to-noise ratio. We have applied thresholding and morphological operations to extract the boundary and detect the tumor.

Spatial filtering and frequency filtering are not recommended for treatment in medical imaging such as CAT scans because they steal vital information for diagnosis to the image because the filtered that are made are made on the whole picture, however with morphological operations can work the image pixel by pixel or can perform a segmentation of the image to separate objects and can identify them without any data loss problem after completing treatment. Sometimes applications of digital image processing are simply summarized do transformations on the image but no analysis can become wider leveraging the benefits of tools like MATLAB as was evident offers many features that can become relevant to the analysis of the images

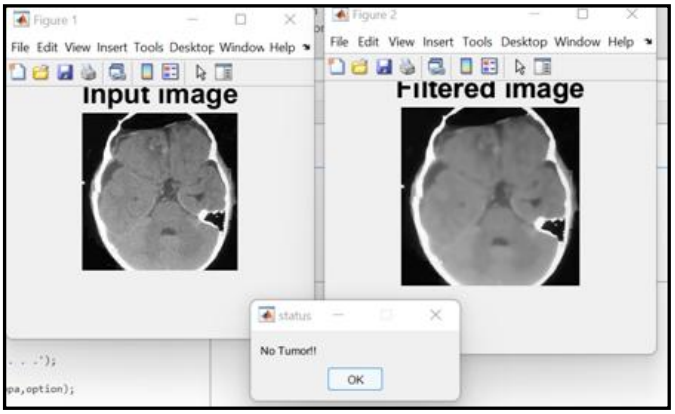
VI. RESULT

Using Matlab the MRI Images were processed and the brain tumor was detected successfully

BRAIN TUMOR DETECTED



BRAIN TUMOR NOT DETECTED



VII. REFERENCES

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