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TISSUE SEGMENTATION AND FEATURE EXTRACTION IN DIAGNOSTIC IMAGING TECHNIQUES FOR THE EARLY DETECTION OF BRAIN CANCER: A SYSTEMATIC NOVEL APPROACH

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A B S T R A C T

In brain images are complicated and tumors may only be assessed by trained physicians, brain tumour detection is one of the most difficult challenges in medical image processing. In the treatment of malignant tumors, the capacity to determine the volume of a tumour is critical. Brain cancers are recognised at various stages in this study because manual segmentation of brain tumors from magnetic resonance images is difficult and time-consuming. First, noise is minimised, then a canny filter is used to detect edges, and last, histogram clustering is used to partition the tumor-affected image into two parts and a threshold value is determined, and the tumour is detected based on this value.The second technique involves superimposing the tumor-affected image over a healthy image. Using a fuzzy set, this method can detect tumors not only approach does not necessitate any initialization, whereas the others necessitate initialization within the tumour. The third method involves calculating the histogram and setting the threshold. This job is done with the help of an MRI image.

Keywords: *Histogram, MRI, Thresholding, Brain Tumour.*

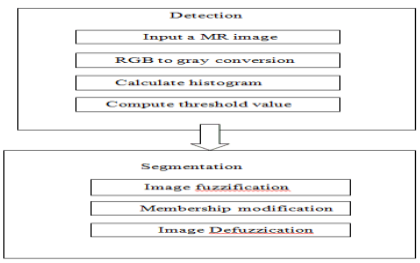
1. INTRODUCTION

Our human system is made up of several organs, the most important of which is the brain, which is the human system's primary and foremost controller. The term "brain tumor" refers to an overabundance of cells in the brain that are developing uncontrollably. This tumour component is discovered at several stages in this article. The first input is a tumor-affected MRI picture. The median filter is then used to pre-process the data. Because the median filter totally removes noise and produces a highly clean image, whereas the Gaussian and linear filters do not. Because of the location of brain cancer and its tendency to spread swiftly, treating it with surgery or radiation is like confronting an opponent hidden among minefields and caverns. A brain cancer is a disorder in which cells in the brain grow uncontrolled. There are two forms of brain tumors: There are two types of tumors: benign and malignant. Benign tumors are unable to spread outside of the brain. The majority of benign brain tumors do not require treatment and their growth is self-limiting. Because of their placement, they might cause issues, and surgery or radiation can assist. Brain cancer is the common name for malignant tumors. These tumors have the potential to spread outside of the brain. Malignant brain tumors are the most dangerous and often go untreated, necessitating a more aggressive procedure. Brain tumour detection is a critical issue in medical science. One of the leading reasons of increased mortality in children and adults is brain tumors. Tumors are classified as benign or malignant. The use of imaging in the diagnosis and treatment planning of brain tumors is crucial. CT scans, ultrasounds, and MRIs can all be used to image cancers.

Because of its better resolution, MR imaging is the best option. However, there are numerous issues with detecting a brain tumour with MR imaging. The extraction of the border of a region of interest is a key step in most medical imaging analysis systems. For MRI segmentation, a variety of approaches are available. Though histogram thresholding has only been used for preprocessing in many segmentation algorithms until now, this study shows that it can be utilised as an effective segmentation tool. The location of the infected region of the brain is seen in this picture taken from a tumor's brain. The scan does not provide numerical information regarding the affected portion of the brain, such as area and volume. The first picture segmentation is done using region growing segmentation after the image has been preprocessed. The unhealthy section is plainly visible in the split image. Cropping the segmented image allows the diseased region (tumour) to be selected. The area of this cropped image is calculated.

2. METHODOLOGY

The method reported here uses histogram thresholding to segment brain images. The MRI technology is used to obtain a brain image. Due to the symmetrical nature of the brain along its central axis, symmetry between the two histograms should be visible if the histograms of the images corresponding to the two halves of the brain are plotted. The presence of a tumour, on the other hand, is recognized if there is any asymmetry.



Thresholding can be used to segment the image after the existence of the tumour has been detected. Calculating the threshold point is how segmentation is done. The difference between the two histograms is shown, and the difference's peak is chosen as the threshold. The entire image is transformed into a binary image with the tumour border using this threshold point. To compute the physical dimension of the tumour, the binary image is now clipped along the contour of the tumour. Fig. 1 – Steps of proposed work,

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2.1 PREPROCESSING

In pre-processing step the read the input image into MATLAB, Transform the brain image into Gray scale, and extracted any noise. The median filter is used to eliminate noise in this method. It is used to preserve edge outlines and position of the edges by reducing the variance of the intensities in the image.Figure 2(a) and2(b) are input images and PPI median filters.

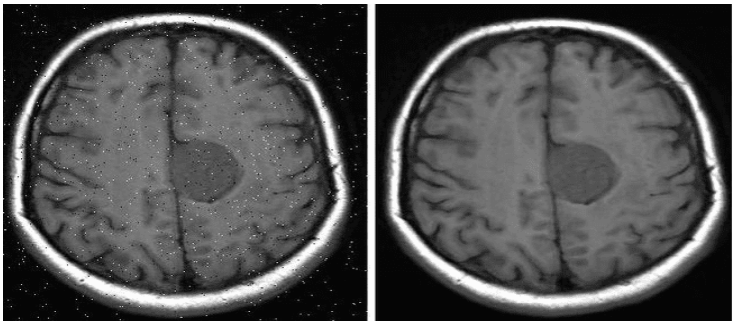


Fig 2-(a): Input image **Fig 2(b): Pre-processed image-median filter**

2.2 MODIFIED HISTOGRAM CLUSTERING AND SEGMENTATION

The pixel values in the picture matrix are compared to the threshold point. The c matrix coordinate is set to 255 if the pixel value is greater than the threshold; else it is set to 0.Figure 3 (a) ,(b),(c),(d),(e),(f) and 3 (g) are different thersholding output.

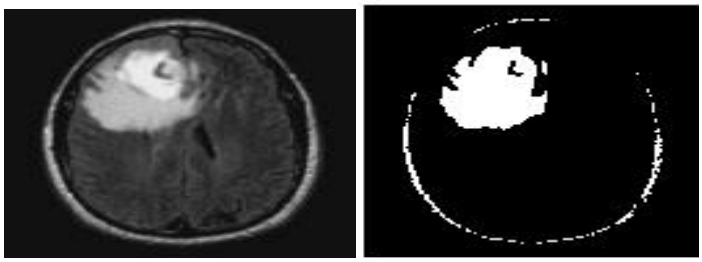


Fig. -3(a) Tumor image1 **Fig-. 3(b) Threshold image1**

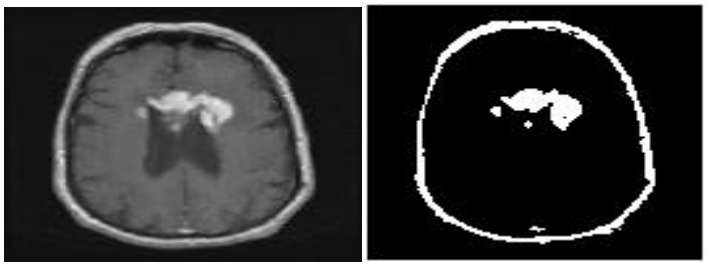


Fig. -3(c) Tumor image2 **Fig. -3(d) Threshold image2**

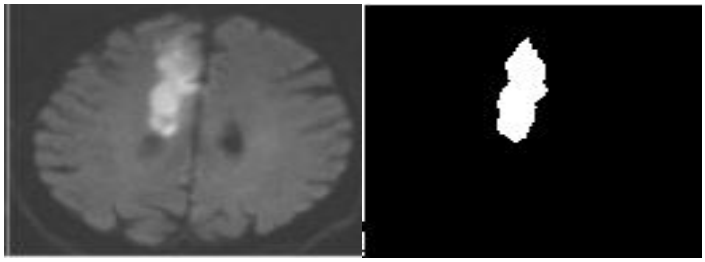


Fig. -3(e) Tumor image3 **Fig.-3 (f) Threshold image3**

Threshold results for various images:

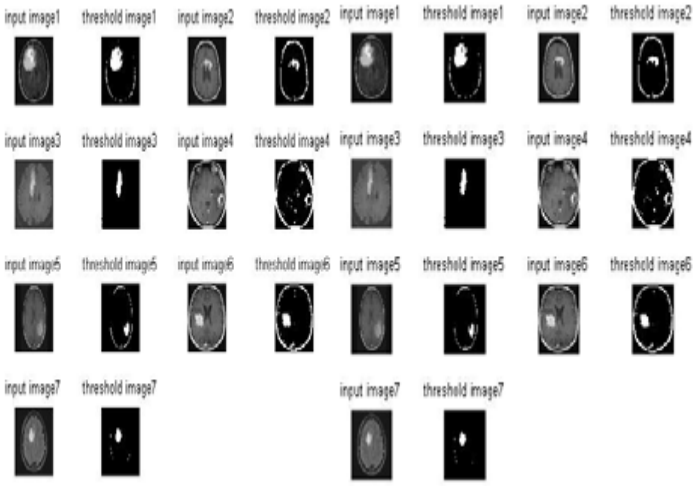


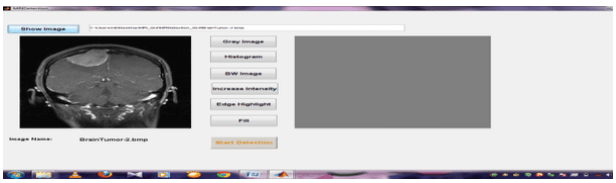
Fig. 4 (a) Threshold -128 **Fig. 4(b) Threshold -129**

3. RESULTS AND DISCUSSION

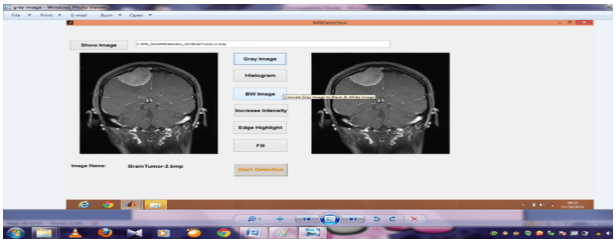
An image of a brain with a tumor has been evaluated in order to taste the algorithm produced. The following graphs and images were produced as a result of the program's outputs:

- The original image in two halves, with their corresponding histograms.
- There is a difference between the two histograms.
- An original image that has been segmented.

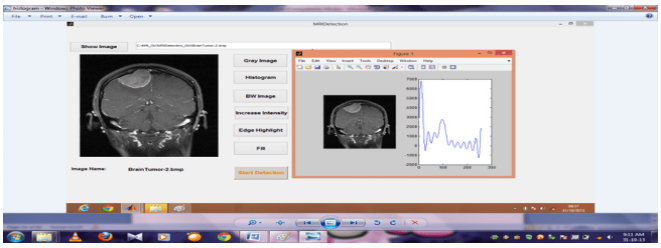
STEP 1: Input an MR image



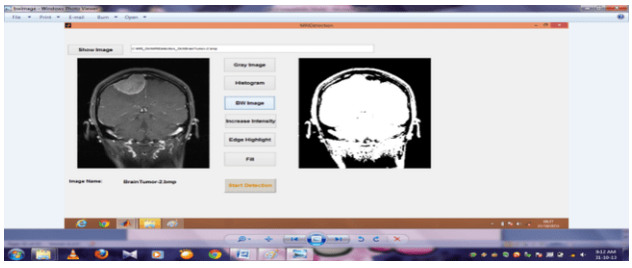
STEP 2- Gray image



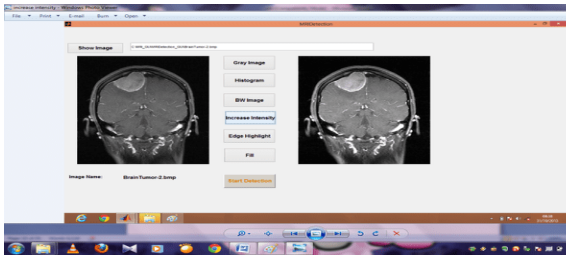
STEP 3-histogram



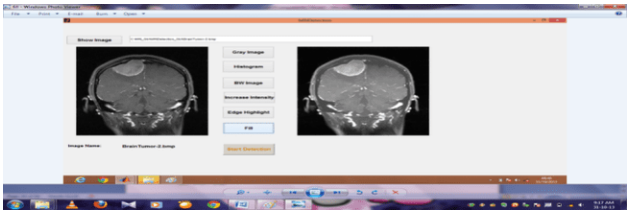
STEP 4-Black and White Image



STEP 5-Increase Intensity

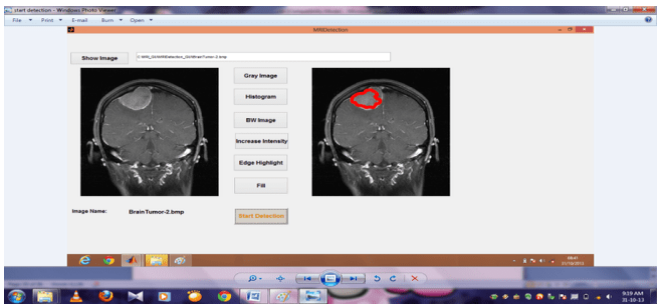


STEP 6-Edge Highlight



STEP 8 -Start Detection

STEP 7-Fill



4. CONCLUSION

The findings suggest that histogram clustering segmentation with a cutoff value paired with modified histogram clustering produces unambiguous results in tumor identification. In medical image processing, this segmentation method is useful. In this study, a thresholding technique was used to establish a technique for detecting the presence of the brain. While detecting the presence of the tumor, the brain is being segmented as well. The current technique can also be used to compute the area of the tumour that is most important to the **doctors.** Acknowledgements

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