COMPUTER AIDED DIAGNOSIS OF BRAIN TUMOUR USING MATLAB

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During past few years, brain tumour detection in magnetic resonance imaging (MRI) has become an emergent research area in the field of medical imaging system. Inaccuracy and failure in detecting the brain tumours leads to loss of life in many parts of the world. This paper describes the proposed strategy for the detection of brain tumour from patient's MRI scan images of the brain using MATLAB.

***Index Terms*—Brain tumour, MRI, MATLAB.**

I. INTRODUCTION

THIS paper presents detection of Brain Tumours from the MRI images using MATLAB.
Tumour is defined as an abnormal growth of the tissues.
Brain tumour is an abnormal mass of tissue in which cells grow and multiply uncontrollably, seemingly unchecked by the mechanisms that control normal cells [1]. Brain tumours are of two types,
(i) Benign (non-cancerous)
(ii) Malignant (cancerous)
The symptoms of the brain tumour are mostly common for both malignant and benign. Common symptoms include headache, vomiting, blurred vision, changes in personality, difficulty in walking, etc.
Medical image processing and analysis is one of the blessings of science to detect the degenerated tissue. Medical imaging is useful to diagnose the noninvasive possibilities. The various types of medical imaging technologies based on noninvasive approach like; MRI, CT scan, Ultrasound, SPECT, PET and X-ray. In the field of medical diagnosis systems (MDS), Magnetic resonance Imaging (MRI), gives better results rather than Computed Tomography (CT), because Magnetic resonance Imaging provides greater contrast between different soft tissues of human body [4].

The first step involves Pre-Processing on the MRI image by performing image enhancement techniques and removing the noise subsequently. The output of the image then undergoes Thresholding and Watershed segmentation. Finally the Morphological relations are applied on some assumptions about the size and shape of the tumour and in the end the tumour is mapped onto the original gray scale image with 255 intensity to make the tumour visible in the output image.

II. RELATED WORKS

Various Researchers have proposed methods to find Brain Tumours and other abnormalities in human brain using MRI Images. The work is as follows :

Rajesh C. Patil and Dr. A. S. Bhalchandra et al, in their paper "Brain Tumour Extraction from MRI Images Using MATLAB", they focused on Meyer's flooding Watershed algorithm for segmentation and also presented the morphological operation [1].
Anam Mustaqeem and Ali Javed et al, in their paper "An Efficient Brain Tumour Detection Algorithm Using Watershed & Thresholding Based Segmentation" ,presented a technique using segmentation, based on a method of threshold segmentation, watershed segmentation and morphological operators [6].
D.Dhilip Kumar and S. Vandhana et al specified the type of Brain tumours using SVM classifier and used Threshold Segmentation in their paper "Brain Tumour Image Segmentation using MATLAB".[3]
In the year 2013, Poonam and Jyotika Pruthi performed a work, "Review of Image Processing Techniques for Automatic Detection of Tumour in Human Brain". In this review paper, the author used segmentation rechniques like k-mean clustering, fuzzy c-mean clustering, thresholding segmentation etc. The volume of the tumour was also calculated to identify its size.[4]

III. IMPLEMENTATION

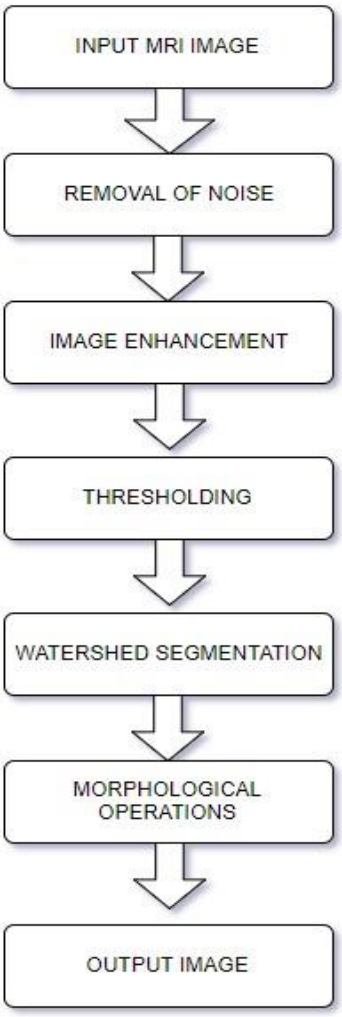

Fig.1 Block Diagram for the proposed methodology

A. PRE-PROCESSING

The MRI image is taken as input from the user, which is a RGB (Red-Green-Blue) image. So, the input image is converted to Grayscale image for better processing.

Fig.2. MRI Input Image

The Gray-Scale image then undergoes Image Enhancement . This includes Sharpening and adjusting the contrast of the Gray-Scale image.

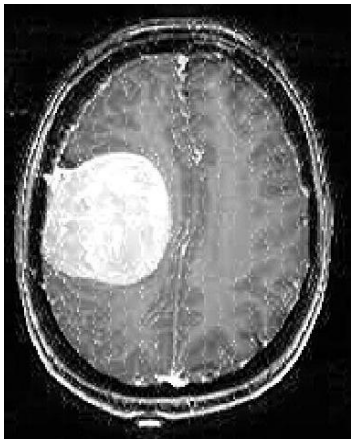

Fig.3. Sharpened Image

The image still contains Noise (random variation of brightness and colour brightness of an image). Though Noise reduction/ removal can be done using various filters present in the Image Processing Toolbox in MATLAB, but we use the Median filter for best possible results under given conditions.

The median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise[4] . Median filters are particularly effective in the presence of impulse noise. Impulse noise is also called as salt and pepper noise because of its appearance as white and black dots covered on image.[2]

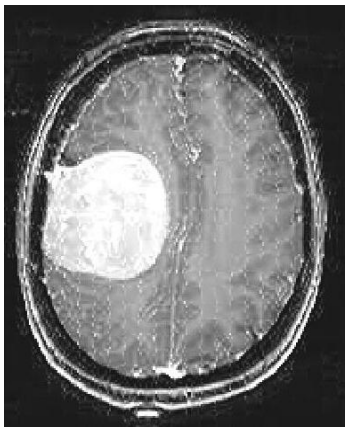

Fig. 4. High pass Filter for Noise removal

B. THRESHOLDING AND WATERSHED SEGMENTATION

Image thresholding is a simple, effective, way of partitioning an image into a foreground and background. This image analysis technique is a type of image segmentation that isolates objects by converting gray scale images into binary images. Image threshold is most effective in images with high levels of contrast.

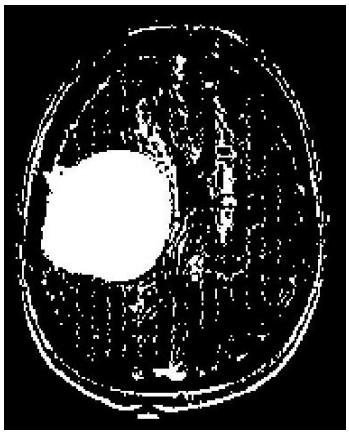

Fig.5. Thresholding

In image Processing, a watershed is a transformation defined on a grayscale image. It is one of the best methods to group pixels of an image on the basis of their intensities. Pixels falling under similar intensities are grouped together [5] .It is a good segmentation technique for dividing an image to separate a tumour from the image.

Watershed is a mathematical morphological operating tool. Watershed is normally used for checking output rather than using as an input segmentation technique because it usually suffers from over segmentation and under segmentation [6].

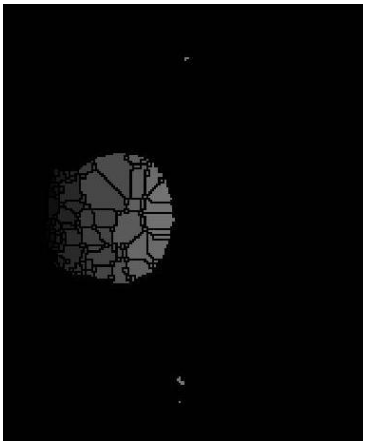

Fig. 6 Watershed Segmentation

C. MORPHOLOGICAL OPERATIONS AND OUTPUT

Morphological image processing is a collection of non-linear operations related to the shape or morphology of features in an image. The erosion and dilation methods are use for morphological operation.
Morphological operations rely only on the relative ordering of pixel values, not on their numerical values, and therefore are especially suited to the processing of binary images.

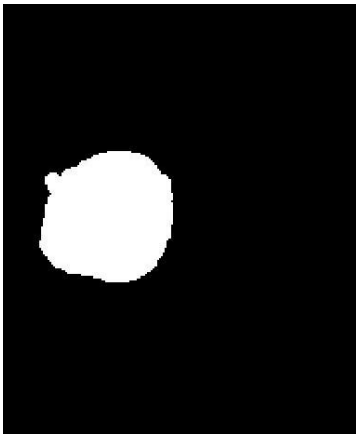

Fig. 7. Morphological operation

In the Final Image, the tumour present in the image is segmented and shown as output.

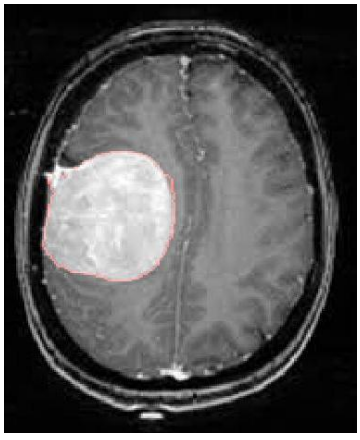

Fig.8. Output Image

IV. CONCLUSION

The proposed algorithm in this paper is simple and effective way to diagnose tumour cells. The algorithm is sufficient enough to detect the tumour successfully. Brain tumour cells have high proteinaceous fluid which has very high density and hence very high intensity, therefore watershed segmentation is the best tool to classify and diagnose tumours and other high intensity tissues of brain.Though Machine Learning techniques give much better results, still,

the training and testing process is computationally expensive and time consuming. The method used in this paper is simple and almost equally effective.

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VII. REFERENCES

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