Brain Tumour Detection image segmentation using Machine Learning

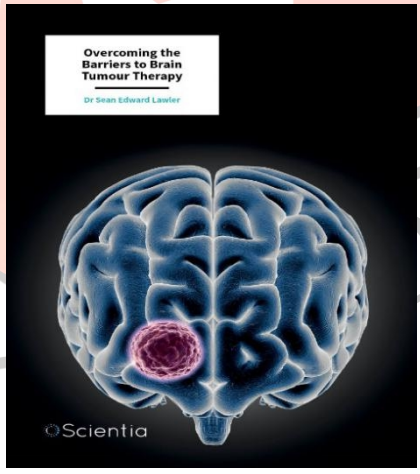
[1]Shilpa Sharma, [2]Nisha Mashahary, [3]Shashank Tripathi, [4]Harshit Sahay, [5]Deepak Kanojia
[1]Student, [2]Student, [3]Student, [4]Student, [5]Assistant Professor
GNIOT, Greater Noida

***Abstract* - Image Processing is one of the most growing field in the biological images. MRI, CT scans and X-Ray are different types of images used in this technique. Even a minute deformity can be identified by these techniques. All these medical image processing uses and explores the 3D image datasheet of the human body for diagnosing pathologies or even to guide medical intervention such as surgical planning or research purpose. The most reliable form of biomedical image available tous is MRI as it does not expose the human body to any sorts of harmful radiation.Once the MRI is obtained it can be processed, and the part of brain affected by tumour can be segmented. The complete process of detecting brain tumour from an MRI can be classified into four different categories: Pre-Processing, Segmentation, Feature Extraction and Tumour Detection. This survey involves analysing andtaking help of the research by other professionals and compiling it into one paper.**

***Key words:* MRI, Pre-Processing, Segmentation, Feature extraction, Tumour Detection.**

1.INTRODUCTION

Brain is an organ which controls all our activities and is one of the most complex organs in the human body. Tumour is usually formed by nonuniform division of cells inside our brain.



Diagnosis of Brain tumour is very important for better calculation of its suitable treatment. Tumour is basically the uncontrolled death and birth of new cells. A cell rapidly divides to form a new cell and non-uniformity in it causes harm to the normal functionality of the brain and destroy the normal cells. Metastasis is a process in which non-uniform cell(lump) moves to the different parts of the body other than the brain.

There are different types of brain tumour. The most understandable classification is Malignant and Benign tumour. Where, Malignant tumour indicates the cancerous growing tumour and Benign is noncancerous tumour.

Brain tumour should be treated in a better way to prevent more damages to the brain. Its symptoms depend upon the size of tumour, location and its type.

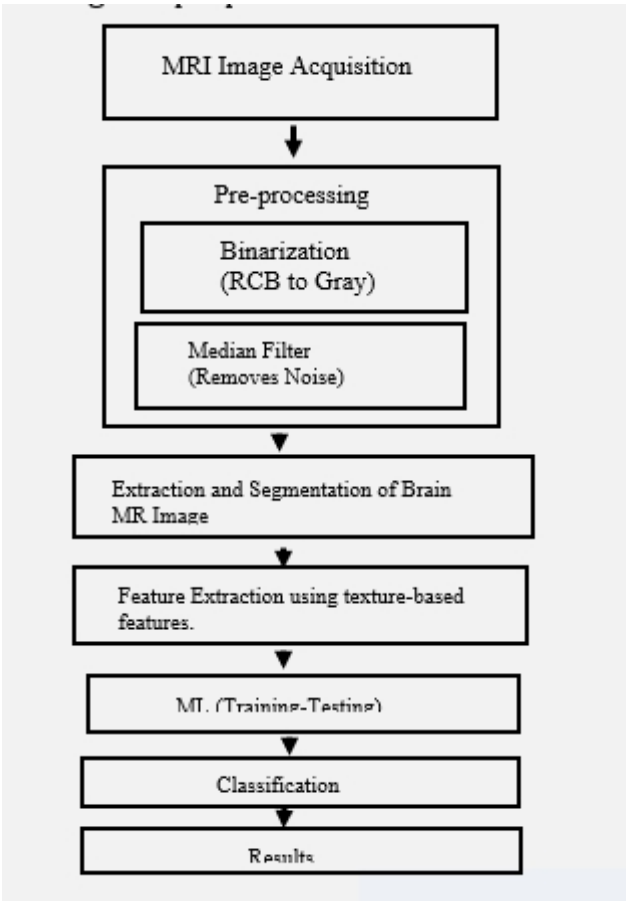
The conventional method for tumour detection in MRI image is human inspection which is a time-consuming method and is not appropriate for large amount of data.

Automated detection of it in MRI images is necessary as high accuracy is needed when dealing with human life.

In this paper, an efficient automated segmentation technique for brain MRI is proposed using machine learning algorithms. The supervised machine learning technique is used for detection of brain MR image.

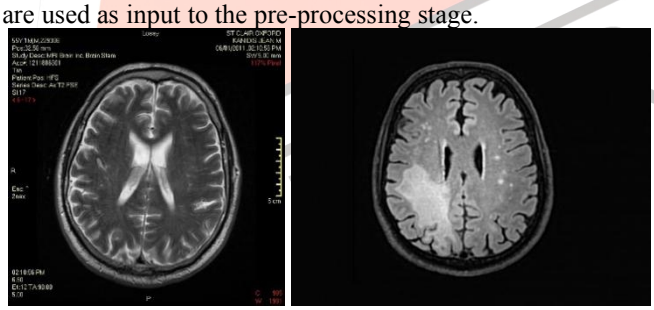
2.PROPOSED METHOD

According to earlier research and knowledge, it was found that automated brain tumour detection is very necessary for high accuracy when human life is involved. This technique involves segmentation and feature extraction using machine learning algorithm (a system to automatically detect tumour using MRI images is proposed).



A. Image Acquisition:

The MRI brain images obtained are used as input to the pre-processing stage.



B. Pre-processing:

Pre-processing is needed to provide improvement in the image data as it enhances some of the image features which are important for further processing. The pre-processing steps applied to MR image are as follows.

The RGB MRI image is converted to Gray scale image and then median filter is applied for removing noise from the brain MRI images.

The edges are then detected from the filtered image using canny edge detection which is needed for segmentation of the image.

Then the segmentation of MRI image is done to find the location of the tumour which divides the image into multiple segments and change details of image into something which is simple and easy to observe. The output of segmentation is a labelled image.

Different objects present in the image will be identified having different pixel values, where all the pixels of first object will have value 1, all the pixels of second object will have value 2 and so on.

C. Feature Extraction:

Feature extraction Transforms input data into set of features. Texture features are extracted from the segmented brain MRI image which shows the texture property of the image. These features are extracted using Gray Level Co-occurrence Matrix (GLCM) as it is a robust method with high performance. Using smaller number of Gray levels shrinks the size of GLCM which reduces the computational cost of the algorithm and also the time preserved for high classification rates.

The GLCM texture features that are extracted are as follows:
1.Mean(M):The mean of an image is calculated by adding all the pixel values of an image divided by the total number of pixels in an image.
2.Standard deviation (SD):The standard deviation is the second central moment describing probability distribution of an observed population and can serve as a measure of inhomogeneity. A higher value indicates better intensity level and high contrast of edges of an image.
3. Energy:It gives a measure of textural uniformity, that is, measure of pixel pair repetitions.
4.Constrast: It gives a measure of textural uniformity, that is, measure of pixel pair repetitions.
5.Correlation: It gives a measure of how correlated a pixel to its neighbour over the whole image.

3.CONCLUSION AND FUTURE SCOPE

In this research by using MRI brain images, we segmented brain tissues into normal tissues such as white matter, Gray matter and tumour-infected tissues. seven patients infected with benign and malignant stages. Initially we used pre-processing to improve the signal-to-noise ratio and to eliminate the effect of unwanted noise such that we get the filtered image required for the tumour detection. In the next step, features are extracted from the filtered image to obtain the morphological image and the active contours. Finally, the tumour is detected based on the different feature extraction techniques used in this study. In this study, we used OpenCV which provides simple and useful ways to read and write images. This technique also allows us to analyse the image by means of different patterns. From the experimental results performed on the different images, the analysis for the brain tumour detection is fast and accurate when compared with the manual detection performed by radiologists or clinical experts. In the future work, to improve the detection and get the accuracy of the classification of the present work, more than one classifier and feature selection techniques can be combined to get a better result.

4.REFERENCES

[1] S. Chrutha and M.J. Jayashree, "An efficient brain tumour detection by integrating modified texture-based region growing and cellular automata edge detection, "in Control Instrumentation, Communication and Computational Technology (ICCICCT),2014 International Conference On,2014, pp.1193-1199.
[2] A. Abdullah, et al., "Implementation of an improved cellular neural network algorithm for brain tumour detection," in Biomedical Engineering (Isobel), 2012 International Conference on, 2012, pp. 611- 615.
[3] R. Preetha and G. R. Suresh, "Performance Analysis of Fuzzy C Means Algorithm in Automated Detection of Brain Tumour, "in Computing and Communication Technologies (WCCCT), 2014 World Congress on, 2014, pp. 30-33.
[4] Bandana Sharma et al. "Review Paper on Brain Tumour Detection Journal of Recent Research Aspects ISSN: 2349-7688, Vol. 3, Issue 2, June 2016, pp. 151-156.
[5] D.N. Louis, et al, The 2007 WHO classification of tumour of central. Using Pattern Recognition Techniques" published in International.