Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 02, February-2016

# Comparative Study of Segmentation Techniques for Brain Tumor Detection

Pallavi Tambe
Student
Computer Department
St. John College of Engineering & Technology
Palghar, Mumbai Universit

Jenitor Thomson
Student
Computer Department
St. John College of Engineering & Technology
Palghar, Mumbai University

Neha Surti
Assistant Professor
Computer Department
St. John College of Engineering & Technology
Palghar, Mumbai University

***Abstract*— A tumor is an abnormal growth of cells within the brain, which is one of the major causes of death among people . Chances of survival is high if the tumor are detected in the early stages so, there is a need for a fast and accurate method for detection of brain tumor. For detecting the tumor MRI or CT scan is used. Magnetic resonance image is a difficult task because of the location, intensities and shapes. For scanning the image MRI or CT scan is used. Scanning of the brain is done to confirm the presence of tumor and to identify the location. Segmentation is required for brain tumor detection. This is one of the important part in an image processing. It subdivides an image into regions or objects. The main goal of segmentation is to make image easier and meaningful. This paper provides review on comparative study of segmentation techniques for segmenting brain tumor from Magnetic Resonance Image.**

***Keywords*: *Image Segmentation Techniques, Brain Tumor, MRI (Magnetic Resonance Image)***

## I. INTRODUCTION

Brain tumor is a growth of an abnormal cells within the brain. Brain tumors are divided into two types: benign and malignant. Benign tumors are non- cancerous growth in the body, whereas Malignant tumors are cancerous which can also spread to other parts of the body. Therefore the tumors should be detected at its early stage. Different techniques are developed to detect the tumor, like CT Scan, MRI, etc. MRI images show the location and tumor size .Various image processing technique are applied on the MRI image, such as pre-processing ,segmentation ,thresholding .There are different types of segmentation techniques in image processing, such as Otsu method ,Fuzzy C-means ,region based segmentation etc .Form the MRI images the information such as tumor location provides an easy way to diagnose the tumor. One of the important techniques to extract information from the image is segmentation process.

## II. LITERATURE SURVEY

In this [12] the Fuzzy C-Means Clustering is best method for the detection of brain tumor from MRI images. The paper uses membership value to each pixel in an image to achieve the aim. This technique is proved that it gives a best result for overlapped data. The paper proves this technique to be very efficient.

In the [5] proposed Otsu segmentation for Brain tumor detection. It is used for partitioning the pixels of an image into two basic classes foreground and background. It calculates the optimal threshold value within class variances of these two classes. By finding the optimal value for global thresholding segmented image is produced.

In this [3] the k-Means Clustering is the best method for detection of Brain tumor from MRI images. The paper uses pixel-based technique to achieve the aim. The paper has deduced that unsupervised are better than the supervised segmentation methods. This technique is proved that it consumes less time for segmentation. The paper proves this technique to be very efficient.

In the [10] proposed Histogram Thresholding segmentation for Brain tumor detection in MRI image. Histogram thresholding technique is based on histogram features and gray level thresholding. A threshold is applied to segment the foreground and background. Histogram presents the intensity value and number of pixels of an image and the thresholding is used for converting the gray scale image into binary image. MRI image is divided into two parts and histogram of both parts are plot. Then the difference between both the histogram is calculated and the segmentation is done using threshold point. This result gives the importance for brain tumor detection in MRI image.

In this [8] the Watershed based segmentation is powerful tool for Brain tumor detection in MRI images. This paper contains analysis of person suffering from the fatal problem of brain tumor. The main importance of the paper lies on segmentation technique. The methodology mentioned in this paper consist of Pre-processing, Post Processing of the input image.

## III. IMAGE SEGMENTATION TECHNIQUES

Segmentation is done by dividing the image into multiple set of pixels. It is used to simplify the image which is more meaningful and easier to analyze. Different techniques are

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 02, February-2016

developed for image segmentation, like Threshold Based Segmentation, K-Means algorithm, Fuzzy C-Means algorithm. So the goal is to search the best algorithm that can be used to segment medical images. Detection of tumor is done by different segmentation techniques are described in the following sections:

*A. Threshold based Segmentation*

Threshold is simplest image segmentation technique used for partitioning image into regions based on intensity values. Thresholding is classified into two types:

1. Local thresholding is also known as adaptive thresholding. In this image is divided into sub regions and then choose threshold value Ts for each sub region.

2. Global thresholding is used when there intensity distribution between the objects of background and foreground are very distinct.

*1) Otsu Method:*

Otsu is a global thresholding. This method is used for automatic binarization level decision, based the shape of histogram. In this algorithm it is observed as the partitioning the pixels of an image into two basic classes foreground and background. It then calculates an optimal threshold value that minimizes weighted within class variances of these two classes.

The aimed of Otsu method is to find the optimal value for global thresholding but disadvantage of Otsu Segmentation is it binarize the whole image and produce some unnecessary part.

*B. K-Means Segmentation –*

K-Means is an unsupervised learning algorithm. It is used to partition the N observations into K-cluster in which each observation belong to cluster with nearest mean. In k-mean clustering initially we have to define number of clusters. Then randomly k-cluster centre are chosen. The distance between each pixel to centre pixel is calculated. This process is repeated until no more changes are required. It is a simplest and work on a large database but it is difficult to predict k-value.

*C. Fuzzy C-Means Segmentation –*

Fuzzy c-mean (FCM) is a clustering method. The goal of the clustering is to divide the given data into cluster, which represents a group. The way of processing data in fuzzy logic is by giving the partial membership value to each pixel in an image. The range of the membership is from 0 to 1.In this member of one fuzzy set can also be a member of other fuzzy set in same image. It gives the best result for overlapped data set, but it takes huge computational time for convergence.

*D. Histogram Thresholding –*

Histogram thresholding algorithm is based on symmetrical structure of the brain. A bar graph can be used to plot the histogram. Histogram is plot between number of pixel and gray level intensity. In this image is divided into two parts and histogram of each half is computed for comparison of two histogram. Based on the comparison of histogram threshold point is selected. After selecting the threshold point, the value is compared with each pixel in MRI image. If the threshold value is lower than the pixel value it will remain as it is. If the threshold value is greater than the pixel value then take away that pixel from image. After thresholding binary image is obtained. It has only two values 0 and 1. All pixels above the threshold is 1 and all pixels below the threshold is zero.

*E. Region Based Segmentation –*

Region based segmentation is a technique in which segmentation is carried out based on the similarities in the given image. The region based approach to segmentation is to create regions directly by grouping together pixels which share common features into regions. Region based segmentation include:

*1) Region Growing:*

Region Growing is a simple method. It is a pixel based image segmentation. The basic approach is to select a seed point and grow regions.

*2) Region Splitting:*

In Region Splitting method we compare the highest and the lowest value and if the subtraction, satisfy the threshold value we don't split the region but if the subtraction does not satisfy the threshold value we split the image in four equal quadrants.

*3) Region Splitting and Merging:*

In the split and merge technique is started with a rectangular regions. Then the homogeneity property is checked for each region. If the homogeneity property fails, then split the region into four quadrants. If the region satisfies the homogeneity property, merge it with the adjacent region. This method can be processed into following steps:

- Split the region into four quadrants if the region does not satisfies the threshold value.
- Continue this process until no further splitting is possible.
- Perform region merging if it satisfies the threshold value. Therefore, continue the process until no further splitting is possible.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 02, February-2016

## IV. COMPARISON

### Comparison of segmentation techniques

| Parameter | Region Based Segmentation | | |
|---|---|---|---|
| | *Region Based Segmentation* | *Clustering Based Segmentation* | *Threshold Based Segmentation* |
| Output Image | Black-White | Black-White | Black-White |
| Speed | Moderate | Moderate | fast |
| Accuracy | Good | Moderate | Moderate |
| Noise Immunity | Less | Less | Less |

## V. CONCLUSIONS

In this comparative study of image segmentation techniques, different image segmentation techniques are described in detailed and comparison is done. These all techniques are suitable for medical image application. This techniques can be used for detection. In medical images this technique is used to detect cancer. After the analysis of various techniques, it is observed that a histogram thresholding for image segmentation is the best method to solve the problem of image segmentation.

## REFERENCES

[1] Dilpreet Kaur, Yadwinder Kaur,“ Various Image Segmentation Techniques: A Review,” International Journal of Computer Science and Mobile Computing, Vol. 3, Issue. 5, May 2014, pg.809-814.

[2] D. Manju, Dr. M. Seetha, Dr. K. Venygopala Rao,“Comparison Study of Segmentation Techniques for Brain Tumor Detection,” International Journal of Computer Science and Mobile Computing, Vol. 2, Issue.
11, November 2013, pg.261-269.

[3] Malathi R, Dr. Nadirabanu Kamal A R, “Brain Tumor Detection and Identification Using K-Means Clustering Technique,” Proceedings of the UGC Sponsored National Conference on Advanced Networking and
Applications, 27th March 2015.

[4] Dr. H. B. Kekre, Dr. Tanuja Sarode. And Kavita Raut ,“Detection of Tumor in MRI Using Vector Quantization segmentation,” International Journal of Engineering Science and Technology. Vol. 2(8), 2010, pp. 3753 3757.

[5] Vinayadth V. Kohir, Sahebgoud H. Karaddi, “Detection of Brain Tumor Using Back-Propagation And Probabilistic Neural Network,” Proceedings of 19th IRF International Conference, 25th January 2015,
Chennai, India, ISBN: 978-93-84209-84-1.

[6] Muhammad Ali Qadar, Yan Z howen,“ Brain Tumor Segmentation: A Comparative Analysis,” National Natural Science Foundation of China (NSFC).

[7] Waseem Khan,“ Image Segmentation Techniques: A Survey,” Journal of Image and Graphics Vol. 1, No. 4,December 2013.

[8] Anam Mastaqem, Ali Javed and Tehseen Fatima,“An Efficient Brain Tumor Detection Algorithm Using Watershed & Thresholding Based Segmentation,” I. J.Image, Graphics and Signal Processing, 2012, 10, 34-39.

[9] Prabhishek Singh, Ramneet Singh Chadha,“ A Novel Approach to Image Segmentation,” International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 4, April 2013.

[10] Easha Noureen, Dr. Md. Kamrul Hassan,“ Brain Tumor Detection Using Histogram Thresholding to Get the Threshold point,” IOSR Journal of Electrical and Electronics Engineering, Volume 9, Issue 5, Sep-Oct. 2014.

[11] H Shrasthta Chauhan, Er. Neha Sharama,“ Brain Tumor Detection and Segmentation Using Artificial Neural Network Techniques,” International Journal of Engineering Sciences & Research Technology, August, 2014.

[12] Gauri P. Anandgaonkar, Ganesh S. Sable,“ Detection and Identification of Brain Tumor in Brain MR Images Using Fuzzy C-Means Segmentation, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 2, Issue 10, October 2013.

[13] G.B.Deashmukh, P.D.Lambhate,“ MRI Brain Image Segmentation and Classification by Modified FCM & SVM Algorithm,” International Journal of Research in Engineering and Technology, Volume 02, Issue 12, Dec-2013.