iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: VI Month of publication: June 2023

DOI: https://doi.org/10.22214/ijraset.2023.54121

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue VI Jun 2023- Available at www.ijraset.com

Region Growing Segmentation for Brain Tumor Segmentation-Based MRI Images

Bratasee Bhunia
Department of Statistics and Data Science, Christ (Deemed to be University), Bangalore

Abstract: Techniques for brain imaging are crucial in identifying the causes of brain cell damage. Therefore, earlier detection of these disorders can have a significant impact on treatment options and help to prevent any potential problems for the patient. One of the main reasons for fatalities in humans is brain tumours. It is obvious that early detection and proper classification of the tumour can increase the likelihood of survival. Recently, brain tumor segmentation has become a common task in medical image analysis due to its efficacy in diagnosing the type, size, and location of the tumor in automatic methods. Several researchers have developed new methods in order to obtain the best results in brain tumor segmentation, including using deep learning techniques such as the convolutional neural network(CNN).The goal of this paper is to discuss conventional methods of brain tumor segmentation with focus on region-growing segmentation from MRI images. For the implementation of the work brain tumor image from Kaggle and Image Processing Toolbox under Matlab Software have been used.

I. INTRODUCTION

In the past few decades, disease detection, diagnosis, and treatment have all benefited from the widespread use of medical imaging techniques like positron emission tomography (PET), magnetic resonance imaging (MRI), computed tomography (CT), X-rays. Medical images are mostly interpreted by experts, such as radiologists. Practically, and due to the widely existing differences in the pathology and the possible fatigue of human experts, researchers and doctors have started to benefit from computer assisted interventions.

Image segmentation largely depends on the accurate extraction of crucial data and features from two-dimensional (2D) and three-dimensional (3D) images.. The objective of image segmentation is to segment an image into sole and exhaustive regions so that each region is spatially neighboring and the pixels inside the region are homogenous in terms of a pre-specified criterion, where the most commonly used homogeneity criteria contain values of intensity, texture, color, range, surface normal, and surface curvature(s) .However, this description itself is one of the major restrictions of brain MRI images segmentation, especially when defining abnormalities tissue, since the tumors to be segmented are anatomical structures that are frequently flexible and complex in shape, highly variable in location and structure, and vary from patient to patient. Therefore, in the case of brain tumors, entails distinguishing between normal brain tissues (white matter; WM, gray matter; GM, and cerebrospinal fluid; CSF) and abnormal brain tissue (active tumor, edema, and necrosis tumor).

Brain MRI segmentation is a crucial step in various neurology applications, such as quantitative analysis. MRI can accurately characterise brain structures and provide a lot of information on anatomical soft tissues, but it is challenging to segment MRI images because of the low contrast, limited spatial resolution, intensity inhomogeneity, and variation in intensity range between MRI sequences. Although many researchers have classified image segmentation techniques into many categories, there is no single typical segmentation technique that can yield acceptable results for different imaging applications. However, the aim of segmentation differs depending on the study purpose and the type of image data, where different techniques are used based on different conceptions about the natural of the image to be analysed.

Conventional methods of image segmentation are most commonly used as a first phase in the process of 2D image segmentation.

The conventional methods of image segmentation are:
1) Thresholding based – Global thresholding and Local thresholding
2) Region based – Region growing, Region splitting and merging and watershed

The thresholding based methods' idea is based on the postulate that the pixels belong to one class that falls within a certain range. Region-based methods presume that a region is comprised of neighboring pixels that have similar properties

II. CONVENTIONAL METHODS OF BRAIN TUMOR SEGMENTATION

Conventional techniques for brain tumour segmentation are frequently employed in 2D image segmentation and produce better results when defining the tumour region's boundaries and segmenting it. Two widely used image processing approaches, referred to as "region-based" and "thresholding-based," are included in conventional methods.

A. Region-based Techniques

Region-based segmentation techniques examine pixels in an image and form disjoint regions by integrating the neighborhood pixels with homogeneity properties based on a predefined similarity standard.

1) Region Growing Segmentation

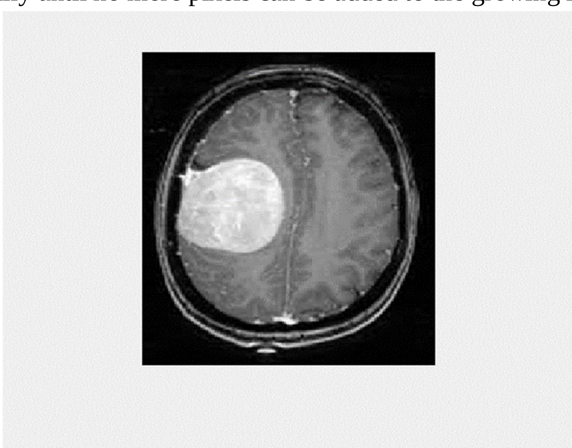
The region growing is a popular region-based segmentation technique which is used to extract a homogeneous region from an image. It is also classified as a pixel-based image segmentation method since it involves the selection of initial seed point.

The first step in region growing is to select a seed point that belongs to the region of interest(ROI).The regions are then grown from the seed point to adjacent points depending on a region membership criterion. The criterion could be for example pixel intensity, grayscale, texture or color.

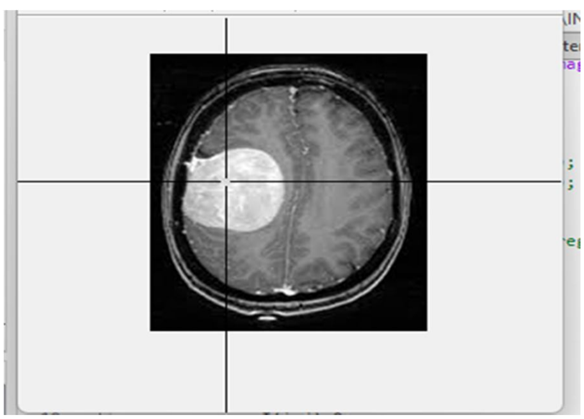
Since, the regions are grown on the basis of the criterion, the image information itself is very important. For example, if the criterion is a pixel intensity threshold value, knowledge of the histogram of the image would be of use to determine a threshold value for the region membership criterion.

4-connected neighborhood or 8-connected neighborhood can be used to grow the region from seed point. Pixels adjacent to the seed point are examined if the absolute value of the difference in the pixel intensity is less than a threshold value and classified accordingly and added to the region.

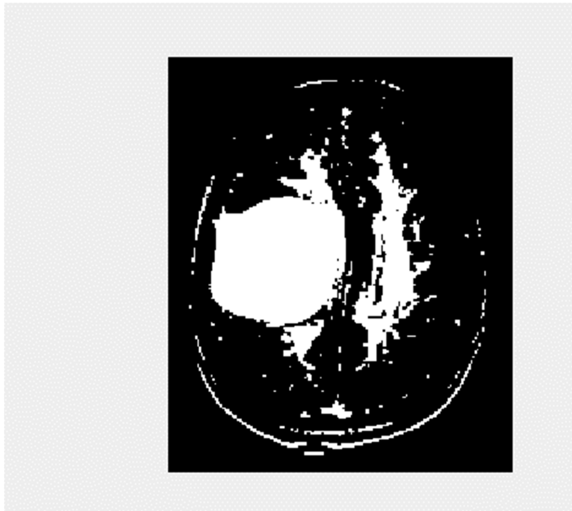
The growing process is repeated gradually until no more pixels can be added to the growing region.



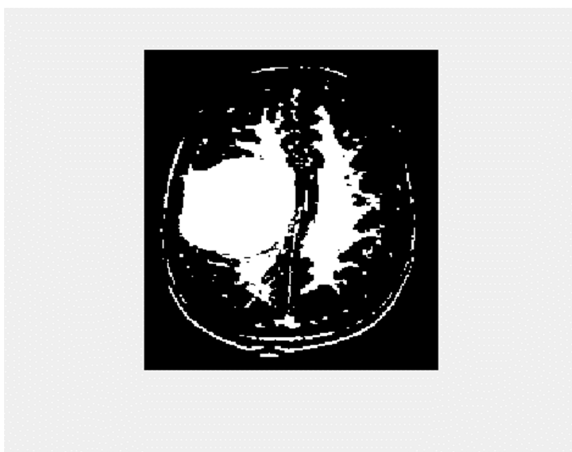
a) An MRI image of a human brain tumor



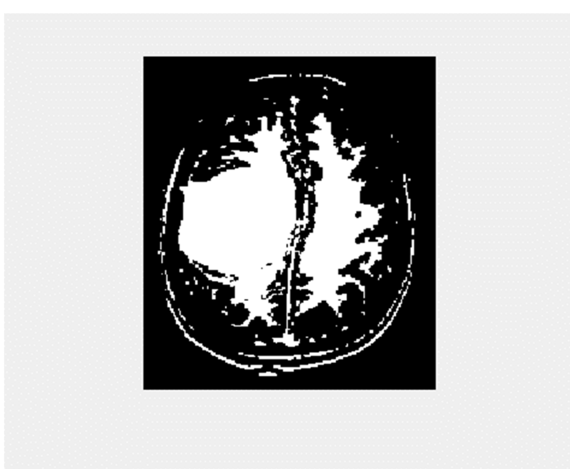
b) The seed point is selected manually



c) A partial segmentation into several seed classes

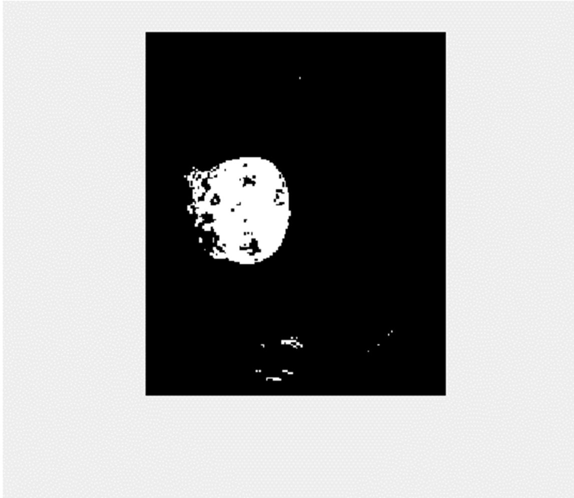


d)



e)

d) and e) gradually expanding the growth region to include all the neighbouring pixels that contain soft tissue,CSF,GM,WF



f) Completed segmentation is obtained that denotes only the tumor region

III. CONCLUSION

Due to the intricacy of brain tumour anatomy, hazy borders, and outside factors, inferring tumour locations in brain MRI imaging continues to be difficult. In this survey, we provided an in-depth analysis of the region-growing techniques used in brain tumor segmentation. In spite of the challenges faced in operations of brain MRI segmentation, deep learning methods can be considered the most recent and commonly used in brain MRI segmentation.

REFERENCES

[1] Yahya M. A. Mohammed1, Said El Garouani2 and Ismail Jellouli,' A survey of methods for brain tumor segmentation-based MRI images', Journal of Computational Design and Engineering, 2023