ISSN: 2278-4632
Vol-10 Issue-6 No. 7 June 2020

INTEGRATED MACHINE LEARING WITH REGION BASED ACTIVE CONTOUR MODELS IN MEDICAL IMAGE SEGMENATION

[1]M.Revathi, [2]P.Venkata Lakshmi, [3]K.Sai suma, [4]K.poornima preethi, [5]CH.Ramesh Babu

[5]Associate Professor, [1,2,3,4,5]Department of Electronics and Communication Engineering
Vignan's Institute of Engineering for Women, Vizag.

ABSTRACT: Now a days people are mostly affected by tumors.so, the main aim of this paper is to identify the tumor in a body and detecting the nearest area effected and that will be done by using machine learning with region-based active contour models, region based active contour model is effective in segmenting images with poorly defined boundaries but often fail when applied image containing intensity inhomogeneity.

Machine learning algorithms are highly effective in handling inhomogeneity, but often result in noises from misclassified pixels. In addition there is no objective function. Therefore, proposed a framework which integrates the machine learning with region based active contour. The integration of the k-nearest neighbors and the support vector machine with the chan-vese method, and by comparing this result with the traditional method of chan-vese method. Better accuracy, speed and less sensitivity to parameter tuning which are being observed in this paper.

INDEX TERMS: Machine learning, active contours, medical images, segmentation.

I. INTRODUCTION

Image segmentation plays a significant role in computer vision and medical image processing. Numbers of segmentation methods are proposed but none is universally applicable. A number of modern approaches using the energy minimization for image segmentation have been worked, starting from the snake model introduced by KASS et.al. A popular energy minimization approach is the level set method (LSM)[1], which is widely used in medical image analysis and it was subsequently applied to image segmentation .Generally, existing image segmentation using level set methods can be grouped into two categories: Edge-based models and Region based models[2]-[3].

Edge-based model:

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. It is used for image segmentation [4] and data extraction in areas such as image processing, computer vision and machine vision. Common edge-detection algorithms include Sobel, Canny, Prewit, Roberts and fuzzy logic methods

Region based model:

Region based methods are depended on continuity. These techniques divide the entire image into sub regions depending on some rules like all the pixels in one region must have the same Gray Level. Region-based techniques rely on common pattern in intensity values within a cluster of neighboring pixels. The cluster is said to be a region, and the goal of the segmentation algorithm is to group the regions according to their anatomical or functional roles. Compared to edge detection method, segmentation algorithm based on region are relatively simple and more immune to noise.

Objectives:

ISSN: 2278-4632
Vol-10 Issue-6 No. 7 June 2020

The main objective of this paper is:

1) To identify the tumor effected area by using region based active contour.

2) To predict the input whether it is cancerous or benign (non-cancerous) by using SVM model.

Motivations and challenges

The main challenges of this paper are:

- To identify the tumor region effectively even in the poorly defined boundaries.
- After the identification of the tumor, by using the svm model it shows the accurate region of tumor effected area.

II. LITERATURE SURVEY

Medical image segmentation is a challenging task suffering from the limitations and artifacts in the image, including weak boundaries, noise, similar intensities in the different regions and the intensity in-homogeneity.MR images are subjectively and quantitatively investigated by specialists, however, it is absolutely restricted by the human vision framework. Human eye vision is confined to 8 bits of dark level. Whereas, these days MRI frameworks are equipped for offering image/picture of the organs up to 65K

dark levels certain crucial data gained through an MRI scanner can't be dissected utilizing a typical human eye, which has visual limitations. The medical image can be processed by using active contour models.

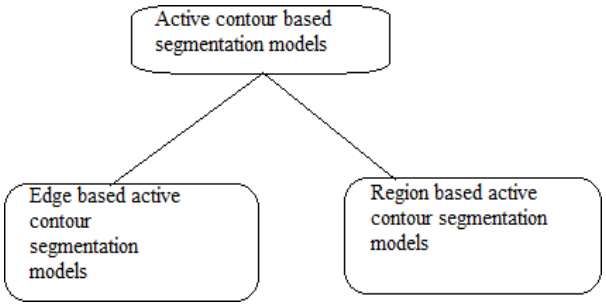


Fig. 1 classification of active contour models.

Thresholding region growing, region splitting, region merging, detection of boundary discontinuities (Point, line and edge detection).Watershed segmentation and active contours are few examples of image segmentation process. These active contour models are considered because they help in segmentation of the target object of particular data or information values from an image. Edge based active contour segmentation model and region based active contour models for segmentation. To detect and extract the bones from body parts without any noise, by using edge based active contour model.

Edge based active contour model fails in poorly defined boundaries so, In those cases can choose the region based active contour model which highly effective in poorly defined boundaries.

Here going to use LPA-ICI (local polynomial approximation – intersection of confidence intervals) anisotropic gradient .Often medical image contains a noise at the boundaries and surfaces of objects.

LPA-ICI (local polynomial approximation-intersection of confidence intervals):

In this Local polynomial approximation using intersection of confidence interval rules. here, considered the de- noising as a basic problem. Although this model has been successfully applied to several other problems such as, interpolation, enhancement, de-blocking.

It is a combination of two independent ideas: Local Polynomial Approximation (LPA):

- For designing linear filters that performs pixel wise polynomial fit on a certain neighborhood.
- Intersection of Confidence Interval rule (ICI) is an adaptation algorithm, used to define the most suited neighborhood where the polynomial assumptions fit better observations.

III. METHODOLOGY USED

Region based active model: Active contour model can also called a snake model [5]. Region based active contour model [2]-[3] is highly effective in detection of poorly defined

ISSN: 2278-4632
Vol-10 Issue-6 No. 7 June 2020

boundaries. The active contour is works on the energy minimization principal. A simple elastic snake is defined by a set of n points vi for I = 0, 1, n-1, the internal energy term $\mathbf{E_{internal}}$ and the external edge-based energy term $\mathbf{E_{external}}$ .The purpose of the internal energy term is to control The deformations made to the snake and the purpose of the External energy term is to control the fitting of the contour onto the image. The energy function in the snake model can be expressed as the sum of its external energy and internal energy. The formula can be taken as :

Equation (1) is…

$$E^*_{snake} = \int_0^1 E_{snake}(\mathbf{v}(s))\,ds = \int_0^1 \left(E_{internal}(\mathbf{v}(s)) + E_{image}(\mathbf{v}(s)) + E_{con}(\mathbf{v}(s))\right) ds$$

Internal energy:

Energy in the image is some function of the features of image. This is one of the most common points of modification in the derivative methods. Features in images and images themselves can be processed in many and various ways. Based on the threshold it get circle over there and that can be detects the misclassified pixels using active contour. The active contour is used to find the approximate region and the region get reduce and some iterations takes place until it satisfy the condition of equation (2), but the result in noise from misclassified of pixels.

Equation (2) is…

$$E_{internal} = \frac{1}{2}\left(\alpha(s)|\mathbf{v}_s(s)|^2\right) + \frac{1}{2}\left(\beta(s)|\mathbf{v}_{ss}(s)|^2\right) = \frac{1}{2}\left(\alpha(s)\left\|\frac{d\bar{v}}{ds}(s)\right\|^2 + \beta(s)\left\|\frac{d^2\bar{v}}{ds^2}(s)\right\|^2\right)$$

That can be handled by machine learning. So, in this paper we proposed a framework which integrates machine learning with region based contour model.

Support vector machine:

Support vector machine is another simple algorithm that every 90% of the data is used for training and the rest 10 percent is used for testing. “Support Vector Machine,” [6]-[8] is a supervised machine learning algorithm, which can be used for both classification and regression challenges. However, it is mostly used in classification problems. In the SVM algorithm we plot each data item as a point in n-dimension two classes very well of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two-dimensional space with the value of each feature being the value

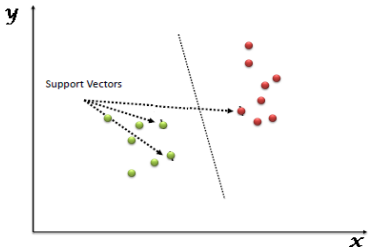


Fig. 2 Differentiate the two classes.

Region-props:

The region-props function returns the properties in a structure array.

stats = regionprops(BW,'properties');

The x and y co-ordinates of the properties into a two column matrix.

If you specify “all,” then the regionprops computes all the shape measurements and for grayscale images the pixel shape measurements as well.

If you specify “basic,” then region-props computes only the ‘Area,’ ‘centroid’ and ‘bounding-box’ measurements

IV. IMPLEMENTATION

Implementation can be done by using software that can be clearly can observe in below flow chart.

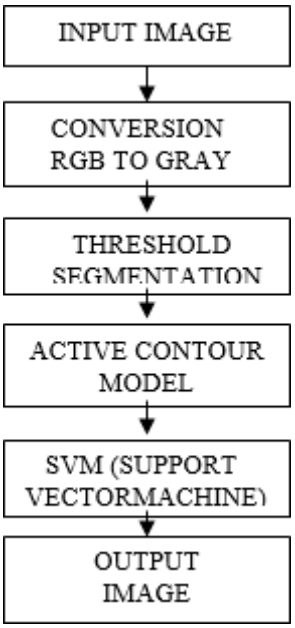


Fig. 3 Flow chart for Software Implementation.

Pre-Processing Stage:

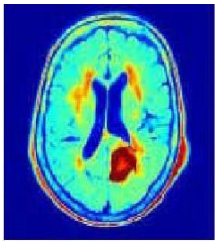
In this phase, image is enhanced in the way that finer details are improved, and noise is removed from the image. Most

ISSN: 2278-4632
Vol-10 Issue-6 No. 7 June 2020

commonly used enhancement and noise reduction techniques are implemented that can give best possible results. In addition to enhancement, image segmentation will also be applied. This improves and enhanced image will help in detecting edges and regions and improving the quality of the overall image. Region detection will lead to finding the exact location of tumor. It involves conversion of image from color to gray image and threshold segmentation.

Conversion of image form rgb to gray:

Many filters are used to remove the noise from the images. Linear filters can also serve the purpose like Gaussian, averaging. For example, average filters are value is replaced with its neighborhood values.



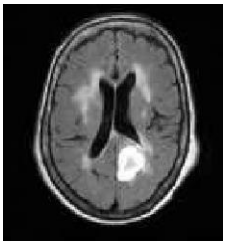


Fig. 4 color image. Fig. 5 Gray image.

Median filters is also used to remove the noise like salt and pepper and weighted average filter is the variation of this filter and it can be implemented easily and give good results. In the median filter value of pixels is determined, by the median of the neighboring pixels. The filter is less sensitive than the outliers.

Threshold segmentation:

Threshold segmentation is the simplest segmentation methods. The input gray scale image is converted into a binary format. The method is based on a threshold value which will convert gray scale into a binary image format.

Post processing:

Image segmentation is based on the division of the image into regions. Division is done on the basis of similar attributes. Similarities are separated out into groups.

Basic purpose of segmentation is the extraction of important features from the image, from which information can easily be perceived. Brain tumor segmentation from MRI images is an interesting but challenging task in the field of medical imaging and later coming to post segmentation which involves Image filters segmentation technique (Active contour model based on region) and support vector machine training.

V. RESULT

The input image given is an MRI image. The MRI given is for the purpose of identifying and detecting the tumor affected area. The detection is being performed using active contour model and the affected region is identified by the region based active contour model with the help of Machine Learning technique **SVM.**

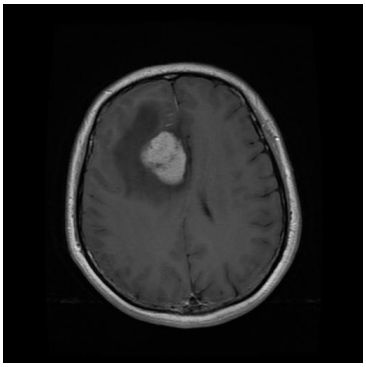


Fig. 6 Input MRI Image.

With the help of active contour reduction of energy can be possible and the boundaries are clearly detected even in poorly defined boundaries because the region based active contour model is highly effective in poorly defined boundaries. “The active contour model works based on number of iterations takes place,” This iterations can be defined by the user for getting accurate region of tumor area.

Svm predicts the true result whether the MRI image contains cancerous cells or not. So, that we need to train the data through Svm train. Input image is testing with the trained data and then it predicts the accurate information about MRI image which is given as input. The output is finally obtained by finding the tumor affected area.

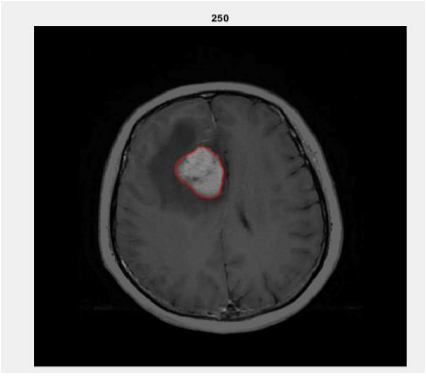


Fig. 7 Output Image.

ISSN: 2278-4632
Vol-10 Issue-6 No. 7 June 2020

VI. CONCLUSION

Proposed a framework to integrate machine learning algorithms with region-based active contour models. The framework utilizes classification probability scores which are regularized using non-linear mapping. We use a active contour models for identifies the region by doing minimization of energy and modified the definition of external force derived from gradient of the image to obtain the more stable results. Our framework is flexible and may be applied to any combination of classifier and region-based active contour. It also discusses a variety of approaches developed over the last decades of the task of medical image segmentation.

The proposed method is not sensitive to the choice of regulization function. This also presents the basic principle of active contour models and different types of recent advancements in active contour models, application and challenges. This paper gives us the solution easily with a simple feature vector and is in-sensitive to parameter tuning.

VII. REFERENCES

[1] Level Set Methods and Fast Marching Methods: Evolving Interfaces in Computational Geometry, Fluid Mechanics, Computer Vision, and Materials Science. Cambridge University Press. ISBN 978-0-521-64557-7.

[2] Lankton,S; Tannenbaum,A.,"Localizing Region-based Active contours ,"Image processing ,IEEE Transactions on, vol!&, no.11,pp.2029,2039.Nov.2008 doi:10.1109/TIP.2008.2004611 http://ieeexplore.ieee.org/xpls/abs_all.jsp.

[3] Laurent D. Cohen, On active contour models and balloons, CVGIP: Image Understanding, Volume 53, Issue 2, March 1991, Pages 211–218, ISSN 1049-9660, doi:10.1016/1049-9660(91)90028-N

[4] Chenyang; Prince, Jerry L. (2000). "Current Methods in Medical Image Segmentation". Annual Review of Biomedical Engineering. **2**: 315–337.

[5] M.kass, A.witkin, D.Terzopoulos: snakes: activecontourModels, international journal of computer vision. Vol. 1 no. 4. jan.1988,321-331.

[6] S.Geman, E.Bienenstock, and R. dourat (1992). Neural networks and the bias/variance dilemma. Neural computation 4,1-58.

[7] Roman, victor (2019-04-21). "unsupervised machine learning: Clustering Analysis".Medium, Retrived 2019-10-01.

[8] Ben-Hur, Asa; Horn, david; "siegelmann, Hava;vapnik, vladmir N." Support vector clustering," journal of machine learning research". 2:125-137.

[9] Hsu, chih-wei &Lin, chih-jen(2002)."A comparison of methods for multiclass Support vector machines". IEEE transaction on neural networks13(2):415-25.doi:10.1109/72.991427. PMID 18244442

