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Region Based Image Segmentation for Brain Tumor Detection

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Abstract: ***Image segmentation is a way to analyze the images and to extract objects out of it. Many researches had been done in this field but still the field is a challenge for the scholars. It is widely used in diagnosis of tumor patient by detecting the tumor in brain using segmentation. Brain tumor segmentation is based on separating the tumor issues from normal brain tissues so as to find the area of tumor. In this paper a technique of segmentation for finding the area of tumor has been represented. Proposed approach has been compared with existing approach in terms of area.***

Keywords: Brain tumor, Segmentation, Medical Resonance imaging

1. Introduction

Image segmentation is very ubiquitous in medical imaging field. The most important part of our nervous system is brain. Along with its importance it is very difficult task to understand the nerves. The functioning of brain is read through MRI by doctors. Our body is made up of several tissues. Tissues are further divided into cells and each cell in nervous system has different function. In our nervous system when the cells lose their ability of controlling their growth, they start increasing or dividing without any order. This stage in nervous system is known as tumor. Tumor is of two kind's i.e. benign and malignant. Benign tumor grows very slowly and do not spread whereas malignant tumors are those which start spreading very quickly and can cause the conditions of cancer. MRI shows the image of brain. It shows the presence of some disorder but still doctors need to study many more factors for detecting and diagnosing the tumor. Brain tumorsSegmentation is an important feature in image processing so as to analyze the image as well as to extract the suspicious region. Medical images are obtained for various applications which include image guided surgery, surgical simulation, neon science studies and therapy evaluation. When working with medical images, i.e. Magnetic Resonance Images (MRI), X-Ray, Ultrasound and Computed Tomography (CT) images etc., it is often to delineate the areas and volumes of interest. Medical experts face the task of finding or characterizing abnormalities within such images [1]. The rapid development of different kinds of highly equipped medical instruments and more use of such images have made it difficult for the medical experts to interpreted infer correct diagnosis. Complicated image features, eye fatigue are the factors that may cause an expert to miss an abnormality in an image. Hence, there is a great need for robust methods that process with the interpretation of huge amounts of data with greater accuracy. The present difficultly of image segmentation is not due to a lack of attention; Till now the approaches done in the field of image segmentation describe statistics, differential geometry, and partial differential equations to game theory, discrete geometry, and computational mechanics. All of the researches till now works effectively upto some degree to help with this, several researchers have proposed mechanisms for evaluating or validating the effectiveness of various segmentation algorithms [2]. Through the context of this paper we are trying to review some these techniques.

2. Literature Review

In this section the previous researches done by researchers in field of image segmentation and tumor detection has been discussed.

R. Pritha et. Al. in "Performance Analysis of Fuzzy C Means Algorithm in Automated Detection of Brain Tumor" (2014) has provided an algorithm for tumor detection using k-means clustering with advanced features. It is a process in which membership levels are assigned to data members and then theses data members are further assigned to clusters. In this paper four data set had been used of size 256,256. To remove spekle noise morphological operator has been used. Performance of algorithm has been measured on the basis of segmentation efficiency, convergence rate and algorithm complexity basis.

Prof. P. Tamije Selvy1, Dr.V.Palanisamy[2] and M. Sri Radhai3, Medical Imaging is the technique and a process used to create images of the human body for clinical or medical science. Magnetic Resonance (MR) Brain image segmentation plays an important role in neurosurgical planning and clinical diagnosis. MR image is segmented using Fuzzy C means (FCM) method; the objective function of FCM is modified by a regularizing function called Total Variation (TV) FCM. The proposed robust image regularization Anisotropic Diffusion Total Variation (ADTV) regularization method focuses on smoothing the images and reducing the steps by reinterpreting the traditional TV regularization. The method preserves the discontinuities and also continues to smooth along line like features in the MR images and the comparison of proposed scheme with classical TV demonstrates the performance improvement. The method shows the consistent improvement in the reconstruction of images. The method is combined with the FCM and the results of segmentation are improved. [2]

In this paper, they propose a natural framework that allows any region-based segmentation energy to be re-formulated in local way. We consider local rather than global image statistics and evolve a contour based on local information. Localized contours are capable of segmenting objects with heterogeneous feature profiles that would be difficult to capture correctly using a standard global method. The presented technique is versatile enough too bemused with any global region-based active contour energy and instilling it the benefits of localization. We describe this framework and demonstrate the localization of three well-known energies in order to illustrate how our framework can be applied to any energy. Comparison has been made between the localized energy and its global counterparts so as to show the improvements achieved on the previous approach. Also the behavior of theses energies over the localization has also been used as a study parameter. Finally, we show results on challenging images to illustrate the robust and accurate segmentations that are possible with this new class of active contour models. [3]

Sinha K. et. Al. in "Efficient segmentation methods for Tumor detection in MRI images(2014) presented a comparative study of three methods implemented for detection of tumor. In this k-means clustering, optimized k-means clustering with genetic algorithm and optimized c-means clustering has been used. The experimental results in this approach shows that genetic c-means is the most effective algorithm among all the techniques. In this searching time and area of tumor is taken as evaluation parameters. Results of the experimentation shows that optimized c-means shows the area in pixels more than 900 pixels. And the others two algorithm have area less than 700.

Ramanpreet Kaur, in this she said that, Image segmentation plays a major role in several medical imaging programs by creating a link of nervous system along with other parts. This paper aims at detecting the lung cancer through MRI images. In this paper the author had implemented Watershed technique of transformation for the segmentation of image. Some comparative analysis after applying watershed algorithm directly and after changing the foreground and background proves that the provided algorithm is more effective. [11]

3. Proposed Methodology

In proposed methodology we had applied region based segmentation for tumor detection. As in case of brain tumor the segmented region is completely closed. In the proposed approach our major assumption is that the required region is different from other values. And all the pixels in required region are very similar to one another so region based segmentation had been applied to the images. Under region based segmentation in proposed approach a threshold value had been taken as the base. It is unseeded approach of image segmentation. Proposed approach is working as follows:

Step 1: Convert the image into a square matrix.
Step2: Apply modified laplacian filter to improve the quality of image.
Step3: Set a threshold value for finding the region in image.
Step 4: Start searching the image for extraction of the area of interest from the image.
Step 5: if pixel value of image is greater than threshold value then add the pixel to output image i.e. tumor image.
Step 6: Calculate the detected region of tumor.
Step7: Compare the results with watershed algorithm in terms of quality, RMS factor and area of region.

4. Results and Discussions

There have been many segmentation methods devised till now. In this paper region based segmentation technique has been presented. The result has been compared with watershed algorithm. The algorithm has been implemented in MATLAB 2010a. The result has been displayed as follows: In figure shown below 1(a) and 1(b) the results of proposed approach and segmented approach has been shown.

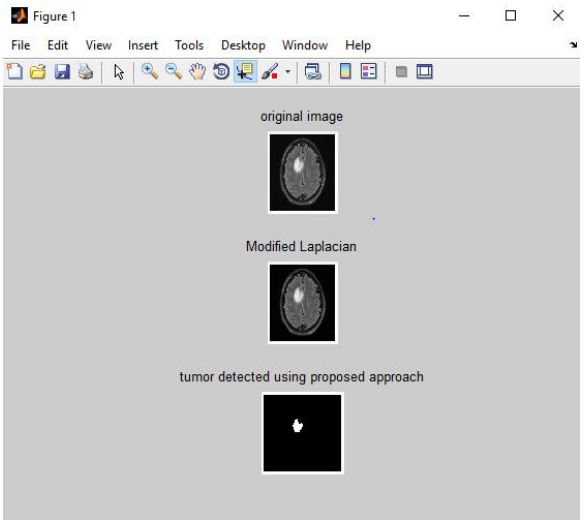

Figure 1(a): Segmentation using proposed approach on image 1

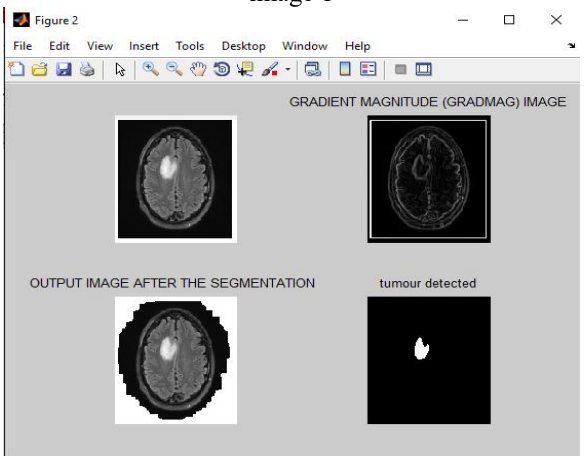

Figure 1(b): Segmentation using watershed algorithm on image1

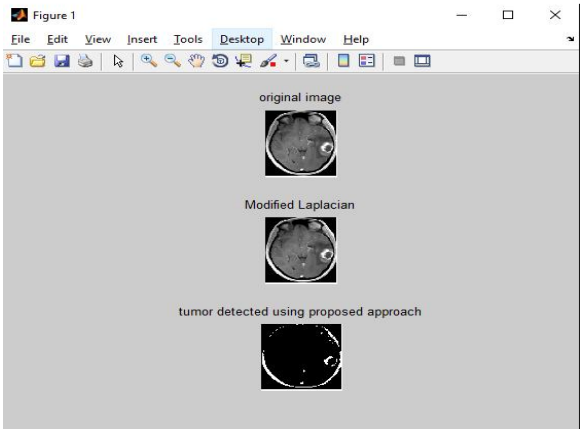

Figure 2(a): Segmentation using proposed algorithm on image2

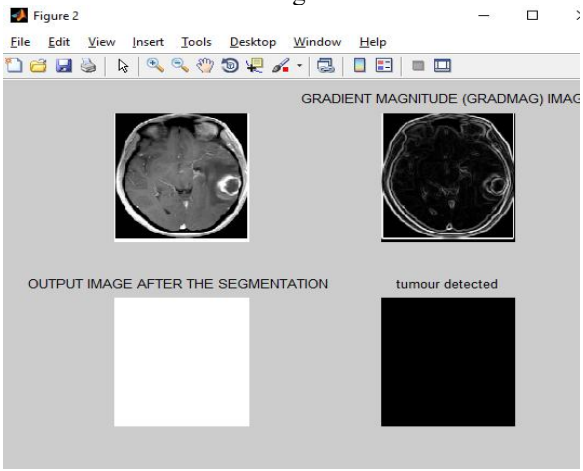

Figure 2(b): Segmentation using watershed algorithm on image1

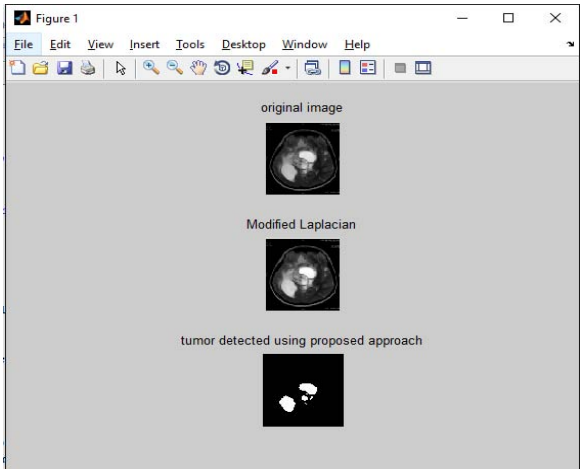

Figure 3 (a): Segmentation using watershed algorithm on image1

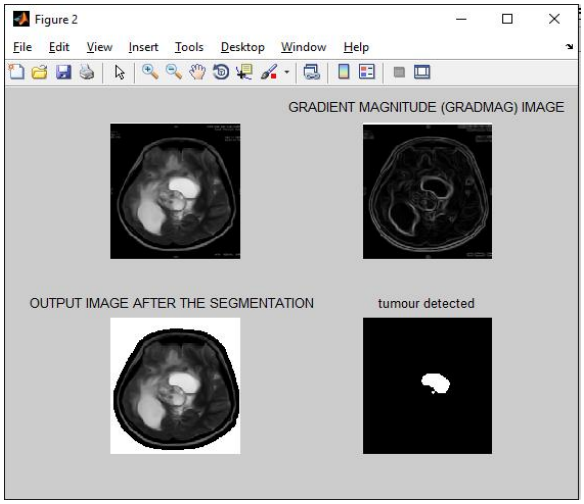

Figure 3(b): Segmentation using watershed algorithm on image1

Algorithm has been applied on set of 50 images and compared in terms of quality, area of segmented region and Run time. Result of some of the images had been listed below:

Table 1: Results on various images

	Area		*Run time*	
	Proposed	*Watershed*	*Proposed*	*Watershed*
Image 1	36928	277	1.606sec	1.838sec
Image 2	27606	0	1.671	1.66
Image 3	17261	426	1.62	1.594

From the above listed results it can be said that proposed algorithm works well for both of the tumor but watershed algorithm can't find the tumor which is spread. As we can see in figure 2 the tumor was spread in the whole brain and it was not detected by watershed algorithm but proposed approach had detected the presence of tumor.

5. Conclusion and Future Scope

From section IV it could be observed that proposed approach is better than watershed in terms of quality and also area. Apart from this watershed algorithm doesn't work for detection of malignant tumors. In future algorithm could be expanded to have comparison by using other parameters.

References

[1] R. Pritha et. Al. in "Performance Analysis of Fuzzy C Means Algorithm in Automated Detection of Brain Tumor" (2014), 978-1-4799-2876-7/13 $31.00 © 2014 IEEE
[2] An Efficient Brain Tumor Detection Algorithm Using Watershed & Thresholding Based Segmentation I.J. Image, Graphics and Signal Processing, 2012, 10, 34-39 Published Online September 2012 in MECS (http://www.mecs-press.org/)
[3] L. Shawn "Localizing Region Based Active Contours" , IEEE Transaction on Image Processing , Vol.17 no 11, 2008.
[4] Sinha K. et. Al. in "Efficient segmentation methods for Tumor detection in MRI images, 978-1-4799-2526-1/14/$31.00 ©2014 IEEE

[5] K. Ramanpreet, "Segmentation In Medical Resonance images to extract the cancerous nodule for early diagnosis on cancer", International Journal of Computers & Technology, Volume 3 No. 2 , 2012
[6] L. Vincent, P. Soille, Watersheds in digital spaces: An efficient algorithm based on immersion simulations, PAMI 13 (6) (1991) 583–598.
[7] F. Meyer, S. Beucher, Morphological segmentation, JVCIR 1 (1) (1990) 21–46.
[8] R. Lotufo,W. Silva, Minimal set of markers for the watershed transform, in: Proc. ISMM2002.
[9] S. Beucher, Watershed, hierarchical segmentation and waterfall algorithm, Kluwer Academic Publishers, 1994,pp. 69–76.
[10] J. B. T. M. Roerdink, A. Meijster, The watershed transform: Definitions, algorithms and parallelization strategies, Fundamenta Informaticae 41 (1-2) (2000) 187–228.URL citeseer.nj.nec.com/roerdink00watershed.html