

PROPOSED SEGMENTATION ALGORITHM FOR MRI BRAIN TUMOR IMAGES

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A great work in the field of medical imaging research was focused on brain tumors segmentation in the recent years [1]. In many Hospitals, brain tumor measurements are obtained by magnetic resonance images (MRI) radiologists, who measure the mass of the tumor manually by using widely available imaging software. Such approach is a time consuming task and leads to large variations in operator performance. Several methods were proposed and developed for accurate segmentation [2-4] such as thresholding, region based, edge based, and clustering methods etc. In this work, thresholding, region growing and proposed method (region growing + active contour) were experimented on two datasets (the first one includes 18 images from a specialized clinic in Vladimir and the second data set of 52 images from a specialized clinic in Riyadh).

The proposed algorithm is based on two methods: region growing and active contour methods. By using region growing method we get the initial contour of tumor, after that based on the principle of active contour method which is the partial differential equation solution, the initial contour can change its own shape, topology and location to cover the object boundaries to be segmented. The initial contour tries to move to the position where energy function is minimized. Energy function consists of internal and external forces to locate the contour of the object. By combining two methods we get rid of the disadvantages of both of them which are a non-accurate results for the region growing method and initial contour selecting for the active contour method. The three methods - Threshold, Region Growing and the proposed algorithm (Region Growing + Active Contour) were compared for Jaccard index, Dice Coefficient, Specificity, Sensitivity and accuracy. The results are presented in Table 1.

Table 1. Descriptive Statistics for Outcome Parameters

Segmentation Methods	Dice Coefficient		Jaccard index		Sensitivity (%)		Specificity (%)		Accuracy (%)	
	Dataset		Dataset		Dataset		Dataset		Dataset	
	1	2	1	2	1	2	1	2	1	2
Threshold	0,7333	0,7665	0,5881	0,6561	97,364	82,827	98,607	97,286	98,611	95,98
Region	0,8718	0,7736	0,7747	0,6818	98,858	83,031	99,228	97,871	99,194	96,018
Proposed	0,9151	0,777	0,8459	0,6866	99,033	88,239	99,451	97,972	99,432	96,903

The results show that the proposed algorithm was the best among the others studied algorithms. Brain tumor is curable and treatable if it is diagnosed in earliest stages of disease. MRI images are generally more sensitive in detecting brain abnormalities during the early stages of disease, and are excellent in early detection of cases of cerebral infarction, brain tumors, or infections. The researches in developing and modifying MRI brain tumor segmentation algorithms are a very relevant and high evaluated task [5].

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