ORIGINAL ARTICLE

Iranian Quarterly Journal of Breast Disease 2017; 10(2):16.

Determining Mass Boundary in 3D Automated Breast Ultrasound Images Using a Deformable Model

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[DOR: 20.1001.1.17359406.1396.10.2.2.3]

Abstract

Introduction: 3D Automated Breast Ultrasound System (ABUS) is a new imaging modality which can be utilized for early diagnosis of breast cancer. Mass segmentation plays an important role in ABUS because the segmented region is used for mass volume estimation, temporal comparison and diagnosing the type of masses as benign or malignant.

Methods: In this paper a geometric model called distance regularized level set evolution (DRLSE) has been applied for mass segmentation. This model is categorized into edge based deformable models. We implemented DRLSE in three dimensions and modified the Neumann boundary conditions as well. Afterwards, a force named balloon force was adjusted to approach the initial contour to the mass borders.

Results: In the presented work Dice similarity measure has been used for evaluation of the proposed segmentation method. Based on the results, we concluded that using a balloon force of -5.5 we can achieve a Dice of 0.52. This result is calculated by comparing the output of the proposed computerized segmentation method and the manually segmented regions by an expert radiologist on a dataset with 50 masses.

Conclusion: The resulted similarity is higher than 0.4 which is an acceptable level for segmentation of masses in ABUS.

Keywords: 3D Automated Breast Ultrasound, Computer Aided Systems, Image Processing, Mass Segmentation.