

Delineation of breast lesions in ultrasound images using Level-set method*

Eng. Zeina Kesra Haddad**

Dr. Eng. Ayman Al-Sabouni***

Abstract

Breast cancer is the second leading cause of death of women in the world. The early detection gives a better chance to cure it. Physicians diagnose breast tumors by analyzing the characteristics of the lesion in ultrasound images. Shape data, provided by a tumor contour, is important to physicians in making diagnostic decisions. However, due to the increasing use of technology in medicine, a computer aided detection systems (CAD) have been built to help the expert. This research focuses on using a level-set method as an effective lesion segmentation method for breast ultrasound images. By applying non-local means filter on image, the unwanted speckle noise will be removed and the image's important details will be preserved. Then the initial contours are sketched using the GUI in order to apply level-set method which delineates the contour of the lesion in breast ultrasound image. The proposed method was found to determine the breast tumor contours that are very similar to manual-sketched contours (about 96%).

Keywords: Breast cancer, lesion, speckle noise, segmentation, level-set, initial contour, non-local means filter, implicit surface

* For The paper in Arabic see pages (347-360)

** Research submitted for the degree of Master in the Biomedical Engineering Department Faculty of Electrical & Mechanical Engineering, Damascus University

*** Biomedical Engineering Department Faculty of Electrical & Mechanical Engineering, Damascus University

References

1. Guo Y., (2010), "Computer-aided detection of breast cancer using ultrasound images", Utah state university, Logan, UT ,US,pages:18-258
2. Gomez W., Leija L., Pereira W. C. A., Infantosi A. F. C. ,(2009), "Semiautomatic contour detection of breast lesions in ultrasonic images with morphological operators and average radial derivative function" International Congress on Ultrasonics, Universidad de Santiago de Chile, ScienceDirect Physics Procedia Vol:3, No.1 Pages:373-380
3. Huang Y. and Chen D.,(2004), "Watershed segmentation for breast tumor in 2-D Sonography" Department of Computer Science and Information Engineering, Tunghai University, Taichung, Taiwan. Ultrasound in Med. & Biol., Vol. 30, No. 5, Pages: 625-636.
4. Grau V. et al,(2004)," Improved watershed transform for
5. medical image segmentation using prior information.", IEEE
6. Transactions Medical Imaging Vol: 23 ,No. 4 ,Pages:447-458
7. Shrimali V., Anand R.S. and Kumar V., (2009), "Current trends in segmentation of medical ultrasound B-mode images: A Review" Image and signal processing lab, department of Electrical engineering, Indian institute of technology. Pages :8-17.
8. Das B. and Banerjee S.,(2004), "Inertial snake for contour detection in ultrasonography images", IEEE proceedings –Vision Image signal processing. Vol. 151, No.3, pages: 235-240
9. Coupe P., Hellier P. Kervrann C. Barillot C.,(2009), "Nonlocal means-based speckle filtering for ultrasound"; IEEE Transactions on Image Processing, Vol.18, No.10, pages: 1-8
10. Sethian J. A.,(1999)" Level Set ethods and Fast Marching Methods: Evolving Interfaces in Computational Geometry, Fluid Mechanics, Computer Vision, and Materials Science", Cambridge University Press, Pages: 3-13.
11. Malladi R., Sethian J. A. and Vemuri ,(1995), "Shape Modeling with front propagation :Level set Approach", IEEE Trans. On pattern analysis and machine intelligence, Vol. 17,No 2, pages:158-174.
12. Osher S. and Fedkiwc R.,
13. (2003), "Level Set Methods and Dynamic Implicit Surfaces", Springer-Verlag New York, Implicit methods, Vol.153, pages: 1-95