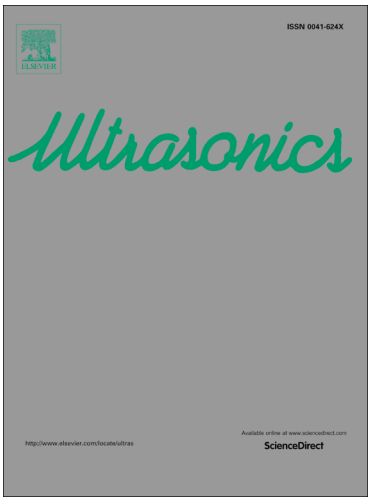

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Segmentation of Arterial Walls in Intravascular Ultrasound Cross-Sectional Images Using Extremal Region Selection

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Abstract

Intravascular Ultrasound (IVUS) is an intra-operative imaging modality that facilitates observing and appraising the vessel wall structure of the human coronary arteries. Segmentation of arterial wall boundaries from the IVUS images is not only crucial for quantitative analysis of the vessel walls and plaque characteristics, but is also necessary for generating 3D reconstructed models of the artery. The aim of this study is twofold. Firstly, we investigate the feasibility of using a recently proposed region detector, namely Extremal Region of Extremum Level (EREL) to delineate the luminal and media-adventitia borders in IVUS frames acquired by 20 MHz probes. Secondly, we propose a region selection strategy to label two ERELs as lumen and media based on the stability of their textural information. We extensively evaluated our selection strategy on the test set of a standard publicly available dataset containing 326 IVUS B-mode images. We showed that in the best case, the average Hausdorff Distances (HD) between the extracted ERELs and the actual lumen and media were 0.22 mm and 0.45 mm, respectively. The results of our experiments revealed that our selection strategy was able to segment the lumen with ≤ 0.3 mm HD to the gold standard even though the images contained major artifacts such as bifurcations, shadows, and side branches. Moreover, when there was no artifact, our proposed method

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