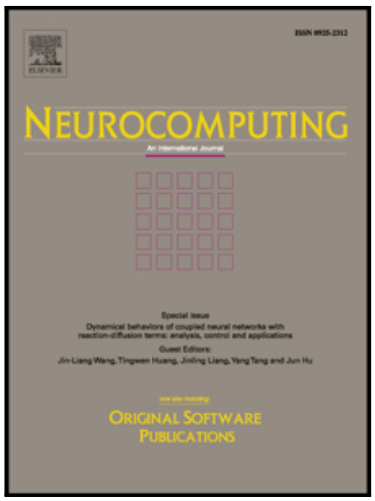

Saliency Driven Vasculature Segmentation with Infinite Perimeter Active Contour Model

Yitian Zhao, Jingliang Zhao, Jian Yang, Yonghuai Liu, Yifan Zhao, Yalin Zheng, Likun Xia, Yongtian Wang

PII: S0925-2312(17)30253-9
DOI: 10.1016/j.neucom.2016.07.077
Reference: NEUCOM 18049

To appear in: *Neurocomputing*

Received date: 25 January 2016
Revised date: 27 June 2016
Accepted date: 16 July 2016

Please cite this article as: Yitian Zhao, Jingliang Zhao, Jian Yang, Yonghuai Liu, Yifan Zhao, Yalin Zheng, Likun Xia, Yongtian Wang, Saliency Driven Vasculature Segmentation with Infinite Perimeter Active Contour Model, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2016.07.077

Saliency Driven Vasculature Segmentation with Infinite Perimeter Active Contour Model

Yitian Zhao[a*], Jingliang Zhao[a] Jian Yang[a*], Yonghuai Liu[b], Yifan Zhao[c], Yalin Zheng[d], Likun Xia[a] and Yongtian Wang[a]

[a] *Beijing Engineering Research Center of Mixed Reality and Advanced Display, School of Optics and Electronics, Beijing Institute of Technology, China*
[b] *Department of Computer Science, Aberystwyth University, UK*
[c] *EPSRC Centre for Innovative Manufacturing in Through-life Engineering Services, Cranfield University, UK*
[d] *Department of Eye and Vision Science, University of Liverpool, UK*
∗*Email: yitian.zhao@bit.edu.cn, jyang@bit.edu.cn*

Abstract

Automated detection of retinal blood vessels plays an important role in advancing the understanding of the mechanism, diagnosis and treatment of cardiovascular disease and many systemic diseases, such as diabetic retinopathy and age-related macular degeneration. Here, we propose a new framework for precisely segmenting retinal vasculatures. The proposed framework consists of three steps. A non-local total variation model is adapted to the Retinex theory, which aims to address challenges presented by intensity inhomogeneities, and the relatively low contrast of thin vessels compared to the background. The image is then divided into superpixels, and a compactness-based saliency detection method is proposed to locate the object of interest. For better general segmentation performance, we then make use of a new infinite active contour model to segment the vessels in each superpixel. The proposed framework has wide applications, and the results show that our model outperforms its competitors.

Keywords: Saliency, Retinex, Active Contour, Vascular Segmentation.