

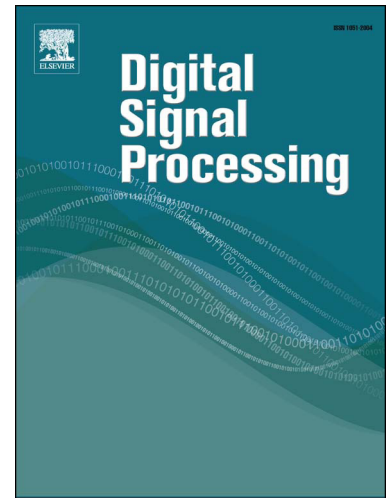
Accepted Manuscript

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PII: S1051-2004(18)30507-4
DOI: <https://doi.org/10.1016/j.dsp.2018.06.006>
Reference: YDSPR 2351

To appear in: *Digital Signal Processing*



Please cite this article in press as: J. Zhao et al., Automatic retinal vessel segmentation using multi-scale superpixel chain tracking, *Digit. Signal Process.* (2018), <https://doi.org/10.1016/j.dsp.2018.06.006>

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Automatic Retinal Vessel Segmentation Using Multi-scale Superpixel Chain Tracking

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Abstract— The segmentation of retinal vessel and its structure information are important for computer-aided diagnosis and treatment of many diseases. This work proposes a superpixel-based chain tracking method for segmentation of retinal vessels. First, a multi-scale superpixel segmentation framework is developed to split the image into patches, which are utilized as the basic unit of the vessel-tracking procedure. Second, a vessel chain model which consists of a series of superpixel nodes is proposed for accurately segmenting small vessels. Third, vessel tracking is achieved by a two-stage procedure where vessel regions with good and bad imaging quality are handled differently. Finally, a maximum gradient method is proposed to estimate the vessel centerline and boundary. The proposed method was validated on synthetic data and public retinal image datasets. Experimental results demonstrate that the proposed method can accurately track the vascular skeletons, and the tracking accuracy can reach 0.9636.

Keywords—Retina vessel, Superpixel, Segmentation, Tracking

1. Introduction

The segmentation of the blood vessel and its structural information, such as vessel centerline and width, play an important role in medical diagnosis [1-4]. For example, the segmentation of medical vessel images is helpful for early diagnosis of diseases such as diabetes, arteriosclerosis and hypertension [5]. Moreover, morphological information, such as the connectedness of vessel segments has exhibited considerable potential in applications in various fields such as reconstruction of coronary arteries [6-8], hemodynamic analysis of vascular trees [9], surgical planning[10], and biometric identification [11-13]. The design of an effective and robust vessel segmentation method is very difficult, and the challenges

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