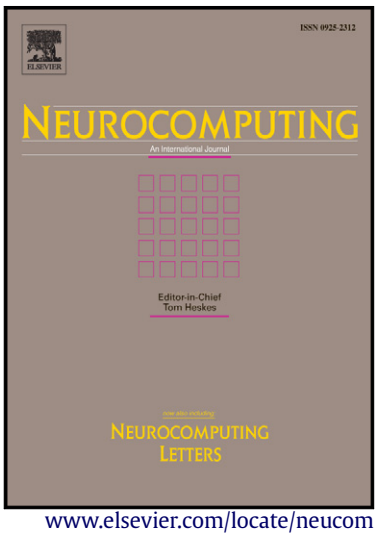

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PII: S0925-2312(15)01140-6
DOI: http://dx.doi.org/10.1016/j.neucom.2015.08.006
Reference: NEUCOM15916

To appear in: *Neurocomputing*

Received date: 17 March 2015
Revised date: 23 June 2015
Accepted date: 4 August 2015

Cite this article as: Miao Liao, Yu-qian Zhao, Xiang-hua Li, Pei-shan Dai, Xiao-wen Xu, Jun-kai Zhang, Bei-ji Zou, Automatic segmentation for cell images based on bottleneck detection and ellipse fitting, *Neurocomputing*, http://dx.doi.org/10.1016/j.neucom.2015.08.006

Automatic segmentation for cell images based on bottleneck detection and ellipse fitting

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Abstract: To segment the overlapping cells in microscopic images, an automatic method for cell image segmentation based on bottleneck detection and ellipse fitting is proposed. Firstly, cell image is segmented by threshold method, followed by a polygonal approximation to extract the feature points of cell edge. Secondly, candidate splitting point pairs are obtained by calculating the bottleneck rate between each feature point pair, and further judged by ellipse fitting to find the correct splitting point pair. Then, a cell is separated from the overlapping cells according to the splitting point pair, and the remaining edge is patched up to form a new closed contour by an improved ellipse fitting method. Finally, repeat the above steps on the new closed contour until all cells are separated. The performance of this method is evaluated on the blood and fluorescent cell databases. Experimental results show that the proposed method can effectively segment overlapping cells with high accuracy and less time, which is superior to many existing methods.

Key words: Cell image segmentation; bottleneck detection; ellipse fitting; edge modification; polygonal approximation

1. Introduction

Cell counting from microscopic images is an important procedure in many fields of biology and medicine such as stem cell engineering, growth rate examination of microorganisms, measurements of cell viability, concentration calculation of blood cells, bacteria, viruses and some other pathogens, etc [1-2]. Since the number of cells in microscope image is very large, manual counting technique is time consuming and tedious. Therefore,