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算法研究

基于自适应阈值分割的宫颈细胞图像分类算法

关涛, 周东翔, 刘云辉, 蔡宣平

国防科技大学电子科学与工程学院

摘要：

本文以宫颈癌细胞图像的自动筛查为应用背景，研究了一种新的宫颈细胞图像分类算法。算法首先采用形态学滤波与自适应直方图均衡的预处理方法进行图像增强；根据对图像内容与直方图分布关系的深入分析，提出采用经验因子加权Otsu自适应阈值分割算法进行细胞核分割，有效地解决了细胞重叠所引起的自适应分割阈值的选取问题；然后，通过提取面积、周长、区域面积与外接凸多边形面积比以及长宽比四种参数，对分割出的细胞核区域进行杂质剔除；最后以最能体现癌细胞特征的面积、平均灰度作为特征参数采用K-means算法对样本图像进行分类实验。实验样本为233幅宫颈细胞图像，其中49幅癌细胞图像，184幅正常细胞图像，实验结果证明了该算法的有效性。

关键词： 细胞核分割；形态学滤波；自适应直方图均衡；Otsu算法；K-means算法

Classification of Cervical Cell Images based on Adaptive Thresholding Segmentation

GUAN Tao, ZHOU Dong-Xiang, LIU Yun-Hui, CAI Xuan-Ping

School of Electronic Science and Engineering, National University of Defense Technology,Changsha

Abstract:

This paper presents a new method of automatically screening cervical cancerous cell images. The proposed method first enhanced the cervical cell images by a morphological filtering and adaptive histogram equalization method. Then, an Experiential-Factor-Weighted Otsu Thresholding algorithm, which solves the biases of traditional Otsu thresholding method due to the overlapping of cells in images, is presented for segmentation of the cell nuclei. To extract the largest cell nuclei, the algorithm uses four features, which are area, perimeter, ratio of area and convex area, ratio of length and width of the segmented cell nuclei. Finally, to classify the cell images into normal and abnormal ones, the K-means clustering algorithm is employed on the basis of two cell nuclei features: area and mean gray level, which are extracted from the largest cell nuclei. Experiments were done on 233 cervical cell images including 49 cancerous cell images and 184 normal cell images. The experiment results validated the proposed method.

Keywords: Cell nuclei segmentation morphological filtering adaptive histogram equalization Otsu algorithm;K-means algorithm

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通讯作者:

作者简介:

作者Email: gtao_nudt@nudt.edu.cn

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