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摘要：对二维Otsu法中类间离散度测度进行了分析,发现按该算法对被噪声污染图像的二维直方图进行划分时,所得两类的类内均值点容易远离主对角线,因而抗噪声能力不足。针对以上情况,本文提出了一种新算法,该算法基于二维直方图中直线阈值分割的思想,利用像素点的二维信息直接建立阈值直线的截距直方图;然后应用Otsu准则对该一维直方图求解最佳截距阈值,并应用该阈值和二维信息完成图像分割。对提出的算法与传统二维Otsu法进行了比较和分析,结果表明:提出的算法可以有效避免传统算法在抗噪方面的缺陷,当实验图像的噪声方差大于0.003且逐渐增加时,提出的算法抗噪表现稳健;另外,提出的算法计算阈值的速度比基于二维Otsu法的直分法和直线阈值法快2个数量级以上,占用内存空间更少。因而提出的算法是一种抗噪稳健且快速有效的阈值分割算法,更适于实时应用。

关键词：图像分割 Otsu准则 阈值选取 直线截距直方图

Thresholding segmentation algorithm based on Otsu criterion and line intercept histogram

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Abstract: Two-dimensional (2-D) Otsu algorithm is analyzed. It is shown that when a 2-D histogram is segmented by 2-D Otsu threshold method, the within-class means is easily far from the main diagonal, so that the algorithm isn't robust enough to noises. This paper proposes a new algorithm. The new algorithm establishes a line intercept histogram directly from the 2-D information of images based on the line threshold segmentation concept. Then, it uses the Otsu criterion to find the best intercept threshold from the histogram. Furthermore, the 2-D information of images and the intercept threshold are adopted to implement the image segmentation. Compared the new algorithm with the 2-D Otsu algorithm, it demonstrates that the new algorithm can avoid both disadvantages of 2-D Otsu algorithm. Firstly, it improves the anti-noise ability. When the noise variance is more than 0.003 or stepup, it shows robustness to noises. Secondly, the processing speed of the new algorithm is faster than the fast Otsu algorithms based on 2-D histogram by two orders of magnitude, and it takes up more less memory. In conclusion, the proposed algorithm is robust anti-noise, more accurate segmentation and is suitable for applications in real time.

Keywords: image segmentation thresholding segmentation Otsu criterion thresholding selection line intercept histogram

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