A Robust 2D Otsu's Thresholding Method in Image Segmentation

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Abstract

Otsu's method is a classic thresholding approach in image segmentation. While the two-dimensional (2D) Otsu's method performs better than the original one in segmenting images corrupted by noise, it is sensitive to Salt&Pepper noise. In order to solve this problem, we present a robust 2D Otsu's thresholding method in this paper. Our method builds the 2D histogram based on the image smoothed by both median and average filters, in contrast to the traditional method using averaged image only. Then the optimal threshold vector is determined with two one-dimensional searches on the two dimensions of the 2D histogram. In addition, we introduce a region post-processing step to deal with the pixels of noise and edges. Compared with the traditional 2D Otsu's method, our method improves the robustness to Salt&Pepper noise and Gaussian noise significantly. Experimental results on both synthetic and real images validate the effectiveness of the proposed MAOTSU_2D method.

Keywords: Otsu's method, Thresholding, Image segmentation