

國立交通大學應用數學系

學術演講公告

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講 題：Numerical linear algebra approach to cell image segmentation

時 間：106 年 1 月 10 日(星期二) 下午 2:00 –3:00

地 點：(光復校區) 科學一館 223 室

茶 會：當天下午 1:30 (科學一館 205 室)

Abstract

Segmentation of cells in time-lapse bright-field microscopic images is crucial in understanding cell behaviors for medical research. However, the complex nature of the cells, together with poor contrast, broken cell boundaries and the halo artifact, pose nontrivial challenges to this problem. In this talk, we present two robust mathematical models based on linear algebra techniques to segment bright-field cells automatically. These models treat cell image segmentation as a background subtraction problem, which can be formulated as a robust Principal Component Pursuit (PCP) problem which minimizes the rank of the image matrix. Our first segmentation model is formulated as a PCP with nonnegative constraints. In this approach, we exploit the sparse component of the PCP solution for identifying the cell pixels. However, the sparse component and the nonzero entries can scatter all over the image, resulting in a noisy segmentation. The second model is an improvement of the first model by combining PCP with spectral clustering. Spectral clustering makes use of the eigenvectors of the graph Laplacian matrix to classify data. Seemingly unrelated approaches, we combine the two techniques by incorporating normalized-cut in the PCP as a measure for the quality of the segmentation. Experimental results demonstrate that the proposed models are effective in segmenting cells obtained from bright-field images.

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