THE UNIVERSITY  OF HONG KONG

Department of Mathematics

Numerical Mathematics and Applied Analysis Group Seminar (NMAA)

Shape Constrained repulsive snake model segments and tracks neurons in 3D microscopy image stacks

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Abstract

The branching patterns of axons and dendrites are fundamental structural properties that affect the synaptic connectivity of neurons. To study axonal branching, three dimensional stacks of confocal images of fluorescently labeled processes can be obtained but there are at present no robust methods of tracing individual axons. We developed a shape constrained repulsive snake model to segment and track axonal profiles in 3D images. The method segments all the axonal profiles in one 2D image and then uses the results obtained from that image as prior information to help segment the adjacent 2D image. The segmentation successfully connects axonal profiles over hundreds of images. Based on the segmented results, individual axons can be separated both from the background and from each other. We demonstrate the performance of the method using stacks of axons from mice that transgenically express fluorescent protein in all axons.

All are welcome