OPEN-SOURCE SOFTWARE FOR THE RECONSTRUCTION AND ANALYSIS OF LIGHT-SHEET MICROSCOPY DATA

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Light sheet fluorescence microscopy (LSFM) techniques have the potential to revolutionize in-vivo studies of biological specimens. Over the last years, the microscopy technology has matured and the first commercial system has been released by Zeiss. However, the processing of the massive datasets produced by light sheet microscopy is becoming a major bottleneck for many laboratories. Open source LSFM processing software available through Fiji [1] and other projects has made significant advances and will be presented in the workshop:

1) LSFM multi-view registration
Registration of multi-view time-lapse LSFM recordings is a central problem. We present the improved bead-based algorithm [2] conveniently accessible as Fiji plugin that is capable of dealing with the data rates for example produced by the Zeiss Lightsheet Z.1 microscope.

2) LSFM multi-view deconvolution
In order to achieve isotropic high-resolution image data, multi-view deconvolution can be used to fuse LSFM datasets. We present our new algorithm "Efficient Bayesian-based Multi-View Deconvolution" [3] available in Fiji enabling deconvolution of large LSFM datasets.

3) Performing LSFM multi-view reconstruction on a cluster
If an institute has access to a cluster, it is of great advantage to process the data using these algorithms in parallel. We present strategies to achieve efficient processing on clusters.

4) The interactive LSFM multi-view time-lapse viewer
Simply viewing terabyte sized LSFM datasets poses a huge challenge. T. Pietzsch developed an ImgLib2 [4] based interactive viewer able to interactively display entire multi-view time-series in arbitrary orientations in real time, integrated into the Fiji LSFM processing pipeline.

5) Exporting, viewing & annotating LSFM datasets using the web-based CATMAID tool
Sharing and collaboratively annotating LSFM data poses another challenge due to the size of the datasets. CATMAID [5] is a web-based google-maps like system to view and annotate big datasets. We present how to use CATMAID to view and annotate LSFM time-lapse data.