

A Software Architecture for the Analysis of Complex Microscopy Image Data Sets

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Abstract

Modern biological imaging experiments using the optical microscope are capable of producing complex image data sets. When carrying out a data analysis task, the images in a data set are arranged, as required by the task, by attributes such as the time and focus levels at which they were acquired. Importantly, different tasks which comprise an analysis are often facilitated by the use of different arrangements of the images. We present a software reference architecture which supports the use of different logical image arrangements to analyze a physical set of images. The Microscopy Image Analysis Tool (MIATool) realizes the logical arrangements using arrays of references to the images, thereby avoiding the need to replicate and manipulate the physical images in their storage medium. In order that they may be customized to address the specific requirements of different analysis tasks, these logical arrangements may differ in size and dimensionality, and are not limited in terms of the number of dimensions and the meaning of each dimension. MIATool additionally offers processing flexibility, relative ease with which new image processing capabilities may be incorporated, and storage management of images and associated information.

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