ImageJ-Driven Intelligent High Content Screening

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Abstract

High content screening at high resolution can generate an overwhelming amount of data and a prohibitive acquisition time, especially for 3D multispectral scans which became routine work in life science. However only a small fraction of the information acquired is often useful to the experimenter, interested in inspecting some particular, potentially rare events. As a faster alternative, we propose to re-organize the acquisition in two scans: a primary scan at lower resolution to detect events of interest and a secondary scan with optimal settings, but with dramatically fewer views centered only on the positions of interest. We developed a software interface in JAVA/ImageJ-macro-language that allows the communication of a workstation running ImageJ with a Leica SP5 confocal microscope, through the recently available High-Content-Screening HCS-A software module from Leica. The program is modular so that the image analysis section can be easily edited by the user to detect virtually any custom targets. The only requirement is that the analysis returns points of interest from the large map of the primary scan, to be sent back to the microscope to trigger the secondary scan. The program launches the scans, accesses, processes and presents the images to the user. User interactions, for instance to refine the secondary targets' selection, can also be easily handled in the program, which keeps all ImageJ functionalities at any time. We demonstrate intelligent scans with automated detection of fixed samples (e.g. cells in mitosis, cells on micropatterns, tissue sections) and show automated time-lapse imaging of rare events.

Keywords

High content screening, ImageJ, image analysis, event detection, user interaction