NIH Award from the National Institute of Biomedical Imaging and Bioengineering

Principal investigator: Gordon Shepherd, physiology, Feinberg School of Medicine

- Project: Flexible, Open Source Software for Laser Scanning Microscopy
- Start Date: September 15, 2009
- Total Award Amount: $329,579

How the results of this project will benefit society:

Laser scanning microscopy and computer-controlled data acquisition are techniques of major importance in many fields of biomedical research. We propose to develop highly flexible software for controlling laser scanning microscopes and general purpose analog and digital data acquisition. We expect these freely available tools to be widely useful across a broad spectrum of experimental biomedical applications. We believe that ScanImage/Ephus will facilitate exciting biological discovery in numerous laboratories.

The problem the project is trying to solve:

Laser scanning microscopy (LSM), including confocal and 2-photon microscopy, continues to play a central role in many areas of biomedical research. In neuroscience alone, the number of applications continues to grow rapidly. However, in contrast to the ongoing advances made on the hardware aspects of LSM (e.g., improved, cheaper light sources, detectors, and scanners), a major limitation to using LSM continues to be the cost and inflexibility of commercial software. Several years ago we introduced ScanImage, an open source software package for LSM. ScanImage has been highly successful and is now used by many labs, in particular for 2-photon microscopy. However, new types of cutting-edge applications require new functionality. In addition, it is usually important to combine LSM with other types of digital or analog stimulation or acquisition, such as electrophysiology, underscoring a related, more fundamental need for an open-source general-purpose data acquisition program.

How the project will work:

Here, we propose (1) to continue to develop ScanImage, with a focus on in vivo imaging and (2) to develop Ephus, a new and complementary program for general-purpose laser scanning and data acquisition, such as electrophysiological recording and video imaging. These programs are mostly written in Matlab, with an underlying C- backbone. Future releases of ScanImage will support new types of scanning hardware; improved region-of-interest and related scans; fast z-scanning; and improved on-line multicolor display. Future releases of Ephus will include an installer; support for CCD camera-based image acquisition; and tools to facilitate easy creation of complex experimental paradigms, such as laser scanning photostimulation-based mapping of neural circuits. We will maintain wiki-style documentation for ScanImage and Ephus, and will merge these programs into a single package.

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