HELIOSCAN: A SOFTWARE FRAMEWORK FOR CONTROLLING IN VIVO MICROSCOPY SETUPS WITH HIGH HARDWARE FLEXIBILITY, FUNCTIONAL DIVERSITY AND EXTENDIBILITY

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Intravital microscopy such as in vivo imaging of brain dynamics is often performed with custom-built microscope setups controlled by custom-written software to meet specific requirements. Continuous technological advancement in the field has created a need for new control software that is flexible enough to, on the one hand, support the biological researcher with innovative imaging techniques and, on the other hand, provide the developer with a solid platform for quickly and easily implementing new extensions. We introduced HelioScan, a software package written in the visual dataflow language LabVIEW, as a platform serving this dual role. HelioScan is designed as a collection of components that can be flexibly assembled into a microscope control software tailored to the particular hardware and functionality requirements. Moreover, HelioScan provides a software framework, within which new functionality can be implemented in a quick and structured manner. A specific HelioScan application assembles at run-time from individual software components and subcomponents, based on user-definable configuration files. Due to its component-based architecture, HelioScan can exploit synergies of multiple developers working in parallel on different components in a community-based effort. We exemplify the capabilities and versatility of HelioScan by demonstrating several in vivo brain imaging modes, including camera-based intrinsic optical signal imaging for functional mapping of cortical areas, standard two-photon laser-scanning microscopy using galvanometric mirrors, and high-speed in vivo two-photon calcium imaging using either acousto-optic deflectors or a resonant scanner. We recommend HelioScan as a convenient software framework for the in vivo imaging community.

Fig. 1. Logo of HelioScan (www.helioscan.org).