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Session PSTR446 - Software Tools: Neurophysiology

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PSTR446.11 / XX60 - Automating multi-probe insertions to improve the efficiency and reproducibility of electrophysiology experiments

November 14, 2023, 1:00 PM - 5:00 PM | WCC Halls A-C

Presenter at Poster
Tue. Nov. 14, 2023 3:00 PM - 4:00 PM

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Poster

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K.J. Yang: None. **D. Birman:** None. **I. Brain Laboratory:** None. **N.A. Steinmetz:** None.

Abstract
Achieving consistent targeting of multiple simultaneous probes during electrophysiology experiments is a challenging and time-consuming process. Even with a planned insertion trajectory, experimenters still have to go through a lengthy process of positioning and inserting each probe. Electrophysiology experiments are increasingly focused on brain-wide coverage, requiring three or more simultaneous probes motivating researchers to accelerate their processes to reduce the duration of the experiment and the corresponding stress levels of their subjects. To improve the efficiency and reproducibility of multi-probe electrophysiology experiments, we developed two frameworks: a communication platform to allow software control of hardware micro-manipulators and an automation platform to perform multiple synchronous probe insertions. Each existing manipulator platform has proprietary software for programmatic control, which are rarely cross-platform and often expose inconsistent interfaces. To standardize manipulator communication, we developed a Python server that acts as a generic cross-platform application programming interface (API). This platform ensures that client applications only need to interface with one API to be compatible with many different manipulator platforms connected across various computer operating systems. Building on top of this communication platform and an existing trajectory planning tool, Pinpoint, we next developed a system that automates the insertion process for multiple probes, saving time. The automation system provides three guarantees for researchers: first, that probes will reach their intended targets without manually-introduced errors in targeting; second, that experiments can be repeated exactly to improve reproducibility; and third, that movement speeds are limited to low levels for reduced tissue damage. Because our software drives multiple probes simultaneously, complex multi-probe insertions are more manageable. Taken together, these open-source tools for communicating with hardware manipulators and automating multi-probe insertions enable the next generation of reproducible, high-efficiency, brain-wide electrophysiology data collection.