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Presentation Abstract

Program#/Poster#:	252.03/KK6
Presentation Title:	Progress toward a self-calibrating, practical intracortical BCI for people with tetraplegia
Location:	WCC Hall A-C
Presentation time:	Sunday, Nov 16, 2014, 1:00 PM - 5:00 PM
Presenter at Poster:	Sun, Nov. 16, 2014, 3:00 PM - 4:00 PM
Topic:	++D.18.d. Neuroprosthetics: Control of real and artificial arm, hand, other grasping devices
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Abstract:	Brain-computer interfaces (BCIs) promise to restore communication and independence for people with severe motor disabilities by translating decoded

neural activity directly into control of a computer. However, nonstationarities in recorded brain activity can degrade the quality of neural decoding over time, and periodically interrupting ongoing use of the BCI to perform decoder recalibration tasks would be time-consuming and impractical. Previously, we showed that typing performance in a neurally-controlled communication interface can be maintained without disruptive recalibration routines by mapping neural activity to movement intentions that are inferred retrospectively based on the user's subsequent selections. In two individuals with tetraplegia using a neurally-controlled point-and-click communication interface, typing speed using an "unsupervised" decoder (calibrated using data acquired during neurally-controlled free typing) was equivalent to typing speed using a "supervised" decoder (calibrated using a task with pre-defined targets). The current study extends this finding to several more sessions with two additional participants, and demonstrates for the first time that these methods can keep the BCI calibrated over long periods of practical, self-paced BCI use without the intervention of a technician. Technical innovations that made this possible include automated calibration routines running in parallel with decoding software, adaptive normalization of extracted neural features, click decoder recalibration in parallel with directional decoder calibration, residual bias suppression, and other innovations (see Sarma et al. and Simeral et al., SFN 2014, for details). By introducing the potential to maintain decoder performance during extended use of unsupervised point-and-click assistive applications, this unsupervised calibration approach advances the potential clinical utility and independent use of BCIs by individuals with severe motor disability.

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