Towards zero training for brain-computer interfacing

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While invasive electrode recordings in humans show long-term promise, non-invasive techniques can also provide effective brain-computer interfacing (BCI) and localization of motor activity in the brain for paralyzed patients with significantly reduced risks and costs as well as novel applications for healthy users. However, two issues hamper the ease of use of BCI systems based on non-invasive recording techniques, such as electroencephalography (EEG).

First, the demands for electrode preparation for multi-channel EEG – necessary for optimal performance – are significant. Second, EEG signals are highly subject-specific and vary considerably even between recording sessions of the same user performing the same experimental paradigm.

Therefore, the BCI software that includes preprocessing and classification needed to be adapted individually for optimal performance before every session. While Popescu et al. (Single Trial Classification of Motor Imagination Using 6 Dry EEG Electrodes, *PLoS ONE*, 2007) have proposed a solution to the first issue by introducing dry electrodes, which can reduce the EEG electrode preparation time from 40 minutes to one minute, the second problem has, until now, remained unsolved.

Reporting in the online, open-access journal *PLoS ONE*, on August 13, a new study by Matthias Krauledat and colleagues at the Berlin Institute of Technology suggests a novel data analysis method that bypasses the need for the time-consuming calibration for long-term BCI users and may

reduce the calibration time from 20?? minutes to one minute. This is achieved by a clustering approach, which extracts most representative spatial filters for each individual subject from prior recordings.

Taken together, these developments of the Berlin BCI group pave the way to make BCI technology more practical for daily use in man-machine interaction both for patients and for the healthy.

Krauledat M, Tangermann M, Blankertz B, Müller K-R (2008) Towards Zero Training for Brain-Computer Interfacing. PLoS ONE 3(8): e2967. doi:10.1371/journal.pone.0002967
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