MU/BETA RHYTHM-BASED BRAIN-COMPUTER INTERFACE (BCI): IMPROVING PERFORMANCE WITH TIME-DOMAIN SIGNAL FEATURES

H. Sheikh, D.J. McFarland, T.M. Vaughan, J.R. Wolpaw
Wadsworth Center, New York State Department of Health and State
Uiversity of New York, Albany, NY 12201

People can learn to control the amplitude of the 8-12 Hz mu or 18-25 Hz beta rhythm of EEG recorded over sensorimotor cortex and use it to move a cursor to selections on a computer screen (e.g., Electroenceph Clin Neurophysiol 78:252-259, 1991 & 90:444-449, 1994). To define additional EEG features that could improve performance speed and accuracy (measured as bit rate), we are examining in the time-domain EEG activity recorded from 64 scalp locations during BCI operation. A trial begins with the appearance of a target occupying one of the four quarters of the right screen edge. A cursor appears in the middle of the left screen edge 1 sec later and moves steadily across the screen in 2 sec. The user's mu or beta rhythm amplitude at one or several locations over sensorimotor cortex controls vertical cursor movement and thus determines whether the target is hit. We examined in the time-domain the EEG activity associated with topmost and bottommost targets. Time-domain EEG at specific times during the trial and at specific electrodes is significantly correlated with target location. These times and electrodes vary among users. The results imply that time-domain EEG analysis properly tailored to each user could supplement current frequency-based analyses and improve BCI performance.

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