

02P-K09 Dynamic online target control of SSVEP-based brain-computer interface with multiple commands
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Brain-computer interfaces (BCI) present a novel challenge to neuroscientists with their strict requirements for high reliability, real-time analysis and quantitative classification of multiple brain activity patterns. A BCI paradigm which is able to satisfy most of these requirements is the steady-state visual evoked potential (SSVEP) approach in which multiple flickering patterns evoke synchronized steady-state brain activity. In this study, we propose a multi-stage procedure for real-time BCI with an implementation for up to eight commands. Our EEG-based BCI system enables a user to navigate a small car on a screen in real time and to execute additional actions. This approach offers several novel points, such as integrated moving patterns for selective attention and minimal eye movement, as well as an online blind-source separation (BSS) unit for artifact rejection, improved feature selection and a fuzzy classifier. The modular and adaptive structure of the BCI platform allows an extension to an even higher number of commands, as well as to other BCI paradigms.

02P-K10 Single-trial based neural prediction of immediate and delayed go/no-go decisions
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To develop an algorithm of neural mind reading, we simultaneously recorded from a small group (2–5) of single neurons in the superior colliculus (SC) while the monkey performed immediate and delayed go/no-go tasks, which required the monkey to either make a saccade toward a peripheral stimulus (go) or maintain fixation (no-go) depending upon stimulus color. We performed a regression analysis on the single-trial activity in order to generate a virtual decision function (VDF) which was designed to reflect the progress of decision-making. Post hoc analyses by VDF predicted the monkey's choice in approximately 90% of immediate and 85% of delayed trials. These results suggest that monitoring of SC activity has sufficient capacity to predict go/no-go decisions on a trial-by-trial basis, which is an ideal candidate to serve for a cognitive brain-machine interface (BMI).

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