

Neural Prosthesis Seminar

Intracortical sensorimotor neuroprosthetics for controlling a robotic arm and hand

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Abstract

Paralysis or amputation of an arm results in the loss of the ability to orient the hand and grasp, manipulate, and carry objects, functions that are essential for activities of daily living. Brain-computer interfaces (BCIs) may enable many of these lost functions to be restored. We tested whether an individual with tetraplegia could rapidly achieve control of a high-performance prosthetic limb using an intracortical BCI. Two 96-channel intracortical microelectrodes were implanted in the motor cortex of a 52-year-old woman with tetraplegia. The participant quickly learned to use the prosthetic limb to perform skillful and coordinated reach and grasp movements that resulted in clinically significant gains in tests of upper limb function. Our second participant, a 28-year-old man with tetraplegia, also had microelectrode arrays implanted in somatosensory cortex. Stimulation through electrodes in somatosensory cortex generated sensations localized to the hand that could be graded by changing stimulation amplitude. As part of these BCI studies, we have also gained insight into changes in neural firing that occur during object manipulation as well as the effect of sensory feedback on BCI performance.

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