Presentation Abstract

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Presentation Title:  The application of ECoG to the restoration of functional grasp

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Abstract:  Brain machine interface systems translate recorded neural signals into command signals for assistive technology. In individuals with upper limb amputation or cervical spinal cord injury, the restoration of aspects of arm movement and hand grasping could significantly improve daily function. To determine if electrocorticographic (ECoG) signals could be used to select among multiple hand postures for a prosthetic hand, orthotic, or functional electrical stimulation system, we recorded ECoG signals from subdural macro- and microelectrodes implanted in motor areas of three participants who were undergoing inpatient monitoring for diagnosis and treatment of intractable epilepsy. Participants performed 5 distinct isometric hand postures, as well as 4 distinct finger movements. Classification rates were 68%, 84%, and 81% for correct identification of 5 isometric hand postures offline. This suggests that ECoG is a plausible source of command signals for prosthetic control. To demonstrate how such a classifier could be utilized for functional restoration, the output of a fist versus rest classifier was used to drive a prosthetic hand, with 97% of trials correctly classified. Online classification performance for a larger number of hand postures remained above
chance, but substantially below offline performance. Due to apparent non-stationarities, both across days and due to changes in behavioral context, classification performance was not stable. The application of signal conditioning and feature selection techniques can improve classifier reliability, which is crucial for the use of these systems with robotic outputs. Exploration of additional avenues for improvement, including better electrode designs and placement, better participant training, and characterization of non-stationarities, are critical for the potential application of ECoG to prosthetic control.

Disclosures:  

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