Contribution ID: **21** Type: **Presentation**

Neural Interfaces for Controlling Finger Movements

Thursday 18 May 2017 16:00 (30 minutes)

Brain machine interfaces or neural prosthetics have the potential to restore movement to people with paralysis or amputation, bridging gaps in the nervous system with an artificial device. Microelectrode arrays can record from hundreds of individual neurons in motor cortex, and machine learning signals can be used to generate useful control signals from this neural activity. Performance can already surpass the current state of the art in assistive technology in terms of controlling the endpoint of computer cursors or prosthetic hands. The natural next step in this progression is to control more complex movements at the level of individual fingers. Our lab has approached this problem in three different ways. For people with upper limb amputation, we acquire signals from individual peripheral nerve branches using small muscle grafts to amplify the signal. After a successful study in animals, human study participants have recently been able to control individual fingers online using acute electrodes within these grafts. For spinal cord injury, where no peripheral signals are available, we implant Utah arrays into finger areas of motor cortex, and have successfully decoded finger flexion and extension with correlations above 0.8. Decoding "spiking band"activity at much lower sampling rates, we recently showed that power consumption of an implantable device could be reduced by 89% compared to existing broadband approaches, and fit within the specification of existing systems for upper limb functional electrical stimulation. Finally, finger control is ultimately limited by the number of independent electrodes that can be placed within cortex or the nerves, and this is in turn limited by the extent of glial scarring surrounding an electrode. Therefore, we developed an electrode array based on 8 um carbon fibers, no bigger than the neurons themselves. We were able to insert arrays with 3x the density of the Utah array by temporarily shortening the fibers for penetration of the top cortical layers. This enabled chronic recording of single units with no apparent contiguous scarring over time. The long-term goal of this work is to make neural interfaces for the restoration of hand movement a clinical reality for everyone who has lost the use of their hands.

Primary author: Prof. CHESTEK, Cynthia (University of Michigan)

Presenter: Prof. CHESTEK, Cynthia (University of Michigan)

Session Classification: Science Use Cases

Track Classification: Science Use-Cases