PennState College of Engineering

Systems, Controls, and Robotics Seminar Series

Neural-Machine Interface towards Dexterous Control of Robotic Hands

Dr. Xiaogang Hu

Dorothy Foehr Huck and J. Lloyd Huck Chair in Neurorehabilitation, Associate Professor

The Pennsylvania State University

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ABSTRACT

An intuitive neural interface is critical for effective communications between humans and assistive devices. In this seminar we will discuss bi-directional neural-machine interfaces that decode user intended movement and encode sensory information of the machine state and environment. We perform continuous decoding of intended finger movement based on motoneuron firing activities, extracted from high-density electromyographic signals. It allows intuitive and robust control of individual fingers of a prosthetic hand. We also deliver artificial haptic and joint kinematic feedback to people with an arm amputation. The evoked sensory feedback can facilitate tactile-based object recognition and enhance closed-loop control of robotic hands. The bi-directional neural interfaces can enable dexterous control of assistive robotic devices in individuals with sensorimotor deficits.

BIOGRAPHY

Xiaogang Hu is the Huck chair in Neurorehabilitation and an associate professor in the Departments of Mechanical Engineering, Kinesiology, and Physical Medicine & Rehabilitation, the Huck Institutes of the Life Sciences and the Center for Neural Engineering at Penn State University since August 2022. He received his BE degree in Mechanical Enginerring at Tsinghua University. He was trained in motor control and biomechanics at Penn State University during his PhD study, and he completed his postdoc training at the Rehabilitation Institute of Chicago (currently Shirley Ryan AbilityLab). His research focuses on neural-machine interface and neural stimulation, targeting upper limb sensorimotor functions of individuals after stroke, traumatic brain injury, or limb loss.