BCL5

5th Workshop on Brain, Computation, and Learning

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Precision in Movement: Towards Multimodal Control of Biorobotic Interfaces

Abstract: In recent years, there has been an immense push towards developing “human-like”, multi-articulated bionic arms, capable of realistically replicating dexterous movements and sensing tactile environmental cues. Despite the enormous investment of resources in the development of upper limb prosthetics, “difficulty of use” and “non-intuitive control” continue to be limiting factors often cited by prosthesis users for abandoning their devices. For past 50 years, surface electromyography (sEMG) has been the predominant method for sensing muscle activation. However, sEMG signals suffer from poor amplitude resolution and low signal to noise, resulting in an unreliable and non-intuitive control paradigm. In this talk, I will introduce sonomyography, or ultrasound-based sensing muscle activity as an alternative to myoelectric control. I will present results demonstrating how this intuitive nature of sonomyography leads to better motion discriminability, as well as fine proportional control in individuals with limb loss with significantly reduced training burden. I will share translational aspects of my research towards developing wearable, miniaturized and low-power ultrasound imaging instrumentation for in-vivo monitoring of muscle activity. I will talk about applications of this wearable sonomyographic system as an interface for biomechatronic devices in particular, and for rehabilitation in general.