SEMINAR SERIES

Supported by The Department of Biomechanics and
The Center for Research in Human Movement Variability (MOVCENTR)

An Artificial Skeletal Muscle for Use in Pediatric Rehabilitation Robotics

Featuring Dr. Ahad Behboodi

University of Nebraska at Omaha

Friday, Sept. 22 | 10:00 am – 11:00 am | BRB 167

PRESENTATION ABSTRACT

Many actuator materials and devices are used to power automated assistive devices, however, in orthotics and prosthetics, the requirement for a “natural” look and feel, to make the artificial or assisted limb feel integrated with the body, is limited by current technology. Bulky, heavy, noisy electrical motors or pneumatic actuators are typically used, which substantially reduce user compliance of powered orthotics and their adoption. For greater acceptance of such devices, the desired requirements include: low weight, quiet operation, soft feel, and dimensions approximating those of a natural limb. Additionally, to mimic skeletal muscle such actuator must contract quickly while exerting enough force to create functional motions. We call such an actuator **artificial skeletal muscle.** Due to variety in soft actuator technology, finding an artificial skeletal muscle for pediatric applications is nontrivial. Therefore, we compared five soft actuator candidates that can be deployed in exoskeleton applications. Two thermally driven actuators, Coiled Nylon Fiber (CNF) and Ethanol-Based Phase Change (EPC); and three electro-active polymer actuators, Plasticized Poly Vinyl Chloride (PVC) gel, Stacked Dielectric Elastomer (DE) and Hydraulically Amplified Self-Healing Electrostatic (HASEL), were chosen for the comparison. The commercially available Stacked DE actuator showed the closest resemblance to skeletal muscle.

ABOUT DR. BEHBOODI

Dr. Behboodi is a biomechanist, holding BSc and MSc degrees in biomedical engineering, and a Ph.D. in Biomechanics and Movement Science from the University of Delaware (UDel). His academic journey led him to undertake post-doctoral training at the NIH's Functional and Applied Biomechanics section, where he innovated a brain-computer interface (BCI) system, aiming to enhance neurorehabilitation and motor coordination in children with neuromuscular disorders. Notably, his contributions also extend to the commercialization of a robotic ankle exoskeleton powered by artificial skeletal muscles for neurodiverse children during his postdoc at the Venture Development Center at the UDel. Driven by a profound passion for advancing pediatric neurorehabilitation through translational rehabilitation technologies, Dr. Behboodi's expertise encompass biological signal processing, movement analysis, artificial muscles, and neuromuscular electrical stimulation. Recently, he embraced the role of an Assistant Professor within the esteemed Biomechanics Department at UNO to continue his pursuit of enhancing the mobility of neurodiverse children.

more info at **cobre.unomaha.edu**

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