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Mechanical and Aerospace Engineering Department Seminar Series

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Staff Scientist

**Functional & Applied Biomechanics Section
National Institutes of Health, Bethesda, MD**

Friday, April 10, at 12:30pm, Glennan, 421
Refreshments will be served starting at 12:15pm



Mobile Brain Imaging for Device Augmented Neurorehabilitation

Recent advances in neuroimaging have resulted in techniques that are capable of recording human brain activity in a wide range of environments. Noninvasive methods now enable the study of cortical activity during mobile activities and therefore offer tremendous potential to improve understanding of human motor control and accelerate new therapies for neurological impairments. The Functional and Applied Biomechanics Section of the National Institutes of Health is developing new ways to harness these imaging modalities to improve motor rehabilitation of individuals with central nervous system injuries, with a particular focus on pediatric populations. This talk will illustrate state-of-the-art mobile neuroimaging as one component of a multi-modal motion capture laboratory for developing innovative neurorehabilitation paradigms. We will discuss recent advances developed in our lab, including application of powered exoskeletons, surface functional electrical stimulation (FES), user-driven treadmills, and other device augmented therapies for gait rehabilitation in adults and children with cerebral palsy. This work will be explored in the context of other relevant advances to discuss future directions for improving functional recovery in individuals with neurological disorders.

Thomas Bulea is Staff Scientist in the Functional & Applied Biomechanics Section within the Clinical Research Center of the National Institutes of Health, Bethesda, MD where he leads the Neural Interfacing and Rehabilitation Robotics group. Dr. Bulea received his M.S. and Ph.D. in biomedical engineering from Case Western Reserve University and his B.S. in mechanical engineering from The Ohio State University. Prior to his current position, Dr. Bulea was a post-doctoral fellow at NIH and a visiting post-doctoral scholar at the University of Houston. Dr. Bulea's research focuses on integration of neural interfacing and rehabilitation robotics to improve understanding of human motor control and to develop new therapeutic tools and interventions for treatment of movement disorders and paralysis. Primary focus areas include: 1) combining neuroimaging, including electroencephalography (EEG) and functional near-infrared spectroscopy (fNIRS) with motion capture and electromyography (EMG) data collection systems to monitor brain-body dynamics during movement, 2) development and application of assistive devices and technology to improve motor function in individuals with central nervous injuries, with specific focus on actuated devices (robotics and exoskeletons) and functional electrical stimulation (FES), and 3) development and evaluation of novel rehabilitation therapies, including human-machine interaction and integration of virtual reality to enhance motor learning and functional recovery.