University of Houston - Biomedical Engineering Seminar
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Neuromusculoskeletal Modeling and Rehabilitation Robotics: Two Great Tastes that Taste Great Together

B.J. FREGLY

Abstract

Rehabilitation robots hold significant promise for maximizing recovery of lost function caused by neurological impairments such as stroke. However, to date, robots have not produced functional gains that are markedly better than those achieved by traditional therapy. While rehabilitation robots can be used to deliver precise movement prescriptions, they do not provide a means for designing treatments that target the neural control deficits of a particular patient. In contrast, neuromusculoskeletal models have recently advanced to the point of being able to design personalized treatments that target an individual's neural control deficits, but models provide no way of implementing treatments. These two observations lead to "The Reese's Peanut Butter Cup Effect," where combining two traditionally separate fields – rehabilitation robotics and neuromusculoskeletal modeling - has the potential to produce better outcomes than what either field could achieve separately. Muscle synergies are the proposed common element for tying these two fields together and facilitating a personalized treatment design process.

Biosketch

Dr. Fregly received his B.S. from Princeton and his M.S. and Ph.D. from Stanford University in Mechanical Engineering. Following a year of post-doctoral research in France at the University of Lyon (1993-1994), Dr. Fregly worked as a software developer in Silicon Valley for Rasna/Parametric Technology Corporation (1995-1999). From 1999 to 2017, he served on the faculty of the Department of Mechanical & Aerospace Engineering at the University of Florida, where he was a Knox T. Millsaps Professor, a University of Florida Research Foundation Professor, and the recipient of departmental and college Teacher of the Year awards. In August of 2017, Dr. Fregly joined the Department of Mechanical Engineering at Rice University as a Professor and CPRIT Scholar in Cancer Research. His research focuses on modeling, simulation, and optimization of the human neuromusculoskeletal system to optimize the treatment of movement-related disorders. He has been the PI on over $11 million in research funding from NSF (including a CAREER Award), NIH, NASA, and most recently the Cancer Prevention Research Institute of Texas (CPRIT).