

Hand Synergies: Theoretical Frameworks and Robotics Applications

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ABSTRACT

The term 'synergy' - from the Greek *synergia* - means 'working together'. The concept of multiple elements working together towards a common goal has been extensively used in neuroscience to develop theoretical frameworks, experimental approaches, and analytical techniques to understand neural control of movement, and for applications for neuro-rehabilitation. In the past decade, roboticists have successfully applied the framework of synergies to create novel design and control concepts for artificial hands, i.e., robotic hands and prostheses. At the same time, robotic research on the sensorimotor integration underlying the control and sensing of artificial hands has inspired new research approaches in neuroscience, and has provided useful instruments for novel experiments. In this talk I will provide an overview of experimental evidence, theoretical considerations, and open questions regarding hand synergies, and how robotics has been leveraging the insights from neuroscience for innovative design in hardware and controllers for biomedical engineering and robotics applications.

BIOGRAPHY

Marco Santello received a Bachelor in Kinesiology from the University of L'Aquila, Italy, in 1990 and a Doctoral degree in Sport and Exercise Science from the University of Birmingham (U.K.) in 1995. After a post-doctoral fellowship at the Department of Physiology (now Neuroscience) at the University of Minnesota, he joined the Department of Kinesiology at Arizona State University (ASU) (1999-2010). He is currently Professor of Biomedical Engineering, Director, and Harrington Endowed Chair at the School of Biological and Health Systems Engineering. His main research interests are motor control, learning, and biomechanics of object grasping and manipulation, neural control of hand muscles, haptics, and multisensory integration. His laboratory uses complementary research approaches, ranging from intramuscular electromyography and transcranial magnetic stimulation to motion tracking, kinetic analysis, electroencephalography, and virtual reality environments. Dr. Santello's research has applications to rehabilitation of sensorimotor hand function, prosthetics, and biologically-inspired robotics. Dr. Santello has published his work (100+ publications) in neuroscience and engineering journals. His research has been supported by research awards from the National Institutes of Health, the National Science Foundation, DARPA, the Whitaker Foundation, The Mayo Clinic, and Google. He has served as regular member of the Motor Function, Speech, and Rehabilitation Study Section at the National Institutes of Health, and currently serves as Associate Editor for *Neuroscience and Biomedical Engineering*, and member of the Editorial Board of the *Journal of Assistive, Rehabilitative and Therapeutic Technologies*. He is a member of the Society for Neuroscience, the Society of Neural Control of Movement, and IEEE.



EVENT DETAILS

DATE:

October 30, 2017

TIME:

2:00 PM

LOCATION:

McLean 510
Stevens Institute of Technology

ATTENDANCE:

Stevens Community