Title: Design and Tele-Impedance Control of a Variable Stiffness Transradial Hand Prosthesis

Abstract:

According to the World Health Organization, only about the half of upper extremity amputees receive prosthetic limbs and only the half of this group consistently use their prosthetic devices. The prominent reasons that hinder widespread adaptation of prosthetic limbs are their high cost, non-intuitive control interface and insufficient dexterity for performing activities of daily living. This talk describes to address these challenges and presents the design, implementation, experimental characterization and human subject experiments of a low cost, customizable, variable stiffness transradial hand prosthesis controlled through a natural human-machine interface. The transradial hand prosthesis features a low cost, robust, adaptive and lightweight design, thanks to its tendon-driven, under-actuated, compliant fingers and variable stiffness actuation. The tele-impedance control of the variable stiffness transradial hand prosthesis is performed through a natural human-machine interface based on surface electromyography (sEMG) signals. This interface, together with variable stiffness actuation, enables the amputee to modulate the impedance of the prosthetic limb to properly match the requirements of the task at hand, while performing activities of daily living.

Bio: Dr. Elif Hocaoglu, is a research scientist in Human-Machine Interaction Laboratory at Sabanci University. She graduated with a B.Sc. degree in Mechanical Engineering from the Yildiz Technical University, Istanbul, Turkey in 2005. Then, she received her M.Sc. and Ph.D. degrees in Mechatronics Engineering from Sabanci University, Istanbul, Turkey in 2008 and 2014 respectively. She is going to work as a post doctoral research associate in Humanoids and Human Centred Mechatronics Laboratory, the Department of Advanced Robotics at Italian Institute of Technology, Genoa, Italy in February 2015. Her research has focused on tele-impedance control, design of hand prosthesis and variable stiffness actuators, sEMG based interface, physical human-machine interaction, design of sEMG data acquisition device, feature extraction and classification problems, embedded system design. Her research extends to development of sensory feedback for neuroprosthetics, and biomechatronic system design for the specific-purpose medical applications.