REHAB WEEK2023
24-28 SEPTEMBER 2023
SINGAPORE

rehabweek
Singapore '23

Category: FES, Brain Stimulation and Neurophysiology

Workshop Title: Hybrid FES robotics: from design challenges to clinical perspectives

Workshop Organizer(s): Emilia Ambrosini

In person Speaker(s):

- Masia, Lorenzo, Heidelberg University, Germany
- Ferrante Simona, Politecnico di Milano, Italy
- Pedrocchi Alessandra, Politecnico di Milano, Italy
- O'Malley, Marcia, Rice University, United States
- Emilia Ambrosini

Virtual Speaker(s): Molteni Franco, Villa Beretta Rehabilitation Center, Italy

Workshop Time: 16:00 - 17:30

Attendee Engagement:

We aim to attract people with different background (engineers, clinicians, patients, and industry representatives) and we plan a session which will exploit team brainstorming techniques, such as brainwriting and reverse thinking, to build new ideas in the field of hybrid rehabilitation systems, mainly to foster clinical uptake.

Abstract:

In the field of rehabilitation engineering, there is a common agreement that Hybrid Rehabilitation Systems, combining Functional Electrical Stimulation (FES) with powered robotic devices can potentially intensify the outcomes of neuromotor rehabilitation by taking full advantage of the combination of the two technologies. On one side, FES enhances neural plasticity, thus improving motor relearning, but FES-induced movements are hard to control due to the non-linear and time-dependent nature of the induced muscle contraction and are affected by the early onset of muscle fatigue, which limits a prolonged training. On the other side, robotic devices provide smooth motion, strong forces and endless training, but can be bulky and expensive. Combination with FES could enable motors' power reduction, thus reducing robot encumbrance, and can promote a more active training. However, the combination of these two technologies poses several challenges in the design, control and clinical uptake of hybrid FES robotic systems.

This workshop will present the state of the art of hybrid systems both for upper extremity and gait assistance, focusing on the current challenges in the design of a shared control which compensates for muscle fatigue and adapts to single users' residual capability, and in the implementation of intuitive and self-calibrated procedures. The current evidence about the efficacy of hybrid systems will be also presented and clinical perspectives will be discussed.

We envisage to have three technical presentations from different research groups (Dr. E. Ambrosini, Politecnico di Milano; Prof. L. Masia, Heidelberg University; and Prof. M. O'Malley, Rice University)

and one clinical presentation (Dr. F. Molteni, Villa Beretta Rehabilitation Center), followed by a brainstorming session coordinated by. Prof. S. Ferrante and Prof. A. Pedrocchi from Politecnico di Milano to find with the help of the audience novel ideas in the field of Hybrid FES robotic systems.