

SEMINAIRE SCIENTIFIQUE – ECOLE DOCTORALE MEGA

Mardi 18 décembre 2018 de 11h à 12H

IFSTTAR - Salle Léonard de Vinci

Cité des Mobilités - Bron

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CONTROL OF WALKING THROUGH ELECTRICAL STIMULATION OF PARALYZED MUSCLES

Abstract:

Bipedal locomotion results from a coordinated activity of a highly redundant system of actuators controlling bodily joints. The system is highly nonlinear and time variable. One feasible method to control muscles is to implement the black box model and mimic natural control. Simulating natural control reduces the complexity of modeling since it inherently comprises a high level of temporal and spatial synergies, a combination of preprogrammed, descending control with sensory driven (feedback) control. The descending control can be assumed as a sensory-driven system. This lecture presents the tool to create the synergistic pattern of activation of muscles applicable for external control of muscles and the means of its implementation. The tool uses optimization where the cost function is a tracking error, and the penalty function is the level of muscle activation. The application relies on the use of machine learning techniques. The illustration of the control will be in the activation of several muscles groups in hemiplegic individuals while walking.

Short CV:

Education: He received Dipl. Eng. in 1974; MsSc in 1977; PhD in 1981 (all from the Faculty of Electrical Engineering, University of Belgrade) and he was awarded Dr Tec from the Aalborg University, Denmark in 2003.

Employment: Professor, Faculty of Electrical Engineering, University of Belgrade up to 2015. Professor Emeritus, Aalborg University, Aalborg, Denmark. Member of the Serbian Academy of Sciences and Arts (SASA) and member of the Academy of Engineering Sciences, Belgrade, Serbia. He was professor at the University of Alberta, Edmonton, Canada (1986-1996); University of Miami, Florida, USA (1991-1996), and Aalborg University, Denmark (1999-2014).

Publications: He published close to 500 papers (3 books, 130 journal publications, 9 textbooks, and many book chapters and conference papers). His papers were cited over 6686 times, h=45 (Google Scholar, November 16 2018). He submitted 8 patents.

Editorial duties: Editor of the Journal of Automatic Control, Belgrade. Associated Editor of the IEEE Transactions on Neural Systems and Rehabilitation Engineering and Medical & Biological Engineering & Computing. Member of the editorial board of Medical Engineering and Physics and Neurorehabilitation journals.

Memberships: IEEE; IFESS – Founding and Life Member; EMBS; AEMBES - Fellow and Founding member, President of the Society for Electronics, Automatics and Computer Engineering (ETRAN), Serbia.