Biorobotics Course

Accademic Year 2011-2012

Master degree in Automation Engineering and Control of Complex Systems

Prof. Paolo Arena

Creditis: 6

Introduction to Biorobotics and to its interdisciplinary aspects; detailed study on nonlinear dynamics in biological neural systems, biological neuron model and phase space analysis, models of synapses and of their modulation; computational models for biological neural networks; simulation examples referring to cases of study; biological neural paradigms for the generation and control of locomotion patterns: the Central Pattern Generator (CPG) and the decentralised control: study and comparison in relation to particular animals; implementation of the locomotion control paradigms through nonlinear circuits and systems (analog and digital implementation), examples of bio inspired robots controlled by models of biological neural networks: implementation of undulatory worm-like locomotion patterns, implementation of CPG networks and decentralised controllers on hexapod, quadruped and biped robots. The role of complex dynamics in modelling and control of perceptual systems for biorobotic applications. Toward an insect brain computational model.

References

"Neuronal Control of Locomotion: From Mollusc to Man", G. N. Orlovsky, T. G. Deliagina and S. Grillner;

"Dynamical Systems, Wave-Based Computation and Neuro-Inspired Robots", P. Arena ed.