Motion Primitives as a Model for the Experimentally Observed Spinal Fields

Francesco Nori

University of Genova

November 14, 2005 at 15:00

Abstract: Recent experiments on the central nervous system of frogs and rats [1] have suggested a new paradigm for controlling complex nonlinear kinematic chains. This paradigm consists in writing the control variable as a linear combination of a finite number of elementary control actions. This seminar will concern a recently developed technique for synthesizing these elementary control actions [2][3][4]. The proposed primitives have two appealing features. First, they can be easily scaled to drive the system to a desired final state in an arbitrary time. Second, they are invariant under modifications of some geometrical parameters of the kinematic chain to be controlled. Finally, all these results are used for simulating human reaching movements; simulated trajectories are compared with human captured data.

1.F. A. Mussa-Ivaldi and E. Bizzi, “Motor learning through the combination of primitives,” Phil. Trans. R. Soc. Lond., vol. 355, pp. 1755–1769, 2000.

2.F. Nori, R. Frezza "Nonlinear Control by a Finite Set of Motion Primitives. 6th IFAC Symposium on Nonlinear Control Systems". NOLCOS 2004. Stuttgart, Germany, September 01-03, 2004.

3.F. Nori, R. Frezza "Biologically Inspired Control of a Kinematic Chain Using the Superposition of Motion Primitives". 43rd IEEE Conference on Decision and Control, CDC'04. Atlantis Paradise Island Bahamas, December 14-17, 2004.

4.F. Nori, R. Frezza. "Control of a Manipulator with a Minimum Number of Motion Primitives". 20th International Conference on Robotics and Automation, ICRA’05. Barcelona, Spain, April 18-22, 2005.