

24 May 2010, h.11:00 - Aula Magna "A.Lepschy" DEI

*Optimal Control on Non-Compact Lie Groups: A Projection Operator Approach*

Alessandro Saccon

Instituto Superior Tecnico, Lisboa, Portugal

Abstract:

Many nonlinear systems of practical interest evolve on Lie groups or on manifolds acted upon by Lie groups. Examples range from aircraft and underwater vehicles to quantum mechanical systems.

The projection operator approach to the optimization of trajectory functionals, developed in [1], allows one to perform local Newton optimization of a (integral plus terminal) cost functional over the Banach manifold of trajectories of a nonlinear system (subject to a fixed initial condition).

In this talk, we will show to extend the projection operator based trajectory optimization approach to the class of nonlinear systems that evolve on non-compact Lie groups. This required the introduction of a geometric derivative notion for the repeated differentiation of a mapping between two Lie groups, endowed with affine connections. With this tool, chain rule like formulas were used to develop expressions for the basic objects needed for trajectory optimization.

[1] J. Hauser, "A projection operator approach to the optimization of trajectory functionals," in 15th IFAC World Congress,

Barcelona, Spain, 2002.