

Master (M2) Stage proposal

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Research team: **E7: " Systèmes dynamiques: théorie et applications "**

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Project title: A Lie-Algebraic Framework for Hamiltonian Control Theory, and Hamiltonian Perturbation Theory.

Abstract:

The "Hamiltonian Control" problem aims to implement a small modification of the hamiltonian of a system in order to restore some properties, such as an "Internal Transport Barrier" or other structures in the phase space. The mathematical problem is to detail which properties are useful to restore, and to compute the associated modification of the hamiltonian (the "control term"). An experimental realization was already made via some external antennas, in a simple machine. The goal here is to extend this method to more general cases, (ex: dissipative dynamics).

The "Hamiltonian Perturbation" problem is a point of view dual to the preceding one, where we don't want (or we can't) modify the system. Instead we search for the "optimal canonical transformation" of the perturbed system which builds a deformation of the simple properties of the unperturbed system.

This Master project consists in an introduction to this framework, and a construction of a new example. In case of a Master2 project, an extension into a PhD thesis is possible.

References:

Michel Vittot: "Perturbation theory and control in classical or quantum mechanics by an inversion formula", J. Phys. A: Math. Gen. 37 (2004) p 6337-6357. Archived on ArXiv/math-ph/0303051