

Master-2 internship proposal

**Lab: Centre de Physique Theorique (CPT), UMR 7332, Aix-Marseille
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Research team: E7: " Systèmes dynamiques: théorie et applications"

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Level (M1, M2 or both): M2

Group Size: This is part 3 of a group of 3 separated subjects (somewhat related), for 1 student.

Project title:

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

Abstract:

The "Hamiltonian Control" problem is 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. A new route is to extend this method to the general (dissipative) case. 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 Master2 project consists in a short introduction to this framework. And it can eventually be continued into a PhD thesis.

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
