

Controllability of Quantum Ensembles

Ugo Boscain* - Mario Sigalotti

* CMAP, Ecole Polytechnique, Paris, France

boscain@cmap.polytechnique.fr

Abstract: In this talk we will review the use of adiabatic techniques to obtain a population transfer from a level to another one. We will discuss the case in which there are at least two controls and there are conical intersection in the space of controls. In the finite dimensional case, we will discuss how the presence of level that are connected by conical intersections permits to prove that the system is Lie bracket generated and hence controllable. In the infinite dimensional case this condition yields to approximate controllability. We will finally describe some preliminary results about how in the finite dimensional case, the presence of conical singularities permits to make ensemble controllability, This properties is of crucial interest in NMR.

[1] U. Boscain, J.P. Gauthier, F. Rossi, M. Sigalotti, Approximate controllability, exact controllability, and conical eigenvalue intersections for quantum mechanical systems. Communications in Mathematical Physics November 2014;

[2] U. Boscain, F. Chittaro, P. Mason, M. Sigalotti, Adiabatic control of the Schroedinger equation via conical intersections of the eigenvalues. IEEE Transactions on Automatic Control, Volume: 57, Issue: 8, pp. 1970 - 1983, 2012.