Joint CQSE and CASTS Seminar

Aug. 19, 2011 (Friday)

TIME Aug. 19, 14:30
TITLE Optimal Control of Atoms and Molecules:
Concepts, Theories, and Computational Methods
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Abstract

Quantum optimal control is concerned with finding optimal control fields to actively manipulate the dynamics of quantum systems. In the past two decades, extensive theoretical and experimental studies have been made on control of dynamics at the atomic and molecular scale. Experimental evidence and numerous simulations showed that effective quantum controls in diverse applications appear surprisingly easy to find. Underlying reason for this attractive behavior is presented based on recent work on quantum control landscapes, especially through examination of topology at control landscape critical points, where landscape slopes (gradients) are zero. For controllable quantum systems, the critical points of the control landscape correspond to global maximum/minimum and local saddle points (or traps). Furthermore, computational methods, based on local control theory in the context of time-dependent dynamical invariants, for solving quantum control problems are outlined. Finally, we show several control simulation results, discuss possible applications of quantum optimal control methods in various interesting physical processes, and address some open issues on the fundamentals of quantum control problems.