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Topology of the landscape of optimally controlled transitions in a multilevel system

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Abstract :

A model for selectively exciting a specific quantum level of a multilevel system was developed at the NLC. This model utilizes adaptive feedback control and beam shaping to optimize the population within a specific vibrational level in the system. The control of quantum phenomena is an active field of research. This study will concentrate on studying the structure of the control landscape of this particular problem. Knowledge of the topology of the control landscape is important because it could allow the finding of fast and robust optimization methods. This would be especially important for experimental workAccording to a theoretical analysis [1] the control landscape of many quantum control problems has a very favorable topology regardless of the detailed nature of the Hamiltonian, provided that one has full control of the system. It is obvious that full control is not possible in a practical experiment and this study will investigate the influence of experimental and other limitations on the control landscape. Depending on the outcome of the investigation the applicability of various optimization techniques will be investigated. In particular gradient based optimization techniques will be investigated and their results will be compared with that obtained by the more traditional (in the sense of quantum control schemes) genetic type optimization techniques.

Award :

Yes

Level :

MSc

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Paper :

No

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