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Inhomogeneous Quantum Annealing

In this work, we develop a programmable approach to non-adiabatic quantum annealing. Specifically, we demonstrate how one can engineer quantum phase transitions via constructing spatially inhomogeneous control Hamiltonians. We numerically investigate the optimal conditions for suppression of topological defects during quantum critical dynamics. We show that our algorithm can significantly outperform conventional schemes, such as standard (homogeneous) adiabatic quantum annealing and simulated annealing, for sampling low-energy states of quasi-1D Hamiltonian systems.