Abstract Submitted
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Bang-Bang shortcut to adiabaticity in trapped ion quantum simulators[1] BRYCE YOSHIMURA, Georgetown University, SHANKAR BALASUBRAMANIAN, Massachusetts Institute of Technology, SHUYANG HAN, JAMES FREERICKS, Georgetown University — An experimental simulation can prepare a nontrivial ground state via an adiabatic process, however due to experimental constraints this process becomes more and more difficult as the number of ions increase. Instead, we model the bang-bang optimization protocol as a shortcut to adiabaticity in the ground-state preparation of an ion-trap-based quantum simulator. This well known technique in the quantum control community is simple to implement and can be applied without prior knowledge of the Hamiltonian. We apply the bang-bang optimization protocol to the transverse-field Ising model as simulated in a linear Paul trap. We compare our results to a transverse magnetic field that exponential decays and the locally adiabatic approach. The bang-bang protocol produces a significantly higher ground-state probability than the exponential ramp. Although the bang-bang protocol produces a somewhat lower ground-state probability than the locally adiabatic approach, the implementation of the bang-bang protocol is far more simple than the locally adiabatic approach.

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