

Speedup in Quantum Adiabatic Evolution Algorithm

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The quantum adiabatic evolution algorithm suggested by Farhi et al. was effective in solving NP-complete problems. The algorithm is governed by the adiabatic theorem. Therefore, in order to reduce the running time, it is essential to examine the minimum energy gap between the ground level and the next one in the evolution. In this paper we show a way of speedup in the quantum adiabatic evolution algorithm, using an extended Hamiltonian. We present the exact relation between the energy gap and the elements of the extended Hamiltonian, which provides a new point of view to reduce the running time.

Key words: Quantum Computation; Quantum Search; Quantum Adiabatic Evolution.