Symplectic speed-up of adiabatic quantum computation

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In adiabatic quantum computation, the Hamiltonian is continuously deformed to drive the system from a trivial quantum state to a complex quantum state of interest. The efficiency and speed of adiabatic quantum computation is, however, very sensitive to the structure of avoided level crossings.

Many times, the states of interest are generated as the ground state of a system with time reversal invariance, belonging to the orthogonal class of Hamiltonians. We study how unitary and symplectic deformations of the Hamiltonian change the speed of adiabatic quantum computation. In particular, we show on the example of Ising systems, that the speed of quantum computation can be increased by orders of magnitude using unitary or symplectic deformations.