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Bifurcation-based adiabatic quantum computation with a nonlinear oscillator network HAYATO GOTO, Toshiba Corporation — The dynamics of nonlinear systems qualitatively change depending on their parameters, which is called bifurcation. A quantum-mechanical nonlinear oscillator can yield a quantum superposition of two oscillation states, known as a Schrödinger cat state, via its bifurcation with a slowly varying parameter. Here we propose a quantum computer comprising such quantum nonlinear oscillators, instead of quantum bits, to solve hard combinatorial optimization problems. The nonlinear oscillator network finds optimal solutions via quantum adiabatic evolution, where nonlinear terms are increased slowly, in contrast to conventional adiabatic quantum computation or quantum annealing. To distinguish them, we refer to the present approach as bifurcation-based adiabatic quantum computation. Our numerical simulation results suggest that quantum superposition and quantum fluctuation work effectively to find optimal solutions.

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