MAR16-2015-001831

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Mean-field analysis of quantum annealing with XX-type terms

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I analyze the role of XX-type terms in quantum annealing for a few mean-field systems including the Ising ferromagnet and the Hopfield model, both with many-body interactions. The XX-type terms are shown to be effective to remove first-order quantum phase transitions, which exist in the conventional implementation of quantum annealing using only transverse fields. This means an exponential increase in efficiency, and is suggestive for the design of quantum annealers. I will discuss how and why this phenomenon emerges and what may happen on realistic finite-dimensional lattices.

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