

Abstract Submitted
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Simulating highly nonlocal Hamiltonians with less nonlocal Hamiltonians¹ YIGIT SUBASI, CHRISTOPHER JARZYNSKI, University of Maryland at College Park — The need for Hamiltonians with many-body interactions arises in various applications of quantum computing. However, interactions beyond two-body are difficult to realize experimentally. Perturbative gadgets were introduced to obtain arbitrary many-body effective interactions using Hamiltonians with two-body interactions only. Although valid for arbitrary k -body interactions, their use is limited to small k because the strength of interaction is k 'th order in perturbation theory. Here we develop a nonperturbative technique for obtaining effective k -body interactions using Hamiltonians consisting of at most l -body interactions with $l < k$. This technique works best for Hamiltonians with a few interactions with very large k and can be used together with perturbative gadgets to embed Hamiltonians of considerable complexity in proper subspaces of two-local Hamiltonians. We describe how our technique can be implemented in a hybrid (gate-based and adiabatic) as well as solely adiabatic quantum computing scheme.

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