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Divide and Conquer Approach to Quantum Hamiltonian Simulation STUART HADFIELD, ANARGYROS PAPAGEORGIOU, Columbia Univ —
The difficulty of simulating quantum mechanical systems is a primary motivation for the development of quantum computers. Quantum simulation has important applications to problems in physics and chemistry. We show a novel divide and conquer approach for simulating Hamiltonian dynamics. We can obtain fast simulation algorithms using Hamiltonian structure. Considering a sum of Hamiltonians we split them into groups, simulate each group separately, and combine the partial results. Simulation is customized to take advantage of the properties of each group, and hence yield refined bounds to the overall simulation cost. We illustrate our results using the electronic structure problem of quantum chemistry.

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