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Hamiltonian Simulation Using Linear Combinations of Unitary Operations NATHAN WIEBE, ANDREW CHILDS, University of Waterloo — We present a new approach to simulating Hamiltonian dynamics based on implementing linear combinations of unitary operations rather than products of unitary operations. The resulting algorithm has superior performance to existing simulation algorithms based on product formulas and, most notably, scales better with the simulation error than any known Hamiltonian simulation technique. Our main tool is a general method to nearly deterministically implement linear combinations of similar unitary operations, which we show is optimal among a large class of methods.

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