

Parallel time-dependent variational principle algorithm for matrix product states

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Combining the time-dependent variational principle (TDVP) algorithm with the parallelization scheme introduced by Stoudenmire and White for the density matrix renormalization group (DMRG), we present the first parallel matrix product state (MPS) algorithm capable of time evolving one-dimensional (1D) quantum lattice systems with long-range interactions. We benchmark the accuracy and performance of the algorithm by simulating quenches in the long-range Ising and XY models. We show that our code scales well up to 32 processes, with parallel efficiencies as high as 86%.

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