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Matrix product states for anyonic systems and efficient simulation of dynamics[1] SUKHBINDER SINGH, Macquarie University, ROBERT PFEIFER, GUIFRE VIDAL, Perimeter Institute for Theoretical Physics, GAVIN BRENNEN, Macquarie University — Anyons are exotic quasiparticles that exhibit non-trivial exchange statistics and arise as low lying excitations of topological phases of matter. Many-body systems of anyons offer a realm of new physics to explore that depends on their topological properties. The formalism of Matrix Product States [1] (MPS) has led to significant advances in the study of quantum many-body systems with local degrees of freedom such as spins or bosons. The MPS also forms the basis of the highly successful "time-evolving block decimation" [2] (TEBD) algorithm, which can be used to efficiently simulate dynamics of 1D systems. I will describe how to extend the MPS formalism and the TEBD algorithm to study lattice systems of anyons, which carry non-local degrees of freedom. I will also present supporting simulation results for chains of interacting anyons, including results for an anyonic Hubbard-type model [3] that give insight into the transport properties of anyons.

[1] S. Ostlund & S. Rommer, PRL 75, 3537 (1995)
[2] G. Vidal, PRL 91, 147902 (2003)
[3] L. Lehman, V. Zatloukal, et al. PRL 106, 230404 (2011)

[1]Based on S. Singh, R.N.C. Pfeifer, G. Vidal & G. Brennen, arXiv:1311.0967.

Sukhbinder Singh
Macquarie University

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