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Non-Markovian dynamics on one-dimensional quantum lattices MICHAEL ZWOLAK[1], California Institute of Technology — Recently ideas from Quantum Information have sparked a number of advances in the simulation of interacting quantum lattice systems. Vidal first proposed a method, dubbed the Time Evolving Block Decimation (TEBD) algorithm, to simulate real-time dynamics of pure states on one-dimensional lattices. [1] Subsequently this method was extended to the simulation of mixed states, including real-time dynamics governed by a Markovian master equation and construction of thermal states. [2] These methods scale linearly in the system size, enabling relatively large lattices to be studied. We present a more general extension of the TEBD algorithm which allows one to simulate non-Markovian master equations within the Born approximation. This method scales quadratically with the system size. We demonstrate the method with examples of spins and fermions. We also discuss applications to systems driven out of equilibrium by external reservoirs. [1] G. Vidal, Phys. Rev. Lett. 91, 147902 (2003); 93, 040502 (2004). [2] M. Zwolak, G. Vidal, Phys. Rev. Lett. 93, 207205 (2004).

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