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Time-dependent DMRG studies of strongly correlated systems out of equilibrium

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The recent development of time-dependent density-matrix renormalization group (tDMRG) has opened the door for studying several interesting problems that involve the nonequilibrium real-time dynamics of strongly interacting 1D lattice models [1]. We describe briefly one tDMRG approach, the Suzuki-Trotter algorithm. Then we discuss applying tDMRG to study the conductance of strongly correlated nanostructures [2] and describe a method to mitigate finite-size effects which may arise in such studies [3]. We present a few examples including quantum dots in the Kondo regime, and dielectric breakdown of a Mott insulator. Another class of problems involves the time-evolution of excitations in cold atoms and strongly interacting electronic materials. We present the results of a tDMRG study of an electron-hole pair in a 1D Mott insulator [4]. We finally present other possible applications and future directions.

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