On adaptive time-dependent DMRG based on Trotter decompositions
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The integration of concepts from quantum information theory into DMRG has recently allowed the extension of DMRG to high-precision calculations of the time evolution of one-dimensional strongly correlated quantum systems at low algorithmic cost. The key idea is that the reduced Hilbert space of DMRG does not remain static or is extended in time at high algorithmic cost, but adapts itself optimally to the quantum state evolving in time. The adaptation strategy I will present is based on Trotter-decomposing infinitesimal global time-evolutions into local time evolutions that are exact. I want to discuss the potential of this new method presenting an error analysis on the Trotter and DMRG truncation errors in this approach and various applications from magnetism far from equilibrium and ultracold atoms (cf. cond-mat/0403313, 0409692, 0411403) and discuss future areas of application.