Density Matrix Renormalization Group applied to Open Quantum Systems

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Upon recent advances on the Density Matrix Renormalization Group (DMRG) algorithm, which offers basically a variational approach over finding a certain systems ground-state related Hamiltonian, its importance to open quantum systems have become even more evident. On this particular field, the advent of the DMRG-related techniques makes it possible to bypass the characteristic highly non-local entanglement problems that have been posing an obstacle to other variational methods until now.

The DMRG allows the numerical study of arbitrarily extensive systems in a rather optimized, clean matter, by finding an approximate wave function of the ground state by gradually increasing the chain and truncating the Hilbert space over the density matrix values.

This new perspective on the field will be used in the study of unidimensional chains attached to different reservoirs, which figures an interesting model to be studied in transport phenomenon field, as the temperature difference between the reservoirs and the constituents of the chain both attain for the heat flowing through the chain, favoring the deepening of knowledge on these quantum transport problems. In particular, the XXZ spin chain shall be studied, in order to grasp the role played by both the energy gap related to this system as well as the magnons propagation.