SFB/TRR 21 - Colloquium

6. Juni 2014, Ulm

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Noisy quantum cellular automata for the study of quantum vs classical transfer processes

After a brief overview of previous work on quantum cellular automaton models, we introduce a class of noisy cellular automata on a qubit lattice that includes all classical Markov chains, as well as maps where quantum coherence between sites is allowed to build up over time. We apply such a construction to the problem of excitation transfer through 1d lattices, and compare the performance of classical and quantum dynamics with equal local transition probabilities. Our discrete approach has the merits of stripping down the complications of the open system dynamics, of clearly isolating coherent effects and of allowing for an exact treatment of conditional dynamics, all while capturing a rich variety of dynamical behaviours. Further, we report on preliminary results concerning the transfer of quantum information along our discrete models in 1 dimension.

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