Minisymposium 23 - Mathematische Physik und Informationstheorie

Universal simulation of quantum Turing machines by cellular automata

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The cellular automaton model of computation is of interest for quantum information as it is close to practical implementations in optical lattices. In this talk, we consider the computational power of the quantum cellular automaton (QCA) and show, how a given quantum Turing machine can be turned into a QCA and vice versa, utilizing the partitioning theorem for one-dimensional QCAs. As a corollary we will show that every quantum Turing machine can be simulated by a Turing machine with deterministic head position.