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The Space-Time Circuit-to-Hamiltonian Construction and Its Applications

BARBARA TERHAL, RWTH - Aachen

We discuss how the dynamics of a D-dimensional quantum circuit can be captured in the ground-state of a D+1-dimensional space-time Hamiltonian. The action of this Hamiltonian restricted to space-like surfaces (as given by the causal structure of the quantum circuit) is again D-dimensional and fully captures the interaction structure of the original quantum circuit. We show how one can use this construction for D=1 to do universal adiabatic computation using a 2D interacting particle Hamiltonian.