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Understanding errors in digital quantum simulation of fermionic systems JAN-MICHAEL REINER, SEBASTIAN ZANKER, IRIS SCHWENK, JUHA LEPPÄKANGAS, MICHAEL MARTHALER, Karlsruhe Institute of Technology — The simulation of complex fermionic systems is one of the most anticipated applications of quantum computing. Various properties of such systems can be described by time-dependent correlation functions of two fermionic operators. Fermions can be mapped onto qubits, e.g., via the Jordan-Wigner transformation. We discuss how (anti-)time sorted correlation functions can be measured in the qubit system. Deploying Keldish formalism, we investigate the effects of relaxation, and dephasing of the qubits, as well as gate errors in an quantum algorithm using the Trotter expansion. We analyze how this translates to a simulated fermionic system, allowing for qualitative understanding of errors of a quantum simulation.

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