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Gauge redundancy as approximate error correction codes for quantum simulations

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In the quantum simulation of lattice gauge theories, gauge symmetry can be either fixed or encoded as a redundancy of the digitized Hilbert space. While fixing the gauge saves the number of qubits to digitize the Hilbert space, keeping the gauge redundancy can provide space to mitigate and correct certain quantum errors by checking and restoring Gauss's law. In this talk, we treat the gauge redundancy as approximate error correction codes. I will present the correctable errors for generic finite groups and the quantum circuits to detect them, and discuss the condition when keeping the gauge redundancy is preferable to fixing it.

Topical area

Quantum Computing and Quantum Information

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