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Canonical Momenta in Digitized SU(2) Lattice Gauge Theory

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Hamiltonian simulations of quantum systems require a finite-dimensional representation of the operators acting on the Hilbert space. Here we present a discretization scheme for gauge links and canonical momenta of an SU(2) gauge theory which offers the possibility to freely refine the discretisation. This is achieved by discretising SU(2) and constructing the canonical momentum using the finite element method while the matrix representation of the gauge links is diagonal. We show that the fundamental commutation relations are fulfilled up to discretisation artefacts and the spectrum of the Hamiltonian is reproduced.

Topical area

Quantum Computing and Quantum Information

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