

Quantum Physics

Simplifying quantum double Hamiltonians using perturbative gadgets

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Perturbative gadgets were originally introduced to generate effective k-local interactions in the low-energy sector of a 2-local Hamiltonian. Extending this idea, we present gadgets which are specifically suited for realizing Hamiltonians exhibiting non-abelian anyonic excitations. At the core of our construction is a perturbative analysis of a widely used hopping-term Hamiltonian. We show that in the low-energy limit, this Hamiltonian can be approximated by a certain ordered product of operators. In particular, this provides a simplified realization of Kitaev's quantum double Hamiltonians.

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