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Renormalization group and classification of anyons as projection

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The projection and projective representation play a fundamental role in constructing and calculating models in physics. These techniques, combined with the analysis of entanglement and related variational techniques, resulted in various numerical techniques for realizing and analyzing renormalization group (RG) flows or quantum phase transitions.

In this presentation, we introduce a rigorous quantum Hamiltonian formalism realizing massless RG as a projection. More precisely, we treat generalized symmetry of a physical system as an algebra or ring in mathematics, and formulate its reduction to the quotient rings by its ideals. This classification of rings also provides the corresponding classification of anyons in one higher space-time dimension. Our research clarifies the algebraic aspect of RG (or projective representation of RGs), and we expect that our proposal will be realized in numerical methods using tensor-network calculations.

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