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Towards topological quantum computer

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One of the principal obstacles on the way to quantum computers is the lack of distinguished basis in the space of unitary evolutions and thus the lack of the commonly accepted set of basic operations (universal gates). A natural choice, however, is at hand: it is provided by the quantum R-matrices, the entangling deformations of non-entangling (classical) permutations, distinguished from the points of view of group theory, integrable systems and modern theory of non-perturbative calculations in quantum field and string theory. Observables in this case are (square modules of) the knot polynomials, and their pronounced integrality properties could provide a key to error correction. We suggest to use R-matrices acting in the space of irreducible representations, which are unitary for the real-valued couplings in Chern-Simons theory, to build a topological version of quantum computing.

Topic:

Topic: Quantum Physics, Quantum Optics and Quantum Information

Summary

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