QUANTUM MANY-BODY DYNAMICS BY RECURSION METHOD: RECENT DEVELOPMENTS AND PROSPECTS

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Recursion method is a technique to solve coupled Heisenberg equations in a tridiagonal operator basis constructed via Lanczos algorithm [1]. We report an implementation of the recursion method that addresses quantum many-body dynamics in the nonperturbative regime. The implementation has three key ingredients: a computer-algebraic routine for symbolic calculation of nested commutators [2], a procedure to extrapolate the sequence of Lanczos coefficients according to the universal operator growth hypothesis [3] and a large time asymptotic expansion. We apply the method to calculate infinite-temperature correlation functions for spin-1/2 systems on one- and two-dimensional lattices [2]. The method allows one to accurately calculate transport coefficients. As an illustration, we compute the diffusion constant for the transverse-field Ising model on a square lattice [2]. The work is supported by the Russian Science Foundation under the grant No. 24-22-00331.

References

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