THE NUMERICALLY GENERATED SERIES EXPANSIONS FOR LATTICE-SPIN SYSTEMS

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9.7 cm

The numerically generated series expansions complementary to widely used computer simulations of the Monte Carlo type, are presented. The effective algorithms for generation of graphs, which constitute the basis of series expansions for lattice-spin systems, are introduced. These algorithms are used to calculate the partition function (and then the free energy and other thermodynamic functions) for a given lattice-spin model. The calculation of magnetic susceptibility using a larger class of graphs is also explained. The advantage of the series expansion technique is demonstrated within the framework of the extended effective-field method [1] for a two-dimensional Ising model on the square lattice. As the series expansions allow inclusion of correlations into the mean-field renormalization group method, a simple scheme can be developed to obtain good estimates of the critical coupling and nonclassical critical exponents of a given model.
[1] G. Kamieniarz, R. Dekeyser, G. Musiał, L. Dębski, M. Bieliński, Phys. Rev. **E56**, 144 (1997)

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