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Precise estimate of correlation length exponents from simple real-space renormalization group analysis ALEKSANDER KUBICA, BENI YOSHIDA, California Institute of Technology — We invent a novel real-space renormalization group (RG) scheme which accurately estimates correlation length exponents ν near criticality of quantum Ising and clock models in higher dimensions. The method, based on a recent proposal by Miyazaki et al., Phys. Rev. E 83, 051103 (2011), is remarkably simple (often analytical), grouping only a few spins into a block spin so that renormalized Hamiltonian has a closed form. A previous difficulty of spatial anisotropy and unwanted terms arising in higher-dimensional RG schemes is avoided by incorporating rotational invariance and internal Z_q symmetries of the Hamiltonian. By applying this scheme to (2+1)-dim Ising model on a triangular lattice, we obtained $\nu = 0.6300$ which is within statistical error of the current best Monte-Carlo result and ϕ^4 theory estimation with seven-loop corrections. We also apply the scheme to higher-dimensional clock (Potts) models for which ordinary Monte-Carlo methods are not efficient due to suppression of quantum fluctuation in first-order phase transition.

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