Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Coarse-graining renormalization by higher-order singular value decomposition ZHIYUAN XIE, JING CHEN, MINGPU QIN, Institute of Physics, Chinese Academy of Sciences, JINWEI ZHU, Institute of Computational Mathematics and Scientific/Engineering Computing, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, LIPING YANG, Beijing Computational Science Research Center, Beijing, TAO XIANG, Institute of Physics, Chinese Academy of Sciences, and Institute of Theoretical Physics, Chinese Academy of Sciences —
We propose a novel coarse graining tensor renormalization group method based on the higher-order singular value decomposition. This method provides an accurate but low computational cost technique for studying both classical and quantum lattice models in two- or three-dimensions. We have demonstrated this method using the Ising model on the square and cubic lattices. By keeping up to 16 bond basis states, we obtain by far the most accurate numerical renormalization group results for the 3D Ising model. We have also applied the method to study the ground state as well as finite temperature properties for the two-dimensional quantum transverse Ising model and obtain the results which are consistent with published data.

Zhiyuan Xie
Institute of Physics, Chinese Academy of Sciences

Date submitted: 02 Nov 2012 Electronic form version 1.4