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Variational approach for 1D antiferromagnetic Heisenberg chain with matrix-product states YING-JER KAO, National Taiwan University, LING WANG, ANDERS SANDVIK, Boston University — In order to explore the practical applicability of variational Monte Carlo simulations based on matrix-product states (MPS) [1], we present two implementations for the one-dimensional antiferromagnetic Heisenberg model with periodic boundary conditions [2]. We compare the convergence properties of two different schemes, which use either two sets of matrices corresponding to the two sublattices, or a 2-spin block representation. It is found that the use of symmetries considerably speeds up the convergence with the matrix size D. We also present an efficient "cooling" schedule for the stochastic method used to optimize the matrices, which significantly reduces the computational effort. Finally, we will discuss application of the scheme to n-leg ladders with periodic boundary condition.
[1] A. W. Sandvik and G. Vidal, arXiv:0708.2232.
[2] Y.-J. Kao, L. Wang, and A. W. Sandvik (unpublished)

Ying-Jer Kao
National Taiwan University

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