Renormalization of tensor-network states

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In this talk, I will give an introduction to a numerical method for calculating accurately physical quantities of the ground state using the tensor network wave function in two dimensions. The tensor network wave function is determined by an iterative entanglement projection approach which uses the Trotter-Suzuki decomposition formula of quantum operators and the singular value decomposition of matrix. The expectation values of physical observables are evaluated by a second renormalization group method of tensors. Our method allows a tensor network wave function with a high bond degree of freedom to be handled accurately and efficiently in the thermodynamic limit. It provides a powerful numerical tool for studying strongly correlated quantum models in two dimensions. We have applied the method to the spin 1 Heisenberg model with biquadratic interactions. The phase diagram of this model is discussed.