Local spin exchange dynamics in random networks and graph partitioning

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We considered an equilibrium local spin exchange dynamics for the Ising model on random networks that conserves total magnetization. At low temperatures the dynamics was found not to thermalize due to the trapping of the system in particular regions of the phase space. The ground state corresponds to network partitions with a minimal number of cut edges for a given size of the cut networks, corresponding to the total magnetization value. Parallel Tempering simulations enabled us to restore thermalization and to obtain the minimum partition cost of graph partitioning from the low temperature simulations. We considered both regular random networks and Erdos Renyi networks. For the later we related the partition of the full network with a partition of the percolating cluster at nonzero magnetization. The results obtained are in good agreement with known previous results for the graph partitioning problem.