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Implications of lack-of-ergodicity in 2D Potts model SMITA OTA, None — Microcanonical Monte Carlo simulation is used to study two dimensional (2D) q state Potts model. We consider a 2D square lattice having NxN spins with periodic boundary condition and simulated the system with N=15 and q=10. The demon energy distribution is found to be exponential for high system energy and large system size. For smaller system size and above the first order transition the demon energy distribution is found to deviate from exp(-βE$_D$) and has the form exp(-βE$_D$ + γE$_D^2$). Here β =1/k$_B$T and k$_B$ is the Boltzmann constant. It is found that γ is finite at higher temperatures. As the system energy is reduced γ becomes zero near the first order transition. It is found that during cooling γ changes sign from negative to positive and then to negative again near the 1^{st} order transition. Therefore the demon energy distribution becomes exp(-βE$_D$) (or ergodic) at two values of system energy near the 1^{st} order transition. Further cooling or at still lower temperatures the system shows lack of ergodicity. However, difference in heating cooling curves are apparent in E vs γ. The system energies for which γ is zero during cooling can represent the 'ergodic' states. This can be related to the two-level systems observed in glasses at low temperatures.

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