Critical behavior of Potts model with long range interactions

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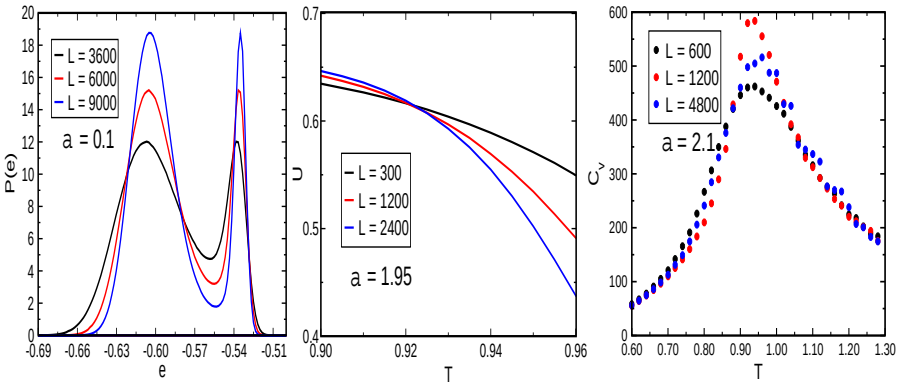
Long range interactions are one of the major ingredients of many forces in physics. Any local change can be rapidly manifested on the whole system. This becomes an important observation in critical systems, where fluctations lead to phase changes. In this work, We present a numerical study of q=3 Potts model on generalized Small World networks whose long-range links have a power-law length distribution $P(l)$ $l^($ $-$ $alpha)$ (1). When the system has a large number of those long range links, the system behaves like a high dimensional lattice whereas if the number is small, it is one-dimensional. By using Monte Carlo techniques, we measure latent heats and Binder's cumulants, as function of alpha. We find that when α is smaller than a critical value α_1, the magnetic transition is of first order, when α is between (α_1,α_2), the transition is of second order and when $\alpha > \alpha_2$, there not a critical transition. The figure below summarizes some of our findings.



[1] C. Moukarzel, Physica A, **356** 157 (2005).