Dynamics of the Ising model on lattices in the hyperbolic plane[1]

HOWARD L. RICHARDS, Marshall Univ — Over the past few years, students at the REU in computational physics at Marshall University have studied the dynamics of the Ising model on lattices in the hyperbolic plane, in particular metastable decay and domain coarsening. In both cases the dynamics are slower than on the corresponding Euclidean lattices. The Ising model with short-ranged interactions on a regular lattice has a spinodal in the hyperbolic plane – meaning that below a nonvanishing magnetic field, the time required for an infinite system to experience metastable decay diverges; in the Euclidean plane this divergence only happens at zero magnetic field. In domain coarsening, feature size grows as $t^{0.13}$ in the hyperbolic plane, but as $t^{1/3}$ in the Euclidean plane. The former result can be explained quantitatively and the latter qualitatively in terms of the differences between hyperbolic and Euclidean circles.

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