

Phase transition in loop percolation

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Abstract:

We study properties of clusters formed by a Poisson ensemble of Markovian loops on Z^d ($d \geq 3$). The intensity measure of the ensemble is proportional to a parameter α which measures the amount of loops entering the picture. First, we observe a non-trivial percolation phase transition with respect to α . Then, we focus on the tails of the distributions of the diameter and the size of clusters in the subcritical regime, which decay at most polynomially through the whole domain. We show that for $d \geq 5$, if the cluster of the origin is large, then it will typically contain very close to the origin a loop comparable in diameter and in size with the whole cluster. On the other hand, for the dimensions 3 and 4, if the cluster of the origin is large, then typically, there are no large loops near the origin. This phenomenon affects values of various critical exponents: they do not depend on α if the dimension is at least 5, but do depend on α if the dimension is 3. We conclude with some open questions. *Joint work with Yinshan Chang (MPI Leipzig).*