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The time constant and critical probabilities in percolation models

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Abstract

We consider a first-passage percolation (FPP) model on a Delaunay triangulation D of the plane. In this model each edge e of D is independently equipped with a nonnegative random variable, with distribution function F, which is interpreted as the time it takes to traverse the edge. Vahidi-Asl and Wierman (1990) have shown that, under a suitable moment condition on F, the minimum time taken to reach a point at distance n from the origin is asymptotically m(F)n, where m(F) is a nonnegative finite constant (the time constant). However, its exact value still a fundamental problem in percolation theory. Here we prove that if $F(0) < 1-p'_c$ then $m(F)>0$, where p'_c is a critical probability for bond percolation on the dual graph D'.

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