

Problems in first-passage percolation.

3: Order of fluctuations

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We discuss variance and concentration bounds for first passage percolation on \mathbb{Z}^d . It is expected based on simulations and arguments from physics that the order of the fluctuations of the passage time to distance N in dimensions 2 and higher is much smaller than for an i.i.d. sum of length N . In fact, in dimension 2, analogies with exactly solvable last passage percolation models have led to the conjecture that the variance should grow according to the “KPZ exponent $2/3$ ”. The mechanism for this low variance is poorly understood, and at present the best one can do is to show that the variance grows like $N/\log N$ at most. This is a result of Benjamini-Kalai-Schramm in the Bernoulli disorder case, with later generalizations by Benaim-Rossignol, as well as Damron, Hanson and myself. In this talk I will review known results on the fluctuations of first passage percolation models and the techniques used to obtain corresponding concentration bounds.

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