STANFORD PROBABILITY SEMINAR

Illya Targoniy, Stanford
Monday, 23 May 2005
4:15pm (Refreshments at 4pm in the 1st Floor Lounge)
Sequoia Hall, Room 200

Principles of Random Walk on Lattices Z^d with Absorption Points with Application to Laplacian Self-Avoiding Random Walk

Abstract. In the best traditions of Frank Spitzer's famous "Principles of Random Walks" book, we develop authentic theory of random walks on the lattices Z^d with absorption points - once random walk gets into such a point, it stays there for the rest of the time. The authenticity comes since with this theory we are able to calculate any transition probability and generation function for any positioning and number of absorbing points on a lattice via the known respective values of symmetric random walk on regular lattice.

We demonstrate then one of the applications of those principles to the Laplacian self-avoiding random walk defined and studied by Gregory Lawler. Specifically, we consider process's behavior in the initial and infinitely large moments of time and compare it with the usual "myopic" self-avoiding random walk process. We show that the behavior of those two processes differs in their initial steps (this comes from the fact that opposite to the usual "myopic" SAW, a Laplcian -SAW cares about its future), but is similar after sufficiently large number of steps.

The latter fact is important - it follows that the second moment of Laplacian self-avoiding random walks is the same as of the usual SAW when the number of steps goes to infinity. So, here comes the advantage of the Laplacian SAW. It is not easy to simulate the paths of usual SAW, since the ratio of such non-intersecting trajectories to all possible is extremely low, thus to get the non-intersecting path is an extremely rare event. Whereas simulating Laplacian-SAW is relatively easy - we obtain its trajectories on the grid by simulating a simple symmetric random walk by Monte Carlo method. Then, by appropriate weighting through the evaluated transition probabilities of any such path, we can estimate the second moment of Laplacian self-avoiding random walk, that is similar to the usual self-avoiding walk.