

A Deterministic Random Walk on the Integers

Joshua Cooper
ETH - Zurich

Thursday, February 9, 2006
L01 Carson Hall, 4:00 pm
(Tea 3:30 pm Math Lounge)

Abstract

Jim Propp's P -machine, also known as the 'rotor-router model' is a simple deterministic process that simulates a random walk on a graph. Instead of distributing chips to randomly chosen neighbors, it serves the neighbors in a fixed order.

We investigate how well this process simulates a random walk. For the graph being the infinite path, we show that, independent of the starting configuration, at each time and on each vertex, the number of chips on this vertex deviates from the expected number of chips in the random walk model by at most a constant c_1 , which is approximately 2.29. For intervals of length L , this improves to a difference of $O(\log L)$, for the L_2 average of a contiguous set of intervals even to $O(\sqrt{\log L})$.

Joint work with Benjamin Doerr, Joel Spencer, and Gabor Tardos.