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Second moment estimates for the growth exponent of planar loop-erased random walk

The loop-erased random walk $\widehat{S}^n$ is the process obtained by running a random walk in Z^d from the origin to the first exit time of the ball of radius n and then chronologically erasing its loops. If we let M_n denote the number of steps of $\widehat{S}^n$ then the growth exponent α is defined to be such that $E[M_n]$ grows like n^α. The value of α depends on the dimension d. In this talk we'll focus on $d = 2$ where it's been shown that $\alpha = 5/4$. We will establish a second moment result and use it to get estimates for the probability that M_n is close to its mean. Namely, we show that there exists $0 < p < 1$ such that for all n and λ large, $P(M_n < \lambda^{-1}E[M_n]) < p^{\lambda^{1/6}}$.

This is joint work with Martin Barlow.