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Localization and pinning for directed polymers

We shall present few results (joint with Yu. Bakhtin) on localization for directed polymers. Directed polymers can be considered as random walks in random potential. They play important role in analysis of parabolic Anderson model and random forced Burgers equation.

We are mostly interested in the case when the random potential has the product structure. Namely, it is given by the product of two terms. The first one is a space-dependent potential, while the second is the white noise in time. We show that corresponding polymers are localized provided that the spatial part of the potential has a large maximum (or minimum). We also consider the case when the spatial potential is a stationary process. In this case we show that polymers at zero temperature (action-optimizing paths) has strong pinning properties. We calculate critical exponents for the optimal action fluctuations and for transversal fluctuations of optimal paths. We also show that probability distribution for normalized optimal action fluctuations converges to the universal limit as $t \to \infty$.