Annealed and Quenched IP for Random Walk in Dynamic Markovian Environment

Antar Bandyopadhyay

Abstract

In this talk we will consider a model, introduced first by Boldrighini, Minlos and Pellegrinotti (1997, 2000) of discrete time random walks in dynamical random environments on the integer lattice $\mathbb{Z}^d$ with $d \geq 1$. In this model, the environment changes over time in a Markovian manner, independently across sites, while the walker uses the environment at its current location in order to make the next transition. Boldrighini, Minlos and Pellegrinotti (2000) used cluster expansions approach to establish quenched CLT when dimension $d \geq 3$. In an earlier work (2006) jointly with Ofer Zeitouni we gave a probabilistic argument based on regeneration times, and proved annealed SLLN and invariance principle (IP) for any dimension, and provide a quenched IP for dimension $d > 7$, which provided for $d > 7$ an alternative to the analytical approach of the earlier works, with the added benefit that it was valid under weaker assumptions. In this work we propose a different "regeneration time" which is more intuitive and can prove all the results (annealed SLLN, annealed and quenched IP) in any dimension $d \geq 1$ under the same weaker assumptions. In particular this provides new results for dimensions $d = 1$ and $d = 2$ when the environment chain is a non-trivial Markov chain.

In this talk we will discuss in detail the construction of this new "regeneration time" approach and indicate the proofs for the annealed and quenched IP.

[This is a joint work with Ofer Zeitouni.]