PHASE TRANSITION FOR ACTIVATED RANDOM WALK MODELS

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Abstract. The model of activated random walks evolves as follows. On Z^d, at time zero there is an i.i.d . number of active particles whose expectation is ρ. Each particle performs a continuous-time random walk with rate one. When a particle is found alone at some site, it will change its state from active to inactive when an exponential clock of rate λ rings. Once a particle is inactive, it no longer jumps. When some other particle jumps into the same site, the particle becomes active again. A natural conjecture is that for low ρ the system locally fixates (i.e., at any finite box a.s. there will be only inactive partiles or empty sites for large enough times) and for large ρ there is no fixation (at every site there will be at least two particles for arbitrarily large times). The first natural difficulty for the study of this model is the lack of attractiveness. To compare different situations and obtain upper/lower bounds, we introduce an explicit graphical representation that recovers the monotonicity of some variables of interest at the limit when time goes to infinity. Such representation has a very useful comutativity property that opens a big space for direct, constructive approaches. With this method we prove that there is a (unique) phase transition for the one-dimensional finite-range random walk. Joint work with V. Sidoravicius.

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