Asymptotic Behavior of Stochastic Particle Systems

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Keywords: branching random walk, non-homogeneous environments, spatial structure

AMS: 60J35 60J80

Abstract

We consider a continuous-time branching random walk on a multidimensional lattice with a finite set of particle generation centres called branching sources, which are situated at lattice points, see, e.g. [1]. We do not impose any restrictions on a variance of random walk jumps as in [2]. Such branching random walks can be used in modeling complex stochastic systems with a spacial dynamics, implying, for example, the existence of heavy-tailed distributions of random walk jumps [2]. The main objects of study are the behavior of the number of particles at an arbitrary area of lattice points and on the entire lattice, their moments, and propagating front of particles. Branching random walks are studied under different assumptions, with finitely or infinitely many particles at the initial time moment at lattice. Moreover, we present new limit theorems about the behavior of particle population and subpopulations. The proofs of the theorems are partly based on spectral theory of operators with multipoint perturbations.

Acknowledgements: The research was supported by the Russian Foundation for Basic Research, project no. 17-01-00468.

References

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