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Critical Multitype Branching Systems: Extinction Results

Peter Kevei, Jose Alfredo Lopez Mimbela

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We consider a critical branching particle system in $\R^d$, composed of individuals of a finite number of types $i\in\{1,...,K\}$. Each individual of type i moves independently according to a symmetric α_i-stable motion. We assume that the particle lifetimes and offspring distributions are type-dependent. Under the usual independence assumptions in branching systems, we prove extinction theorems in the following cases: (1) all the particle lifetimes have finite mean, or (2) there is a type whose lifetime distribution has heavy tail, and the other lifetimes have finite mean. We get a more complex dynamics by assuming in case (2) that the most mobile particle type corresponds to a finite-mean lifetime: in this case, local extinction of the population is determined by an interaction of the parameters (offspring variability, mobility, longevity) of the long-living type and those of the most mobile type. The proofs are based on a precise analysis of the occupation times of a related Markov renewal process, which is of independent interest.

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