Multitype Bienaymé-Galton-Watson processes escaping extinction

Maria Conceição Serra, mcserra@math.uminho.pt

Department of Mathematics, Minho Umiversity, Campus de Gualtar, 4710- 057 Braga, Portugal.

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Abstract

In the framework of multitype Bienaymé-Galton-Watson (BGW) process, the event that the daughter's type differs form the mother's type can be viewed as a mutation event. Assuming that mutations are rare, we study a situation where all types except one produce on average less than one offspring. We establish a neat asymptotic structure for the BGW process escaping extinction due to a sequence of mutations toward the supercritical type.

The asymptotic analysis is performed by letting mutation probabilities tend to 0. The limit process, conditional on escaping extinction, is another BGW process with an enriched set of types permitting to distinguish a stem lineage of particles that leads toward the escape event. The stem lineage can be described by a simple Markov chain on the set of particle types. The total time to escape becomes a sum of a random number of independent geometrically distributed times spent at intermediate types. (This is joint work with Serik Sagitov)

Badajoz (Spain)