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Probabilistic properties of second order branching process

Akanksha S. Kashikar · S. R. Deshmukh

Abstract The classical BGW process assumes first order dependence, whereas many real life datasets exhibit a second or higher order dependence. Further, in some situations, there is a need for a model which allows for simultaneous reproduction by a parent and its offspring. This paper proposes a second order branching process model to accommodate such situations and discusses its probabilistic properties such as extinction probability and limiting behaviour of the generation sizes. Estimation of offspring means and growth rate are also discussed. This model is further used to model the swine flu data for Pune, India, and La-Gloria, Mexico.

Keywords Almost sure convergence · Extinction probability · Generating functions · Higher order branching processes · L^2 convergence