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Quasi-Stationary Asymptotics for Perturbed Semi-Markov Processes in Discrete Time

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Abstract

We consider a discrete time semi-Markov process where the characteristics defining the process depend on a small perturbation parameter. It is assumed that the state space consists of one finite communicating class of states and, in addition, one absorbing state. Our main object of interest is the asymptotic behaviour of the joint probabilities of the position of the semi-Markov process and the event of non-absorption as time tends to infinity and the perturbation parameter tends to zero. The main result gives exponential expansions of these probabilities together with an recursive algorithm for computing the coefficients in the expansions.

Keywords: Semi-Markov process, Perturbation, Asymptotic Expansion, Regenerative process, Renewal equation, Solidarity property, First hitting time.

MSC2010: Primary 60K15; Secondary 41A60, 60K05.

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