Czapla, Dawid; Horbacz, Katarzyna; Wojewódka-Ściążko, Hanna

Ergodic properties of some piecewise-deterministic Markov process with application to gene expression modelling. (English) [Zbl 1440.60069]

Stochastic Processes Appl. 130, No. 5, 2851-2885 (2020).

Authors’ abstract: We investigate a piecewise-deterministic Markov process with a Polish state space, whose deterministic behaviour between random jumps is governed by a finite number of semiflows. We provide tractable conditions ensuring a form of exponential ergodicity and the strong law of large numbers for the chain given by the post-jump locations. Further, we establish a one-to-one correspondence between invariant measures of the chain and those of the continuous-time process. These results enable us to derive the strong law of large numbers for the latter. The studied dynamical system is inspired by certain models of gene expression (see [M. C. Mackey et al., SIAM J. Appl. Math. 73, No. 5, 1830–1852 (2013; Zbl 1279.92029)] and [S. Hille et al., Ann. Math. Blaise Pascal 23, No. 2, 171–217 (2016; Zbl 1353.92042)]), which are also discussed here.

Reviewer: Ivan Podvigin (Novosibirsk)

MSC:

60J05 Discrete-time Markov processes on general state spaces
60J25 Continuous-time Markov processes on general state spaces
37A30 Ergodic theorems, spectral theory, Markov operators
37A25 Ergodicity, mixing, rates of mixing

Keywords:
Markov process; invariant measure; exponential ergodicity; asymptotic stability; strong law of large numbers; gene expression

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References:


[34] Revuz, D., Markov Chains (1975), North-Holland, Elsevier: North-Holland, Elsevier Amsterdam · Zbl 0329.60045


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