On fluid model and averaged parameters model for Markov additive processes with finite environment's state space

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Abstract

We deal with a continuous time Markov additive process (J_t, S_t) where the environment (J_t) is a Markov chain on a finite state space E. Moreover we always assume that (J_t) is irreducible and we also consider some further Markov additive processes derived in a suitable way from (J_t, S_t): the fluid model $(J_t, S_t^{(F)})$, the averaged parameters model $(J_t, S_t^{(A)})$ and $(J_t, \underline{S}_t)$ where $(\underline{S}_t)$ depends on (J_t) only. In this paper the results in [M] concerning (S_t), $(S_t^{(F)})$ and $(S_t^{(A)})$ are extended to $(S_t, \underline{S}_t)$, $(S_t^{(F)}, \underline{S}_t)$ and $(S_t^{(A)}, \underline{S}_t)$. In particular the inequalities between rate functions are related with inequalities between suitable Perron-Frobenius eigenvalues. We also present some convergence results for rate functions and Lundberg parameters for both fluid model and averaged parameters model. A final section is devoted to the discrete time case.

[M] C. Macci: "Continuous time Markov additive processes: composition of large deviations principles and comparison between exponential rates of convergence". *J. Appl. Prob.* 38 (2001), 917–931.