Markovian Repeated Interactions Systems

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Abstract

We study a class of dynamical semigroups $(L_n)_{n\in\mathbb{N}}$ that emerge, by a Feynman–Kac type formalism, from a random quantum dynamical system $\mathcal{L}_{\omega_n}\cdots\mathcal{L}_{\omega_1}\rho_{\omega_0}$ driven by a Markov chain $(\omega_n)_{n\in\mathbb{N}}$. We show that the almost sure large time behavior of the system can be extracted from the large n asymptotics of the semigroup, which is in turn directly related to the spectral properties of the generator L. As a physical application, we consider the case where the $\mathcal{L}_\omega$'s are the reduced dynamical maps describing the repeated interactions of a system S with thermal probes C_ω . We study the full statistics of the entropy in this system and derive a fluctuation theorem for the heat exchanges and the associated linear response formulas. This is joint work with J.-F. Bougron and A. Joye.