SPECTRAL GAP AND CONVEX CONCENTRATION INEQUALITIES FOR BIRTH-DEATH PROCESSES

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Abstract: Consider a birth-death process with generator $\mathcal{L}$ and reversible invariant probability π. Given an increasing function ρ and the associated Lipschitz norm $\|\cdot\|_{\mathrm{Lip}(\rho)}$, we find an explicit formula for $||(-\mathcal{L})^{-1}||_{\mathrm{Lip}(\rho)}$. As a typical application, with spectral theory, we revisit one variational formula of M.F. Chen for the spectral gap of $\mathcal{L}$ in $L^2(\pi)$. Moreover, by Lyons-Zheng's forward-backward martingale decomposition theorem, we get convex concentration inequalities for additive functionals of birth-death processes.