Accelerating Brownian Motion on N-Torus

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Abstract

On N-torus we consider antisymmetric perturbations of Laplacian of the form $L(C) = \Delta + C \cdot \nabla$, where C is a divergence free vector field. The spectral gap, denoted by $\lambda(C)$, of L(C) is defined by $-\sup\{$ real part of μ, μ is in the spectrum of L(C), $\mu \neq 0\}$. We characterize for certain class of C's the limit of $\lambda(kC)$ as k goes to infinity and prove that $\sup\{\lambda(C)$, C is divergence free$\} = \infty$. This problem is motivated by accelerating diffusions. By adding a weighted antisymmetric drift to a reversible diffusion the convergence to the equilibrium is accelerated using the spectral gap as a comparison criterion. However, how good can the improvement be is yet to be answered. In this paper we demonstrates that on N-torus the acceleration of Brownian motion could be indefinitely fast.