Large deviation theory and the dynamics of a bacterium

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Abstract
Bacteria can move for various reasons, including in response to chemical stimuli in the environment. In this article, we model the movement patterns of a typical bacteria in the form of a discrete-time Markov chain in one dimension (one-dimensional running and tumble model). Then with the help of the large deviation theory, the behavior of the probability density function of current (displacement per unit time), as a dynamical variable that is defined on the moving path, is studied. We will show that it is possible to observe a dynamical phase transition in the system.

Keywords: large deviation theory, dynamical phase transition, chemotaxis, run and tumble model, stochastic process

For full article, refer to the Persian section