Two-boundary first exit time of Gauss-Markov processes for biological modeling

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1. Abstract

The theory of Gauss-Markov and Diffusion processes plays a key role in the construction and development of models in a wide variety of fields, as molecular biology, financial markets, population dynamics and in the context of neuronal modeling. We will recall some of the main theoretical results for two-boundary First Exit Time (FET) densities of some specified Gauss-Diffusion (GD) processes. We will focus on the conditions that guarantees the existence of a closed-form expression or on the methods that provide numerical approximations when these conditions are not satisfied. We will show how it is possible to use GD processes and the corresponding FET through suitable boundaries for modeling the acto-myosin dynamics responsible of the contraction in the skeletal muscles. Starting from the stochastic differential equations used in [1] and [2] for the modeling of the interaction between actin and myosin filaments, we will discuss the role of the time-inhomogeneous Ornstein-Uhlenbeck process for modeling phenomena subject to additional (external) time-dependent forces.

References

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