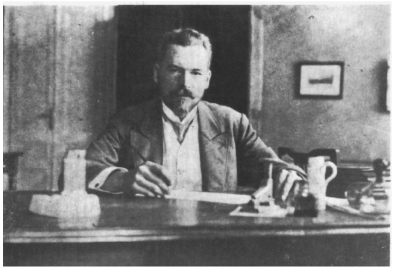

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Accumulation time of stochastic processes with resetting

Tuesday, 28 September 2021 16:00 (30 minutes)

One of the characteristic features of a stochastic process under resetting is that the probability density converges to a non-equilibrium stationary state (NESS). In addition, the approach to the stationary state exhibits a dynamical phase transition, which can be interpreted as a traveling front separating spatial regions for which the probability density has relaxed to the NESS from those where transients persist. A very different mechanism for generating an NESS occurs within the context of diffusion-based morphogenesis, in which an extrinsic localized current source combined with degradation within the interior of the domain leads to the formation of a protein concentration gradient. A common method for characterizing the relaxation process is to calculate the so-called accumulation time. The latter is the analog of the mean first passage time of a search process, in which the survival probability density is replaced by an accumulation fraction density. In this paper, we extend the definition of the accumulation time to stochastic processes with resetting by showing how the probability density associated with trajectories that reset at least once evolves in an analogous fashion to protein concentration gradients. We consider a range of examples, including diffusion with instantaneous resetting, resetting with refractory periods and finite return times, and non-diffusive processes such as run-and-tumble particles. In each case we calculate the accumulation time as a function of the spatial separation from the reset point.

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