żaba, Mariusz; **Garbaczewski, Piotr**; **Stephanovich, Vladimir**

Trajectory statistics of confined Lévy flights and Boltzmann-type equilibria. (English)

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Summary: We analyze a specific class of random systems that are driven by a symmetric Lévy stable noise, where the Langevin representation is absent. In view of the Lévy noise sensitivity to environmental inhomogeneities, the pertinent random motion asymptotically sets down at the Boltzmann-type equilibrium, represented by a probability density function (pdf) $\rho_*(x) \sim \exp[-\Phi(x)]$. Here, we infer pdf $\rho(x,t)$ based on numerical path-wise simulation of the underlying jump-type process. A priori given data are jump transition rates entering the master equation for $\rho(x,t)$ and its target pdf $\rho_*(x)$. To simulate the above processes, we construct a suitable modification of the Gillespie algorithm, originally invented in the chemical kinetics context. We exemplified our algorithm simulating different jump-type processes and discuss the dynamics of real physical systems, where it can be useful.

MSC:

60G51 Processes with independent increments; Lévy processes
82C31 Stochastic methods (Fokker-Planck, Langevin, etc.) applied to problems in time-dependent statistical mechanics

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