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Resetting random walks in a bounded chain

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The search of a target of unknown location is often random and ineffective, especially when the search domain is spacious and there is a lot of detrimental trajectories. To get rid of them, thereby improving the search, interruptions of the latter with starting it from scratch can be a good strategy. Called resetting, such a manner is in fact inherent to many search processes at very diverse levels of organization.

Initiated by the seminal work [1] devoted to diffusion with resetting along an infinite chain, the study of resetting effects in various model systems has quickly become a flourishing branch of the theory of stochastic processes. The vast majority of corresponding works, however, concerns spatially continuous models, whereas their discrete counterparts – such as random walks in lattices or networks – are not less important. For the latter, there were practically no exact results even in one dimension.

In the present talk, the recent results [2] on the resetting effects in one of the basic model – classical random walks with Poissonian resetting in a one-dimensional lattice – are expounded at length. The model is analyzed in its general version, for arbitrary initial and boundary conditions, which lead to a variety of optimization scenarios illustrated by non-standard behavior of the main observables (splitting probabilities, mean first passage times, coefficients of variation). A quantum analog of the model is briefly discussed.

- 1. M.R. Evans, S.N. Majumdar. Phys. Rev. Lett. 106, 160601 (2011).
- L.N. Christophorov. Rep. Natl. Acad. Sci. Ukraine (Dopovidi) 8, 43 (2020); J. Phys. A: Math. Theor. 54, 015001 (2021); J. Phys. A: Math. Theor. 55, 155006 (2022); Ukr. J. Phys. (2024).

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