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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).
2. 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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