Control of random walkers with time delayed feedback

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It is found that a specific feedback with time delay can control fluctuated motion in not only nonlinear deterministic systems [1] but also stochastic systems [2] to a stable state. In this presentation, we consider diffusion phenomena in non-stationary stochastic processes, i.e., a random walk and the Winner process, and observe suppression of their diffusions with the specific time delayed feedback. We analytically illustrate this suppression of diffusion by using stochastic delay differential equations and justify the feasibility of this suppression by applying the time delayed feedback to a molecular dynamics model. Furthermore, we show that the control method can be applicable to a deterministic diffusion which is observed in chaotic dynamical systems.

[1]   Pyragas K., *Physics Letters A* **170**:421–428, 1992.
[2]   Ando H., Takehara K., Kobayashi M. U., *Physical Review E* **96**:012148, 2017.