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Asymmetry of Coordinate and Velocity in Noisy Oscillator

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Abstract: The velocity variable of a noise oscillator as an internal or external noise is proposed, the spectrum of which is quite different from that of the coordinate variable of the same noise oscillator. The former leads to ballistic diffusion for a free particle in long time limit and the asymptotical results of the system are sensitive to the initial condition. However, diffusion process induced by the coordinate of noise oscillator is a normal one and depends on the initial condition only in the transient time. This allows us to classify two kinds of non-Markovian processes: normal one and strong one, just like the processes induced by the coordinate and the velocity of noise oscillator, respectively. Applying to a correlation ratchet, we have found that the steady current of a particle subjected to the velocity of noise oscillator is opposite to that subjected to its coordinate, thus the former shows greenness and the latter redness.

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