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## Dynamics of a quantum particle interacting with a thermal bath and subject to an oscillating asymmetric bistable potential

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Exploiting the approach of the Feynman-Vernon functional within the framework of the discrete variable representation (DVR), we consider a quantum particle described by the Caldeira-Leggett model. The particle, "moving" in an asymmetric bistable potential subject to a periodical driving, interacts with a thermal bath of harmonic oscillators. In this conditions we study the dynamics of the particle by analyzing the time evolution of the populations in the DVR. Specifically we focalize on the position eigenstate located in the shallower well, i.e. metastable state, finding a nonmonotonic behaviour of the corresponding population as a function of the frequency. Moreover, for different values of the coupling strength with the thermal bath, we obtain the equilibrium energy of the particle as a function both of the amplitude and frequency of the periodical driving.

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## Ergodicity and mixing of anomalous diffusion processes

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We study ergodic properties of some classes of anomalous diffusion processes. Using the recently developed measure of dependence called the Levy autocorrelation, we derive a generalization of the classical Khinchin theorem. This result allows us to determine ergodic properties of the class of Levy flights. Moreover, taking advantage of the so-called dynamical functional we show how to verify ergodicity/ergodicity breaking in experimental data. Some examples are presented.

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## Polymer unfolding induced by spatially correlated noise

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In contrast to the time-correlated noise, which is extensively researched on in the context of sub-diffusion and synchronization effects, little work has been done to understand its spatial counterpart and its consequences. Therefore, we have analyzed the behavior of 2D polymer-like chain under the influence of spatially correlated Gaussian noise.

By means of Langevin equations, we have simulated a bead-spring chain, where the nearest neighbors interact via the harmonic potential and every node interacts globally by Lennard-Jones potential, which provides excluded volume. We have also introduced a harmonic interaction between beads  $i$  and  $i+2$  which resulted in a saw-like conformation of the chain. This system has been forced by the spatially correlated Gaussian noise, which amplitude and the correlation length have been varied.

Our investigation into the system revealed several effects, namely: beads motion synchronization, increased time-correlation of the nearest neighbors distance and angles between modules, and, most notably, chain unfolding due to the rise in the correlation length.