Work statistics at first-passage times

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The presentation is about the one of the themes of my Master degree, in which is based in the field of Stochastic thermodynamics. During my entire master degree, we worked in four different papers (the last one is at the final phase of submission)[Phys. Rev. E 105, 024106 (2022), Phys. Rev. E 106, 064125 (2022), Phys. Rev. Research 5, 043278 (2023)] and, the one with the same title as this abstract is published at Physics Review Research (Phys. Rev. Research 5, 043278 (2023)).

In a the field of thermodynamics in stochastic processes, there has been a growing interest in the study of the thermodynamic quantities until a particular event of interest has occurred for the first time. Since the underlying dynamics is stochastic, the time at which these events take place also varies from realisation to realisation. This drastically changes the properties of the thermodynamic quantities compared to situations where the observation time is fixed for all events. For instance, the bound on the average work picks up a non-trivial correction term due to the fact that the system is generally out of equilibrium at the end of the first-passage time. Similar observation has also been made for the efficiency of heat engines. In fact, based on the martingale theory, many new results on the integral fluctuation theorem and stopping times for entropy production have been analytically obtained. Despite these general results, the number of thermodynamic first-passage problems that have been solved exactly, seems to be very limited.

In the this part of my the research, this gap is partially filled by studying an analytically tractable class of models, where one can get exact results for the moment generating function associated with the mechanical work. In other words, the phenomena of First-Passage time is analyzed with the framework of Brownian functionals and the Feynman-Kac formalism.

Type

ORAL