Distinct routes for the engine optimization, including maximizations of output power and efficiency with respect to the asymmetry, force and both of them are investigated. For the isothermal work-to-work converter and/or small difference of temperature between reservoirs, they are solely expressed in terms of Onsager coefficients. Although the symmetric engine can operate very inefficiently depending on the control parameters, the usage of distinct contact times between the system and each reservoir not only can enhance the machine performance (signed by an optimal tuning ensuring the largest gain) but also enlarges substantially the machine regime operation. The present approach can pave the way for the construction of efficient Brownian engines operating at finite times.

References

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ANALYTICAL GRAPH THEORY APPROACH FOR QUANTUM CIRCUIT THEORY

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There is a great amount of challenges in the understanding of the properties of charge, heat and spin transport in nanostructured electronic system. Mesoscopic physics studies transport phenomenon in nanostructures, that can be described by semiclassical techniques. In this work, we approach the description by graph theory of the observables of electronic transport in systems of network chaotic quantum dots in the form of cumulants of the statistics of transmission of charge for normal reservoirs for semiclassical regime. The comprehension of how a topology and further parameters of a network of quantum dots affects in the process of transmission of charges is of natural interest for a more efficient modeling for the realization of architecture of these systems obtained by lithography techniques in semiconductors heterostructures. Graph theory provides an algebraic approach more adequate for the description of transport process in networks, like vehicle traffic in urban roads, data traffic in computer networks, charge transport in classical circuits and in this work, we use for charge transport in chaotic quantum dots networks. The electronic current signal verified for a network of chaotic quantum dots is characterized as a noise described by cumulants of full-counting statistics of charge, which reveals the observables of the transport like conductance and shot-noise power. Through the quantum circuit theory introduced by Y. Nazarov, the cumulants of the counting statistic of charge are calculated in the semiclassic regime from sadle-point of nonlinear sigma model an analog set of "Kirchhoff's laws" with non-ohmic pseudo-current. We build an algorithm dedicated to calculating the cumulants of a given quantum dot network which is described from a weighted adjacency matrix formed by conductance matrix of set barriers which represents edge set of the graph associated. We construct a package in Mathematica software to calculate the cumulative counting statistic of charge for an arbitrary network. We still apply the method to investigate the ballistic-diffusive transition of these networks with A random barriers and V quantum dots with diffusive limit sensitive to $\lim_{V\to\infty} A(V)/V$, which is different of the universal Dorokhov regime for disordered systems.

Heat distribution of relativistic Brownian motion

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Understanding the statistical behavior of the heat in stochastic systems gives us insight into the thermodynamics of such systems. Using the recently proposed relativistic stochastic thermodynamics, we investigate the statistics of the heat of a Relativistic Ornstein–Uhlenbeck particle, comparing with the classical case. The results are exact through numerical integration of the Fokker–Planck of the joint distribution, and are validated by numerical simulations. In the presentation we will discuss briefly the fundamentals of relativistic stochastic thermodynamics together with the results of the heat distribution.