Title:	Estimating performance of Feynman's ratchet with limited information
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Abstract:	We estimate the performance of Feynman's ratchet at given values of the ratio of cold to hot reservoir temperatures (θ) and the figure of merit (efficiency in the case of engine and coefficienct of performance in the case of refrigerator). The latter implies that only the ratio of two intrinsic energy scales is known to the observer, but their exact values are completely uncertain. The prior probability distribution for the uncertain energy parameters is argued to be Jeffreys prior. We define an average measure for performance of the model by averaging, over the prior distribution, the power output (heat engine) or the χ-criterion (refrigerator) which is the product of rate of heat absorbed from the cold reservoir and the coefficient of performance (COP). We observe that the figure of merit, at optimal performance close to equilibrium, is reproduced by the prior-averaging procedure. Further, we obtain the well-known expressions of finite-time thermodynamics for the efficiency at optimal power and the COP at optimal χ-criterion, given by and respectively. This analogy is explored further and we point out that the expected heat flow from and to the reservoirs, behaves as an effective Newtonian flow. We also show, in a class of quasi-static models of quantum heat engines, how Curzon-Ahlborn efficiency emerges in asymptotic limit with the use of Jeffreys prior.
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