Title:	OPTIMIZATION ANALYSIS OF CLASSICAL, MESOSCOPIC AND QUANTUM HEAT ENGINES IN FINITE-TIME THERMODYNAMICS
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Keywords:	OPTIMIZATION MESOSCOPIC QUANTUM HEAT ENGINES THERMODYNAMICS
Issue Date:	Oct-2019
Publisher:	IISERM
Abstract:	Due to the contemporary growing importance of saving energy resources, thermodynamic op- timization of energy conversion devices has attracted a lot of interest recently. In the present work, we focus on the optimal performance of different classes of heat engines, including classi- cal, mesoscopic and quantum heat engines, operating in finite-time or at finite-rates. In order to achieve the optimal performance of an energy conversion device, an appropriate objective function has to be introduced. Maximization of the power output is the most studied criterion to analyze the performance of irreversible heat engines. But, heat engines operating at maxi- mum power are not the most efficient ones and, hence, are not very economical. Also, from an environmental point of view, we should also care about the extent of entropy production which ultimately pollute the environment. The optimization of ecological function and efficient power function fall within such a regime, as they pay equal attention to both power and efficiency. In this thesis, we study the optimal performance of cyclic as well as steady-state heat engines using the ecological function and efficient power function as our optimization criterion. As a representative of classical cyclic heat engines, we study the optimal performance of a low- dissipation Carnot-like engine operating in the maximum efficient power regime. We also used the methods of finite-time thermodynamics to study the optimal performance of steady state heat engines such as Feynman's ratchet and pawl model and a three-level quantum laser heat engine. To estimate the performance of heat conversion devices, a novel method of optimization has been introduced, by which some variables can be assigned values, only in a probabilistic sense. In prior information approach, one has only limited or partial information about the control parameters of the system under consideration and a prior probability distribution quantifies the uncertainty in these parameters. We have used this approach to estimate the performance of Feynman's model.
URI:	http://hdl.handle.net/123456789/1567 (http://hdl.handle.net/123456789/1567)