Optimization of a Energy Harvesting Device via Cross-Entropy Method

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Resumo/Abstract:
Energy harvesting is a process in which energy is captured from an external and abundant source, stored and then used to power small devices. The applications are diverse, including powering of clocks, LED panels, autonomous sensors and even pacemakers. One of the major challenges for the advancement of this technology is to increase the efficiency of harvesting devices. In this sense, this work deals with the formulation and numerical solution of a nonlinear optimization problem, with discontinuous constraint, which seeks to find a suitable configuration of parameters that maximize the electrical power recovered by a bi-stable energy harvesting device. The problem is formulated in terms of the harvesting dynamical system response and a classifier obtained from 0-1 test for chaos. A stochastic strategy of solution, combining penalization and cross-entropy (CE) method is proposed and tested numerically. The results illustrate the effectiveness of the proposed optimization strategy when compared to a reference solution obtained with a standard exhaustive search in a very fine grid.