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# Port-Hamiltonian optimal control of adaptive structures

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## Abstract

Adaptive structures are equipped with sensors and actuators to actively counteract external loads such as wind. This allows to significantly reduce resource consumption and emissions during the life cycle compared to conventional structures. After modeling adaptive buildings as port-Hamiltonian input-state-output systems, we suggest an optimal control problem maximizing the withdrawn energy from the system while achieving the goal of stabilization. Whereas this control objective is intrinsic to the port-Hamiltonian formulation, it is singular from an optimal control point of view. We show that this singularity can be overcome by using the port-Hamiltonan structure and further prove that energy-optimal controls are stabilizing. Last, we demonstrate the performance of this optimal controller by means of numerical examples.