Stabilization of a class of distributed parameter systems with non-monotone infinitesimal generators

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Abstract

In this presentation, a class of bounded perturbations of linear dissipative control systems in a Banach space is considered. Sufficient conditions for the relative compactness of the trajectories are proposed based on the direct Lyapunov method. Such conditions are shown to be applicable for a nonlinear evolution equation without assuming that the corresponding infinitesimal generator is dissipative. Compactness results are used to characterize the property of partial asymptotic stability by means of the Lyapunov and LaSalle functionals for abstract differential equations. These functionals are applied for the control design of a mechanical system governed by the Euler-Bernoulli and Kirchhoff equations. As illustrative examples, the dynamics is modelled with provision for the motion of rigid and deformable parts. Several types of beam and plate equations are considered in the variational form for the purpose of adequate modeling. Both distributed parameter models and their finite dimensional approximations are used in the control design. A special feature of this work is that finite dimensional approximations of an arbitrary order are investigated, and the spillover analysis is carried out in the open-loop setting with finite dimensional minimizing controls.

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