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Title:

Optimal Feedback Synthesis and Singular Riccati Equations Arising in Fluid Structure Interactions.

Abstract:

We consider an optimal control problem governed by fluid structure interaction with boundary controls defined on a bounded domain in R^3 . The control function actuates via tension stresses applied to the interface - a 2 dimensional manifold separating solid and fluid environment.

The main goal is to derive optimal feedback synthesis represented by gain operator based on solution to Riccati equation. It is known that for problems driven by hyperbolic like dynamics with unbounded controls (model considered in this talk) the optimal feedback gain operator may be inconsistent with optimal feedback synthesis resulting from Riccati solutions. This is due to a pathological multivalued character of optimal gain representation based on solutions to Riccati equations, in the presence of unbounded control actions. The consequence of this pathology is that standard and classical Riccati equations can not be used as a reliable method of finding optimal gains.

It is shown in this talk that in the case of fluid structure interactions the gain operator still exhibits singularity (it is unbounded), however the pathological inconsistency described above does not occur. This result is based on newly developed string of PDE estimates capturing singularity of the blow up rates for optimal synthehsis.

This is joint work with Francesca Bucci from the University of Florence, Italy.