The advantages of surrogate models in optimal model reduction $- \mathcal{H}_2$ and $\mathcal{H}_\infty$ perspectives

Alessandro Castagnotto[*]

Abstract

In this talk we present novel approaches to the task of finding reduced order models for multiple-input/multiple-output linear time-invariant systems in state-space that are good approximations in terms of $\mathcal{H}_2$ and $\mathcal{H}_\infty$ norms.

First we focus on $\mathcal{H}_2$-optimal model reduction and introduce *surrogate models* to speed up the reduction process, effectively decoupling the cost of reduction from the cost of optimization (cp. [1, 2]). Numerical examples will demonstrate the speed up achievable through this new framework. An outlook on current developments and further applications will be given.

As a second application of surrogate models in optimal reduction, we will address the task of finding near-optimal $\mathcal{H}_\infty$ approximations by means of interpolatory reduction methods. The proposed method [3] is an extension of [4] to the MIMO case and exploits a combination of $\mathcal{H}_2$-optimal reduction and surrogate optimization techniques. Numerical examples will show the effectiveness of the proposed method, which often results in lower $\mathcal{H}_\infty$ error than *Balanced Truncation* and in some cases even *Optimal Hankel Norm* approximation.

References

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[*]Chair of Automatic Control, Technical University of Munich, Boltzmannstr. 15, D-85748 Garching. a.castagnotto@tum.de