RATIONAL APPROXIMATION FOR DATA-DRIVEN MODELING AND COMPLEXITY REDUCTION OF LINEAR AND NONLINEAR DYNAMICAL SYSTEMS (MS - ID 69)

Structure Preserving Model Order Reduction by Parameter Optimization

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We present a framework for structure-preserving model order reduction (MOR) based on direct parameter optimization as introduced in [1]. We explain how our method can be applied to compute reduced order models for linear port-Hamiltonian (pH) systems. For that, we first describe how we fully parametrize pH systems such that all structural constraints regarding the system matrices are automatically satisfied. After that, we give insights into the specific optimization problem we set up to find a good approximation with respect to the H-infinity norm. Finally, we highlight the effectiveness of our method by comparing it to other structure preserving MOR algorithms [2, 3] on a pH benchmark system from [2].

[1] P. Schwerdtner and M. Voigt, "Structure Preserving Model Order Reduction by Parameter Optimization", https://arxiv.org/pdf/2011.07567.pdf

[2] S. Gugercin, R. V. Polyuga, C. Beattie, and A. van der Schaft, "Structure-preserving tangential interpolation for model reduction of port-Hamiltonian systems," Automatica, vol. 48, no. 9, pp. 1963-1974, 2012.

[3] R. V. Polyuga and A. J. van der Schaft, "Effort- and flow-constraint reduction methods for structure preserving model reduction of port-Hamiltonian systems," Systems & Control Letters, vol. 61, no. 3, pp. 412-421, 2012.