On Systematic Model Reduction Techniques for Dynamic Optimization and Robust Control of Distributed Process Systems

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Abstract
In this contribution we present an overview of some recent works carried out in our group to develop systematic and efficient methods for model reduction and its application to simulation, dynamic optimization and robust control of complex distributed process systems. The numerical projection methods we developed exploit the underlying finite element structure of the numerical PDE system to efficiently evaluate and to integrate the spatial differential terms, and thus to systematically project the original PDE set into a low dimensional subspace. This results into a reduced order description which is able to capture the relevant dynamics of the original system. Details on computational aspects of the methodology as well as applications in the context of dynamic optimization and robust control will be discussed on a number of representative case studies involving nonlinear diffusion-reaction and fluid dynamic systems.

Keywords: Distributed Process Systems, Reduced Order Models, Dynamic Optimization, Robust Control.

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