



CSC Seminar

SPEAKER

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OVGU

TITLE

Structure-preserving model reduction of linear time-varying port-Hamiltonian systems

ABSTRACT

Many physical processes can be naturally modeled using port-Hamiltonian (pH) systems, which are inherently passive and stable, and allow for structure-preserving interconnection, making them particularly suitable for the modeling of complex networks. Furthermore, many dedicated numerical methods have been developed to exploit and preserve the structure of pH systems, e.g. for space- and time-discretization, and model order reduction (MOR).

In our work, we focus on the structure-preserving MOR of linear time-varying (LTV) pH systems. LTV systems appear quite naturally in many applications, e.g. in the linearization of nonlinear systems around non-stationary reference solutions, or when some of the system parameters are time-dependent.

In this talk we introduce a general approach based on (Petrov)-Galerkin projection for the structure-preserving MOR of LTV-pH systems. This includes (but is not limited to) the extension of the effort constraint method to LTV-pH systems. Furthermore, we combine balancing and projection to obtain a reduced model that is guaranteed to be pH. We exhibit numerical experiments to validate our algorithms.

This is joint work with Karim Cherifi (University of Wuppertal).

Tuesday, July 22, 2025 at 2 pm
seminar room Prigogine