



Large-scale dynamical model approximation and its applications

Soutenance de thèse d'HDR – Charles POUSSOT-VASSAL

12 juillet 2019, 10h

Auditorium de l'ONERA

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Résumé

Linear dynamical models play an important role in many engineering fields, including simulation, analysis, optimization and control of complex systems and processes. This role is even emphasized when critical systems (motivated by industrial, economical, societal and strategical reasons) are under consideration, and for which a deep attention and understanding are needed.

In addition, for these cases, digital-based modelling solutions involving dedicated computer-based softwares are being developed and largely preferred by engineers and researchers to reduce development costs and time, to improve, and to better understand the systems under consideration. These systems being largely grounded on accurate complex and large-scale dynamical models, not well tailored to standard numerical tools and computationally demanding, their approximation by an (accurate) low complexity dynamical model is then a cornerstone for further advanced developments.

This presentation will focus on this last point, and more specifically, the linear large-scale (and infinite dimensional) dynamical model approximation. Both theoretical contributions accompanied with industrial applications, illustrating the wide application spectrum of this research field, will be presented. More specifically, the interpolatory framework, tailored to a large variety of dynamical model structures and classes, will be the main invoked tool. Some side effects of the main purpose of dynamical model approximation, such as the approximation of the input-output stability regions of a class of meromorphic functions are also presented, highlighting the effectiveness and versatility of the methods developed within this research field.

Mots clés

Dynamical model approximation and reduction ; Large-scale linear dynamical model ; Infinite dimensional dynamical models ; Interpolatory techniques