Structure Preserving Model Order Reduction

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Abstract

Discretization techniques for partial differential equations (PDEs) frequently lead to very high-dimensional numerical models with corresponding high demands concerning hardware and computation times. These high computational costs pose a serious problem in the context of multi-query and real-time computing scenarios. Such situations can be observed in the case in parameter studies, design, optimization, inverse problems or statistical analysis. Real-time scenarios consist of problems, where the simulation result is required very fast. In the past two decades efficient reduced order methods (ROMs) are developed to tackle these problems. In this talk we report about the structure preserving ROMs for conservative/dissipative PDEs; the nonlinear Schrödinger equation [2], Allen Cahn equation [4], Fitz-Hugh Nagumo equation [3], Ginzburg-Landau equation, Swift-Hohenberg equation [1] and shallow water equation. Current challenges in reduced order modelling like travelling waves, pattern formation, parametric ROMs and machine learning will be also discussed.

References

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