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Reduced order modeling and fast simulation strategies

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In the past years, the development of technologies that reduce the computational cost of numerical simulations has attracted a lot of attention in the field of computational science and engineering. The current trend is the following: instead of employing very general approaches (as for instance, building the finite element operators via element-by-element numerical integration, and solving the linear systems via black-block solvers), advanced numerical approaches dedicated to specific applications are developed. By exploiting the nature of the underlying problem to be solved, those methods drastically reduce the numerical resources required for simulation.

Generally, fast simulation strategies integrate knowledge to enhance or accelerate classical modeling and simulation methods. For example, reduced order models exploit *a priori* simulation data or knowledge of the underlying physical system, and are powerful tools in the case of parameterized problems, for running real-time simulation, or for building digital twins.

This minisymposium aims to bring together multidisciplinary viewpoints that facilitate fruitful discussions and exchange of ideas on how we can accelerate our simulations. We welcome contributions from both theoretical method developments and applications.

Topics of interest include, but are not limited to:

- *reduced order modeling via physics-based and/or data-driven approaches*
- *reduced order modeling in nonlinear mechanics and complex physical processes*
- *efficient numerical integration rules and fast formation of finite element operators*
- *domain decomposition and substructuring techniques, multigrid methods and fast solvers*
- *coupling and combination of reduced order models*

Any application in the scope of computational mechanics is encouraged, such as material design, multiscale and multiphysics problems, biomechanics, optimization and inverse problems, uncertainty quantification, control, large-scale simulation, and others.

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