Localized model order reduction

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Projection based model order reduction has become a mature technique for simulations of large classes of parameterized systems. However, especially for large-scale and multiscale problems the ``standard'' model order reduction approach exhibits several limitations: Curse of parameter dimensionality in the sense that many parameters require prohibitively large reduced spaces, no topological flexibility, and possibly high computational costs and storage requirements in the offline stage, for instance, due to large computational domains. Localized model order reduction methods, which combine approaches from model order reduction, multiscale methods and/or domain decomposition techniques, overcome or significantly mitigate those limitations.

In this talk we present localized model order reduction methods that allow both for the efficient construction of the basis functions by solving the partial differential equation (in parallel) on several small subdomains (in space and/or time) at low cost and proving convergence of the global approximation at a certain rate. For the efficient construction of the local spaces, we employ random sampling. Moreover, we will present the application of localized reduced order modelling in seismic imaging.

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