

Complexity reduction techniques for the numerical solution of PDEs

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In this talk we present different examples for reducing the computational complexity in the numerical solution of PDEs. Three different types are considered. A dimension reduced approach for transport problems in networks. A reduced basis approach combined with mortar techniques in the case of eigenmode analysis. Finally, the Stokes problem is considered and two different examples for operator modifications are given which allow to reduce the time to solution. In the first case, the operator is modified on the discrete level and results in improved convergence rates on uniform meshes for two-dimensional domains with reentrant corner. In the second case, we consider a jump in the viscosity and reformulate the stress operator in terms of the simpler gradient operator and suitable interface terms. In all cases, the theoretical results are illustrated by numerical examples motivated by different application fields.