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## Domain Decomposition Preconditioners for the Optimization of Distributed Parameter Systems

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**Abstract:** Optimization of distributed systems in the context of parameter estimation, optimal control, or optimal design plays an important role in science and engineering. These optimization problems pose several computational difficulties arising, among other things, from the large number of variables and the conditioning of subproblems, which often depends on the choice of a penalty parameter.

In this talk we present and analyze a Neumann-Neumann DD preconditioner for the solution of elliptic linear quadratic optimal control problems. The Neumann-Neumann DD preconditioner is applied to the optimality system. Theoretical results and numerical tests show that the dependence of the quality of this preconditioner on mesh size and subdomain size is comparable to its counterpart applied to elliptic equations only.

Numerical tests indicate that, unlike other DD preconditioners for optimality systems, the proposed Neumann-Neumann DD preconditioner is rather insensitive to the choice of the penalty parameter, which makes this preconditioner attractive as a subproblem solver in interior-point methods. Theoretical and numerical results as well as some comparisons of the Neumann-Neumann DD preconditioner with other DD preconditioners for optimality systems are presented.

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