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**Preconditioning Iterative Methods for the Optimal
Control of the Stokes Equations**

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Solving problems regarding the optimal control of partial differential equations
(PDEs) – also known as PDE-constrained optimization – is a frontier area of
numerical analysis. Of particular interest is the problem of flow control, where
one would like to effect some desired flow by exerting, for example, an external
force. The bottleneck in many current algorithms is the solution of the optimal-
ity system – a system of equations in saddle point form that is usually very large
and ill-conditioned. In this talk I will describe a block-diagonal preconditioner
for the minimal residual method which can be applied to such problems where
the PDEs are the Stokes equations. We will consider only distributed control
here, although other problems – for example boundary control – can be solved
in a similar way. I will present numerical results, and compare these with those
obtained by solving the equivalent forward problem using similar techniques.