## PRECONDITIONING OF LARGE-SCALE SADDLE POINT SYSTEMS ARISING IN RICCATI FEEDBACK CONTROL OF FLOW PROBLEMS

## Heiko Weichelt

TU Chemnitz, Chemnitz, Germany e-mail: heiko.weichelt@mathematik.tu-chemnitz.de

Joint work with Peter Benner, Jens Saak, and Martin Stoll

## Abstract

In order to explore boundary feedback control of flow problems we consider the (Navier-) Stokes equations that describe instationary, incompressible flows for low and moderate Reynolds numbers. After a standard finite element discretization we get a differential-algebraic system of differential index two. We show how to reduce this index with a projection method to get a generalized state space system, where a linear quadratic control approach can be applied. This leads to large-scale saddle point systems which have to be solved. For obtaining a fast iterative solution of those systems we derive efficient preconditioners based on the approaches due to Wathen et al. [Elamn/Silvester/Wathen 2005, Stoll/Wathen 2011]. Finally we show recent numerical results regarding the arising nested iteration.