Abstract Dr. Lukas Failer

»Newton-Multigrid Solver for Optimal Control of Fluid-Structure Interaction«

We present a monolithic Newton multigrid solver for the nonlinear-systems occurring in every time-step in optimal control of three dimensional fluid-structure interaction. To compute gradient information, an adjoint equation is solved. The key idea of the presented algorithm is to neglect the derivatives with respect to mesh deformation in the Jacobian of the Newton algorithm. This step allows to rewrite the Newton equation in three smaller systems. The linear systems are now much better conditioned than the full Jacobian such that a geometric multigrid solver can be applied. To compute the adjoint problem, the used Richardson iteration can be modified in a similar way. Thereby, state and sensitivity information of fluid-structure interaction problems with a large number of degrees of freedom, as in 3D configurations, can be computed. The new solver enables parameter estimation and optimal control for various applications. For example unknown parameters in the outflow condition can be determined to model blood flow in a vein or artery segment.