Shape Optimisation for Stationary Navier-Stokes with the Discrete Adjoint Technique

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We present an approach to shape optimisation for the stationary Navier-Stokes equations based on the "discretise then optimise" strategy. This is approached in a highly modular way, which has advantages in terms of implementation and solution strategies for the linear systems. The shape is parameterised by Bezier-splines, and optimisation performed with respect to these parameters. In order to allow efficient evaluation of the gradients in the optimisation problem the discrete adjoint technique is used. An of the shelf SQP optimisation solver approximating the Hessian by BFGS updates is employed which gives super linear convergence, avoiding second derivatives. The utility of the presented approach is demonstrated considering an example of drag reduction for an object moving in a channel of viscous fluid. For more details, see [1].

[1] R. Schneider. *Applications of the Discrete Adjoint Method in Computational Fluid Dynamics*. PhD Thesis, University of Leeds, 2006.
`http://www-user.tu-chemnitz.de/~rens/`