

Lothar-Collatz-Seminar

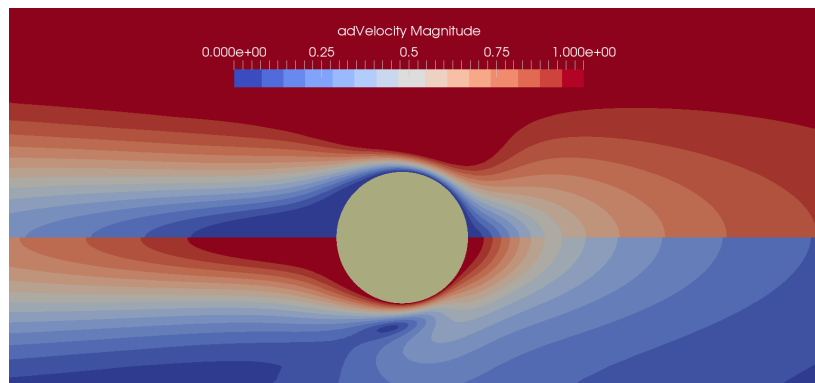
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Decoupling of Control and Force Objective in Adjoint-Based Fluid Dynamic Shape Optimization

Abstract:

We discuss exterior and classical interior alternatives for evaluating fluid flow induced forces on bodies. The discussion aims at a reduction of the total shape derivative, achieved through a decoupling of control and objective in the exterior approach. In this case, geometric as well as convective contributions to the shape derivative vanish. Convective contributions depend on primal physics and may disappear, which is not the case for geometric components. The latter can be interpreted as curvatures immanent to industrial applications. The remaining local derivative of the objective functional can be determined efficiently with an adjoint system, that differs to the classical approach in its boundary conditions only and resembles an ALE strategy (cf. figure below). A two-dimensional flow exposed to gravity illustrates the features of the exterior approach, whereby carefully derived derivatives from a second order Finite-Difference study were used to validate the results.



Adjoint velocity magnitude in the direct cylinder vicinity at $Re_D = 20$ and $Fn_D = 0.25$.

For further information please contact

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www.c3s.uni-hamburg.de/news-events/seminar-c3s.html

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