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Talk announcement

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Optimal Control of an unsteady Fluid-Structure Interaction Problem

Fluid-structure interaction (FSI) problems have been extensively studied from theoretical and numerical point of view in the last decade. However, especially in the context of optimal control problems for unsteady FSI problems no optimality systems based on rigorous analysis are available in the literature.

In this talk, we regard a model optimal control problem governed by a linear FSI problem, establish necessary optimality conditions, and analyze the regularity of the optimal solutions. To this end, we propose a novel symmetric monolithic formulation for the linear FSI problem. This formulation leads to an adjoint equation with the same structure as the considered linear FSI problem, which allows for a unified analytical and numerical treatment of the state and the adjoint systems.

In the framework suggested in this talk, the coupling conditions in the adjoint systems have exactly the same structure as for the state system. This is advantageous not only from the theoretical point of view but especially allows to use the same discretization schemes and the same practical solution algorithms for both the state and the adjoint systems. The fact that the coupling conditions are directly incorporated in the variational formulation allows for a natural usage of Galerkin finite element discretizations is space and time. This is advantageous particularly for optimal control problems, since the two approaches optimize-then-discretize and discretize-then-optimize lead to the same discretization scheme. By using a dual-weighted residual error estimator, we can choose space and time step size adaptively and thereby hope to be able to reduce the computational cost of the monolithic approach.