

Fluid Dynamic Optimization of HVAC-Components with Adjoint Methods

Anne Gerdes

Abstract

The theory and application of continuous adjoint methods for the optimization of heating, ventilation and air-conditioning components is presented in this talk. The cost functions to be optimized are related to comfort and efficiency criteria. Shape and porosity modifications are the means of control, in a CFD-based framework. The underlying physics are the incompressible, steady state Reynolds-averaged Navier-Stokes-Fourier equations. Porosity is modeled by a Darcy term. Using the adjoint method, the sensitivity is computed from the numerical solution of the primal and adjoint equation systems. The cost of the computation is independent of the number of degrees of freedom which makes the method attractive for the application to complex industrial settings. The arising framework is applied to heating, ventilation and air-conditioning components of aircrafts.