

Conference on Industrial Design Optimisation for Fluid Flow,  
Technical University Munich, March 28-29, 2012

## **Adjoint-Based Design Optimisation**

**Prof. R. Löhner**

CFD Center, George Mason University, Fairfax, VA, USA  
e-mail: rlohner at gmu.edu

Adjoint-based design optimization has seen major developments over the last two decades. Due to its very low computational cost, it has become the method of choice for optimization problems that are amenable to gradient-based techniques. And experience in engineering, where controllability and smooth, predictable performance are key requirements, has shown that adjoint-based techniques can be used advantageously for many more problem classes than initially thought.

After a brief introduction, the talk will focus on adjoint- based techniques for transient problems. As the adjoint proceeds backwards in time (from the end to the start of the flow simulation), the main difficulty encountered for large-scale applications is the massive amount of data storage required. Techniques such as checkpointing (i.e. trading CPU for storage) and data compression can alleviate this core difficulty to a large extent.

Several cases from design for blast-structure protection will be used to exemplify the techniques developed.