Universität Konstanz Fachbereich Mathematik und Statistik

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## Arbeitsgruppe Numerik

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Im Oberseminar

### Numerik

wird am Dienstag, dem 20. Januar 2015 folgender Vortrag gehalten:

#### Frau Dipl.-Math. Angela Scardigli, Turin

### Shape Optimization of Large-Scale Aerodynamic Problems using Reduced-Order Modelling

Zeit: 13:30 Uhr Raum: G 308

Interessenten sind herzlich willkommen!

gez. Stefan Volkwein

Abstract: The definition of a reduced-order model (ROM) to be used as surrogate model during the aerodynamic optimization of a complex constrained geometry is addressed.

In order to avoid handling geometry variation within the ROM, we propose a hybrid low- order/highorder method based on domain decomposition: the main idea is to split the domain of interest in two subdomains and to use different approximation methods in each of the two subdomains. In particular, the canonical CFD solver is used within a crucial region, whereas in the rest of domain we use a semiempirical model based on Proper Orthogonal Decomposition (POD). Generally speaking this approach delegates non-linear effects to the canonical solver whereas linear phenomenology is addressed by the ROM. The two models are coupled through a Schwarz method exploiting directly the properties of the POD basis. This results in a non-local boundary condition for the CFD solver on the reduced subdomain. The effectiveness and drawbacks of this approach are highlighted on a large-scale industrial problem, i.e. in a surrogate-based global optimization problem of car aerodynamics. The feasibility of taking into account varying geometry directly in the ROM as one of the parameters is also investigated; ongoing works, such as the parametrization of volumetric grids and reduced-order modelling applied to immersed boundary problems are therefore discussed.