Universität Konstanz
Fachbereich Mathematik und Statistik

Prof. Dr. Stefan Volkwein
Stefan.Volkwein@uni-konstanz.de

Arbeitsgruppe Numerik

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Im Oberseminar

Numerik

wird am

Donnerstag, dem 28. Juni 2012,

folgender Vortrag gehalten:

Frau Laura Iapichino

Mathematics Institute of Computational Science and Engineering

(MATHICS), Lausanne

„Reduced basis methods for the solution of parametrized PDEs inrepetitive and complex networks with application to CFD“

Zeit: 15.15 Uhr
Raum: D 309

Interessenten sind herzlich willkommen!

gez. Stefan Volkwein

Abstract:
The reduced basis (RB) method is a model order reduction technique that provides a rapid and reliable solution of parametrized partial differential equations (PDEs) as projection of previously precomputed solutions for certain instances of the parameters.
We propose new extensions of the RB method combined with domain decomposition techniques for solving problems described by PDEs within domains represented by networks of repetitive geometries with heterogeneous parametrization.
Since topological features of the domain are recurrent, the idea is to consider some reference shapes and use a suitable map to deal with each corresponding block of the computational domain. The empirical interpolation procedure is applied to the geometrical non-affine transformation terms to recast the problem into an affine setting.
The presented methods consist in computing once, locally and for every reference shapes, some representative solutions for different values of the parameters with a set of different suitable boundary conditions on the boundaries representing the internal interfaces of the network.
Then, the approximated solution is recovered as projection of the local previously computed solutions properly glued through the different subdomains. The proposed methodologies are applied to find a rapid and efficient numerical solution for viscous flows problems
on several combinations of geometries representing cardiovascular networks (made up of stenoses and bifurcations) by guaranteeing the continuity of stresses and velocities.
These computational procedures, thanks to an offline/online decomposition, allow to reduce considerably the problem complexity and the computational costs. Moreover, by splitting the global problem into smaller subproblems, the approaches are able to deal with arbitrarily complex network and a larger global parameter space than the one for which classical RB method is effective.