Delft University of Technology

Aerospace Structures & Computational Mechanics
Ph.D. Seminar Series

Dr. Martin Ruess

Weak enforcement of boundary conditions and coupling constraints in the framework of higher order methods

The absence of boundary fitted elements in meshless methods and the non-interpolatory nature of NURBS in the framework of isogeometric analysis are examples in the numerical analysis of boundary value problems that can prevent essential boundary conditions being strongly imposed. Following the pioneering work of Nitsche for the Poisson problem the concept of a weak enforcement of essential boundary conditions for elasticity problems is adapted. It is shown that this concept can be extended to impose coupling conditions between NURBS patches and/or finite element sub-domains, regardless of their degree of conformity. Embedded in the finite cell method, a fictitious domain approach of higher approximation order, the concept even allows for a simple and reliable coupling of overlapping domains without compromising accuracy and convergence, thus supporting the simplified and flexible geometric modeling of complex geometries. The proposed simulation concept is a variationally consistent extension of the principle of virtual work and allows for exponential rates of convergence under uniform p-refinement as well as optimal rates under uniform h-refinement. The method requires the stabilization of the formulation to retain positive definiteness of the governing system of equations. The stabilization terms used and the derivation of suitable stability parameters to preserve the convergence properties of high order approximation are discussed. The potential of the concept is presented with several benchmark tests and problems taken from engineering practice.

time:	**Wednesday, October 16th, 2013, 16:00**
location:	**Meeting room 7**
organization:	**Dr. Martin Ruess ‹m.ruess@tudelft.nl›**

IMPORTANT:

Please save the following date: Tuesday, October 29th, 15:00-17:00 (prelim. time frame), Zaal C

for an invited lecture given by Prof. Dr. Dominik Schillinger, University of Minnesota. Further details and an invitation including an abstract will follow.