T E C H N I S C H E U N I V E R S I T Ä T D O R T M U N D

INSTITUT FÜR ANGEWANDTE MATHEMATIK

LEHRSTUHL FÜR APPROXIMATIONSTHEORIE

Oberseminar über Approximationstheorie

WS 2015/16

Es spricht:

Dr. Wolfgang Dornisch
Technische Universität Kaiserslautern

über das Thema:

" On the use of approximate dual basis functions in the isogeometric mortar method"

Abstract:
Isogeometric analysis uses a common set of basis functions for the design in a Computer-Aided Design (CAD) program and the analysis with the finite element method (FEM). In this work the basis functions of Non-Uniform Rational B-splines (NURBS) surfaces are used. The properties of NURBS surface basis functions make them a good choice for the use as basis functions in the finite element method. However, the tensor-product property of NURBS surfaces requires the use of methods for the coupling of non-conforming NURBS domains, which occur in complex geometry models. The mortar method allows a flexible decomposition of the domain of a problem into subdomains in which the discretization does not have to match. The subdomains are connected by using constrained approximation spaces which results in a replacement of the standard basis functions by mortar basis functions on the slave side of the interface. This method fits very well to NURBS-based isogeometric analysis and it neither requires the definition of empirical parameters nor additional degrees of freedom. But the standard form of the isogeometric mortar method yields mortar basis functions with non-local support along the interface, which significantly deteriorates numerical efficiency. Within this contribution the use of approximate dual basis functions as test functions within the mortar coupling is proposed. This approach is compared to standard dual basis functions. The locality of the support and thus numerical efficiency depends on the choice of the test functions within the mortar method. If approximate dual basis functions are used, local support is recovered. The accuracy and efficiency of the proposed isogeometric mortar approach is shown to be competitive to other coupling techniques, and especially competitive to computations of conforming NURBS meshes with shared degrees of freedom. The applicability of the isogeometric dual mortar approach to nonlinear problems and to Reissner-Mindlin shell formulations is shown with the help of numerical examples.

Termin: Donnerstag, den 10.03.2016
13.00 Uhr , Raum M 511

Ort: Mathematikgebäude

gez. Prof. Dr. J. Stöckler