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Recent progress in Isogeometric Analysis: Hierarchical refinement of NURBS, weak coupling of trimmed multi-patch geometries and isogeometric collocation methods

Isogeometric analysis (IGA) bridges the gap between computer aided geometric design (CAD) and finite element analysis (FEA). Its core idea is to use the same smooth and higher order basis functions, e.g. non-uniform rational B-splines (NURBS), for the representation of both geometry in CAD and the approximation of solutions fields in FEA. The goal behind IGA is to simplify the cost-intensive mesh generation process required for standard FEA and to support a more tightly connected interaction between CAD and FEA tools.

The purpose of this talk is to review some recent developments in IGA technology: In the first part, I will talk about hierarchical refinement of NURBS as a basis for adaptive IGA. I will illustrate its advantages in terms of its intuitive derivation from a hierarchical subdivision principle, straightforward implementation in tree data structures and its simple generalization to 3D elements. In the second part, I will review the weak imposition of constraints based on Nitsche's method. I will illustrate that weakly coupled spline discretizations in combination with the finite cell method open the door for a truly isogeometric treatment of trimmed NURBS geometries. In the third part, I will talk about isogeometric collocation methods that use the smoothness of splines to discretize the strong form of the differential equation. I will show that collocation has the potential to significantly increase the efficiency of IGA and to outperform both isogeometric Galerkin and standard C^0 finite elements, when a specified level of accuracy is to be achieved with minimum computational cost.

Biography

Dr. Schillinger received his PhD from TU München in 2012. He has a MSc from the University of Stuttgart and a MSc from the University of Connecticut, Storrs. Dr. Schillinger joined the group of TJR Hughes at ICES, UT Austin, Texas, for a two-years period as a visiting graduate student, post-doc fellow and lecturer. In 2012, Dr. Schillinger was awarded the sixth John Argyris Award by IACM, one of the most prestigious awards for young researcher in the field of Computational Mechanics. He was appointed Assistant Professor at the University of Minnesota, Twin Cities, in 2013.

We cordially invite you to attend the lecture of Dr. Schillinger at

location: **Lecture Hall C, Faculty of Aerospace Engineering, Building 62,
Kluyverweg 1, 2629 HS Delft**

time: **Wednesday, October 30th, 2013, 10:30**