Università degli Studi di Pavia

Dipartimento di Meccanica Strutturale

in collaboration with

Centro di Simulazione Numerica Avanzata – CeSNA

Istituto Universitario di Studi Superiori

SEMINAR

TO MESH OR NOT TO MESH that is the question

This talk is intended to encourage a discussion on the geometric description of computational models, the necessity to generate conforming meshes and how to avoid them. Mesh generation for structural analysis is still an important issue. As pointed out by Cottrell et. al [1], 80% of the total time spent for the analysis is devoted to the creation of a suitable geometry and the generation of a computational mesh. Only 20% of the total time is actually spent for the analysis itself. This ratio has been even more unfavourable for high order methods, especially for complicated geometries. There are several ways to avoid this issue. One may try to come up with better mesh generators. I will demonstrate one approach to generate meshes for high thin walled structures. One may use Isogeometric Analysis [1]. The aim here is to directly use the CAD geometry for computation. Or, one may use embedded domain approaches such as the Finite Cell Method [2], to avoid mesh generation all together. I will present these approaches in the light of the challenges we face in modelling engineering problems.
Finally, the talk will conclude with an insight into a new research project which will be carried out jointly between the Chair for Computation in Engineering, Technische Universität München, Germany and the Dipartimentodi Meccanica Strutturale, Università degli Studi di Pavia. It aims at the direct use of trimmed NURBS or B-Spline surfaces or volumes within the framework of Isogeometric Analysis and the Finite Cell Method by extending some of the ideas given in [3].

REFERENCES:
[1] J. Austin Cottrell, Thomas J.R. Hughes, Y. Bazilevs. Isogeometric Analysis. Wiley, 2008, ISBN 978-0-470-74873-2.
[2] A. Düster, J. Parvizian, Z. Yang, E. Rank. The finite cell method for three-dimensional problems of solid mechanics. Comput. Methods Appl. Mech. Engrg., 197(45-48):3768–3782, 2008.
[3] E. Rank, S. Kollmannsberger, Ch. Sorger, A. Düster. Shell Finite Cell Method: A High Order Fictitious Domain Approach for Thin-Walled Structures. Comput. Methods Appl. Mech. Engrg., 200(45-46):3200–3209, 2011.

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