

in collaboration with

Centro di Simulazione Numerica Avanzata – CeSNA
Istituto Universitario di Studi Superiori

Isogeometric Analysis and the Finite Cell Method: Two approaches to better integrate CAD and Numerical Analysis

In recent years, *isogeometric analysis* (IGA) has gained huge attention in the computational science and engineering community. It is based on geometric models described by spline functions, as they have been used very successfully in the world of *Computer Aided Design* for long. The big advantage compared to the classical FEM is the excellent integration of design and analysis, and the high accuracy obtainable by this new approach. IGA is especially well suited to geometric models of thin structures, described by the shape of their surfaces, so-called *BRep-models*.

The *Finite Cell Method* (FCM), on the other hand, can be integrated easily with the second class of frequently used geometric models, the *Constructive Solid Geometry* (CSG). FCM is a fictitious domain approach with high order shape functions, embedding a physical body into a larger, simply shaped domain. FCM relieves completely from the necessity to generate a finite element mesh and thus reduces the engineering effort for a numerical analysis drastically. This presentation will show recent results on the FCM, demonstrating its efficiency on complex examples from civil, automotive and biomedical engineering. Finally, a synthesis of the central concepts of IGA and FCM combines the advantages of both methods in a seamless design-through-analysis methodology.

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