UNIVERSITÀ DEGLI STUDI DI TRENTO
Dipartimento di Ingegneria Civile, Ambientale e Meccanica

INSTABILITIES

Instabilities and nonlocal multiscale modelling of materials
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# AVVISO DI SEMINARIO

Si comunica che **martedì 09 dicembre 2014 a partire dalle ore 09.30**
si terrà presso l'aula **B2** (via Mesiano 77) il seguente seminario

## Isogeometric Analysis: A basic introduction with applications in solid and structural mechanics involving complex geometries, structural vibrations, explicit dynamics, large deformations, inelasticity, contact, and buckling.


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Isogeometric Analysis (IGA) is a recent simulation framework, originally proposed by TJR Hughes and coworkers in 2005, to bridge the gap between Computational Mechanics and Computer Aided Design (CAD). The basic IGA paradigm consists of adopting the same basis functions used for geometry representations in CAD systems - such as, e.g., Non-Uniform Rational B-Splines (NURBS) - for the approximation of field variables, in an isoparametric fashion. This leads to a cost-saving simplification of the typically expensive mesh generation and refinement processes required by standard finite element analysis. Thanks to the high-regularity properties of its basis functions, IGA has shown a better accuracy per-degree-of-freedom and an enhanced robustness with respect to standard finite elements in a number of applications ranging from solids and structures to fluids, opening also the door to geometrically flexible discretizations of higher-order partial differential equations in primal form. In particular, the superiority of IGA over standard finite elements appears to be remarkably evident in the approximation of spectra (e.g., in the case of structural vibration studies) and dynamics problems.
This lecture aims at giving an overview of the basic features of IGA and of its main advantages. These are illustrated through some convincing applications, mainly belonging to the field of solid and structural mechanics. In particular, after an introduction about the IGA approximation properties of structural vibrations, the application to a real-life case, the so-called NASA "Aluminum Testbed Cylinder", is shown along with comparisons with experimental results. As a further example, a demanding explicit structural dynamics simulation of a patient-specific aortic valve, modeled by nonlinear hyperelastic shells and involving large deformations and contact, is presented and carefully analyzed in terms of accuracy and efficiency. As a third representative case study, the bending behavior of complex structures like shape memory alloy stents is simulated in the large deformation regime, with particular attention to a correct modeling of buckling phenomena. In all these cases, the superior results which can be provided by isogeometric analysis with respect to standard finite elements are clearly pointed out.
Finally, some further work in progress is briefly presented.


Tutti gli interessati sono invitati a partecipare.

Il seminario è organizzato dal gruppo di Scienza delle Costruzioni
(D. Bigoni, L. Deseri, N.Pugno, M. Gei, A. Piccolroaz, F. Dal Corso, M.F. Pantano, R. Springhetti)

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