Università degli Studi di Pavia

Dipartimento di Ingegneria Civile e Architettura

in collaboration with

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

SEMINAR

Isogeometric Analysis of Phase-field Models: Application to the Thermomechanics of Shape Memory Alloys

Phase-field modeling refers to a particular mathematical description of a system with evolving interfaces. The key idea is that interfaces are described by a smoothly-changing phase field, defined on a fixed domain. The phase field is governed by a partial differential equation, which tracks the so-called diffuse interfaces and encodes the interfacial physics at once. Typically, the phase-field equations are strongly nonlinear with higher-order spatial derivatives that account for the interfacial forces. From a numerical perspective, the higher-order partial-differential operators usually present in phase-field equations are difficult to deal with by standard finite element approaches that utilize C0 trial and weighting functions. In the first part of this presentation, I will show how our computational approach, based on Isogeometric Analysis, permits simple and efficient discretizations through the use of highly-continuous splines both in a Galerkin a collocation contexts. In the second part of my presentation I will focus on a particular application which involves the coupled thermomechanics of nanostructured shape memory alloys. I will present our strain-based phase-field model for cubic-to-tetragonal solid-solid tranformations, and I will illustrate the the effectiveness of our approach with several computations on various three-dimensional geometries.

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Thursday, January 23, Aula MS1, 10.30
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