Università degli Studi di Pavia

Dipartimento di Ingegneria Civile e Architettura (DICAr)

in collaboration with

Centro di Simulazione Numerica Avanzata – CeSNA

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SEMINAR

Locking in "solid-shell" NURBS-based finite elements: Extending the Enhanced Assumed Strain and Assumed Natural Strain methods for Isogeometric Analysis

Despite shell finite elements, either based on Kirchhoff or Mindlin formulations, are quite effective ways of modeling complex low thickness structures (being present in the majority of commercial codes), for some applications there is the special need of a higher generality. To this end, the so-called "solid-shell" formulations can be a nice alternative. These elements are topologically equivalent of solid (brick) elements, but with a preferential orientation (the thickness) related to which shell formulations can be developed. Compared to conventional shell elements, "solid-shell" elements can reproduce a full 3D stress field (no plane stress conditions are imposed) and double-sided contact in a natural fashion, which is extremely important in the simulation of plastic forming processes. The main disadvantage of such elements is the higher computational times and, more importantly, their sensitivity to transverse shear and volumetric locking phenomena. This presentation will show some preliminary results on the development of NURBS-based "solid-shell" formulations, proposing some extensions of well-known techniques to alleviate locking (namely, the Enhanced Assumed Strain (EAS) and Assumed Natural Strain (ANS) methods) to make them fully compatible to the Isogeometric Analysis (IGA) field.

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