Università degli Studi di Pavia
Computational Mechanics & Advanced Materials Group - DICAr

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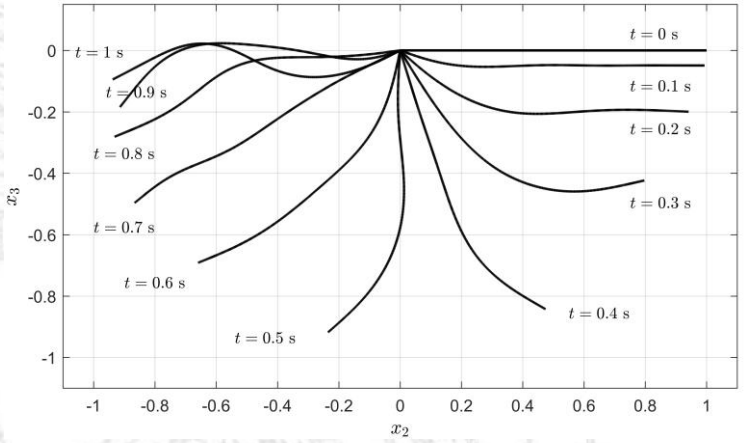
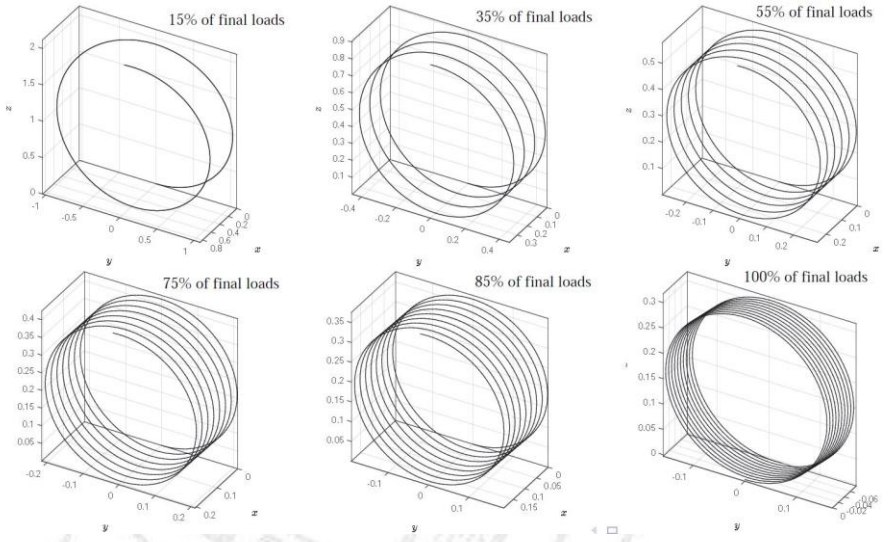
Virtual Modeling and Additive Manufacturing for Advanced Materials

SEMINAR

Isogeometric collocation for geometrically exact shear-deformable beams: statics and explicit dynamics

This talk will summarize the recent progresses in the development of isogeometric collocation methods for geometrically exact beams, considering both static (primal and mixed locking-free formulations) and dynamic problems (Marino 2016, Marino 2017 and Marino et al. 2019). With "geometrically exact" it is meant a kinematic model able to describe three-dimensional displacements and rotations without any restriction in magnitude and direction, and the associated strain measures are derived without introducing any approximation. In this framework, the main theoretical and computational complexities arise from the presence of finite rotations, which are represented by elements of the special orthogonal group SO(3). SO(3) is non-commutative (Lie) group where standard linearization procedures and time stepping schemes, as well as additive operations, are no longer valid. After a brief review of the governing equations, the talk will address the geometrically-consistent procedure for the linearization of the strong form of the governing equations, the update procedures, and the development of a SO(3)-consistent explicit time integration scheme. Several numerical applications will be shown and discussed. The talk will conclude with a short presentation of the work in progress and some ideas for future developments.





References:

Marino, E. (2016). Isogeometric collocation for three-dimensional geometrically exact shear-deformable beams. CMAME, 307, 383–410.

Marino, E. (2017). Locking-free isogeometric collocation formulation for three-dimensional geometrically exact shear-deformable beams with arbitrary initial curvature. CMAME, 324, 546–572.

Marino, E., Kiendl, J., & De Lorenzis, L. (2019). Explicit isogeometric collocation for the dynamics of three-dimensional beams undergoing finite motions. CMAME, 343, 530–549.

Prof. Enzo Marino

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November 12th, 4:00pm (sharp)

DICAr MS1 Meeting Room

Via Ferrata, 3 – Pavia