

**BEAMS: MODELS, NUMERICAL METHODS
AND THEIR APPLICATIONS
900 – STRUCTURAL MECHANICS, DYNAMICS AND
ENGINEERING**

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ABSTRACT

Over the years, improvements in geometrical approaches for 3D beam models and associated computational methods have resulted in a wide variety of applications, ranging from structural dynamics in space applications to bio-inspired flexible robot design and control, flexible hoses and pipes in real-time virtual prototyping of assembly tasks, and even in physically-based methods in the computer graphics community. With a central role played by Lie groups, and especially the group of rotations $SO(3)$ and its remarkably rich structure, the main drawbacks of the seminal methods of the pioneer works of J.C. Simo have been progressively overcome. Still, many issues in 3D beam problems remain open, all the more so as the complexity of real-world engineering problems very often requires combining several and not-yet-unified formulations or numerical schemes and exploring the limits of recently designed methods.

This mini-symposium is dedicated to 3D beam models, computational methods for beams and their applications. Topics of interest include, but are not limited to:

- Geometrical approaches to 3D beam problems in finite deformations
- Geometrically exact finite elements of beams in their various acceptations and flavors
- Cosserat beam models and associated numerical methods
- Precision and convergence of finite element methods for 3D beams, higher-order methods and locking phenomena
- Nonlinear stability and energy dissipation properties of numerical methods for beam elastodynamics
- Nonlinear vibrations of beams
- Modeling of beam structures based on anisotropic or heterogeneous materials
- Beam models for cables and wire-ropes
- Computational efficiency in beam simulations for large scale systems or real-time applications