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ABSTRACT:

The Physico-Geometric Paradigm in Nonlinear and Nonlocal Structural Mechanics

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Analysis of structures undergoing significant displacements and deformations is addressed. This topic has become increasingly crucial in tackling challenging applications involved in a broad spectrum of disciplines, including nanomechanics, electromechanics and biomechanics. Among these fields, design and optimization of small-scale flexible electronic devices have attracted particular attention. In this context, nonlocal continuum mechanics plays a fundamental role in ensuring a consistent representation of scale effects governing the behavior of nano-engineered materials and structures. Moreover, the reformulation of fundamental concepts and methodologies commonly adopted in nonlinear mechanics naturally emerges as a necessary step for accurately modeling structural systems undergoing large configuration changes. A new geometric paradigm is here proposed to definitely address issues and paradoxes in nonlinear mechanics of nonlocal structures. Both theoretical formulations and computational strategies are provided and discussed.