

PROCEEDINGS

Reformulation of the Virtual Fields Method Based on the Variation of Elastic Energy for Hyperelastic Materials

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ABSTRACT

This work deals with the parameter identification of invariant-based hyperelastic materials using the virtual fields method (VFM). Combined with the full-field deformation data obtained from the digital image correlation (DIC), VFM has been utilized to characterize the mechanical properties of hyperelastic materials [1]. In the conventional formulation of the VFM, the calculation of the internal virtual work (IVW) needs to obtain the stress and conjugate virtual strains, which requires a lot of calculation and derivation work. In this paper, the VFM is reformulated by calculating the IVW through the variation of elastic energy, which is more concise and easier to be implemented [2]. To illustrate this reformulated framework, a neo-Hookean-typed material and a fiber-reinforced neo-Hookean-typed material are selected for study, and biaxial tests which give rise to heterogeneous deformation fields are performed on these materials. Finally, material parameters are successfully extracted using the reformulated VFM framework.

KEYWORDS

Virtual fields method; variation of elastic energy; hyperelastic materials; parameter identification

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