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Orientation preservation and Newton-Raphson convergence in the case of an hyperelastic sphere subjected to an hydrostatic pressure. (English) [Zbl 1026.74074](#)
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Summary: We show that the incremental Newton-Raphson algorithm diverges if the orientation is not preserved. To illustrate this point, we treat the example of a compressible hyperelastic sphere subjected to hydrostatic pressure. The selected model is Blatz-Ko material. We also show that it is possible to choose an optimal step loading. This step guarantees at the same time the orientation preservation, the Newton-Raphson convergence and a minimum computing time.

MSC:

- [74S05](#) Finite element methods applied to problems in solid mechanics
- [74B20](#) Nonlinear elasticity
- [65N12](#) Stability and convergence of numerical methods for boundary value problems involving PDEs

Cited in **2** Documents

Keywords:

compressible hyperelastic sphere; Blatz-Ko material; Newton-Raphson convergence; orientation preservation; hydrostatic pressure; optimal step loading

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References:

- [1] Aron, M.; Christopher, C.; Wang, Y., On the straightening of compressible, nonlinearly elastic, annular cylindrical sectors, *Math. mech. solids*, 3, 131-145, (1998) · [Zbl 1001.74531](#)
- [2] Blatz, P.J.; Ko, W.L., Application of finite elastic theory to the deformation of rubbery materials, *Trans. soc. rheol.*, 6, 223-251, (1962)
- [3] Ciarlet, P.G., *Elasticité tridimensionnelle*, (1985), Collection RMA Masson · [Zbl 0572.73027](#)
- [4] Chung, D.T.; Horgan, C.O.; Abeyaratne, R., The finite deformation of internally pressurized hollow cylinders and spheres for a class of compressible elastic materials, *Int. J. solids struct.*, 22, 12, 1557-1570, (1986) · [Zbl 0603.73038](#)
- [5] Horgan, C.O.; Polignone, D.A., A note on the pure torsion of a circular cylinder for a compressible nonlinearly elastic material with nonconvex strain-energy, *J. elasticity*, 37, 167-178, (1995) · [Zbl 0817.73008](#)
- [6] Horgan, C.O., Remarks on ellipticity for the generalized blatz – ko constitutive model for a compressible nonlinearly elastic solid, *J. elasticity*, 42, 165-176, (1996) · [Zbl 0852.73019](#)
- [7] Peyraut, F.; Laped, N., Préservation de l'orientation et convergence de newton – raphson avec le modèle hyperélastique compressible de blatz – ko, *Rev. europ. éléments finis*, 10, 5, (2001) · [Zbl 1054.74073](#)
- [8] Wineman, A.S.; Waldron, W.K., Normal stress effects induced during circular shear of a compressible non-linear elastic cylinder, *Int. J. non-linear mech.*, 30, 3, 323-339, (1995) · [Zbl 0853.73014](#)

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