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Stability of Compressible Elastic Blocks

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Recently a new method of obtaining a full nonlinear stability analysis of inhomogeneous deformations of arbitrary hyperelastic has been found. This method replaces the second variation condition expressed as an integral involving arbitrary perturbations, with an equivalent system of (quadratically nonlinear) ordinary differential equations. The aim of this work is twofold. Firstly, we look at the bifurcation and stability of equi-biaxial plane strain loading of a cube (one version of Rivlin's cube) for compressible materials. This has some interesting features that are not apparent for incompressible materials. Secondly, we use this simple homogeneous problem, whereby stability can be obtained directly from the second variation condition, to compare with some analytical results and numerical results obtained from the system of differential equations.

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