STABILITY AND BIFURCATION CRITERIA FOR SPHERICAL ELASTIC SHELLS

E. Kirkinis[a] and D.M. Haughton[b]

University of Glasgow,
Mathematics, Glasgow G12 8QW, Scotland
[a] ek@maths.gla.ac.uk; [b]dmh@maths.gla.ac.uk

The method of adjacent equilibria (small deformations of the linearised equations superposed on a large one) is compared with the fully non-linear stability analysis introduced by Chen and Haughton (Proc. Roy. Soc. London A, 2003), for the inflation of a perfectly elastic incompressible and homogeneous spherically symmetric shell (an inhomogeneous deformation). The stability criterion, which relies on the second variation of the energy, leads to an integral inequality which is evaluated by solving a third order system of nonlinear ODE's, in contrast to the linear fourth order system of the bifurcation analysis. The non-linear stability analysis represents a significant advance on the early work of Pearson, Ericksen, Toupin and Hill. It remains to be seen if this approach can detect changes in stability where there is no associated bifurcation point (turning points of the post-bifurcation solution).