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Direct evaluation of the ‘worst’ imperfection shape in shell buckling. (English) Zbl 0924.73090
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Summary: For the evaluation of the imperfection-sensitivity of elastic and elastic-plastic shells a fully nonlinear finite-element-method has been developed that directly gives the ‘worst’ imperfection shape connected to the ultimate limit load. The approach uses no approximations such as asymptotical theories or computations in the deep postcritical range. The key point of the method is the description of imperfections as nodal degrees of freedom at the element level. These unknown quantities are implemented by isoparametric shape functions in a finite shell element including finite rotations and thickness stretch. The ultimate buckling load and the corresponding ‘worst’ imperfection shape is defined by two different criteria and numerically determined by an extended system of nonlinear equations. In the computation of the structurally stable collapse the deflections, the imperfection shape, the eigenvector and the lowest possible load-level are obtained. The method is illustrated by several numerical examples.

MSC:

[74G60](#) Bifurcation and buckling

[74K15](#) Membranes

[74S05](#) Finite element methods applied to problems in solid mechanics

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