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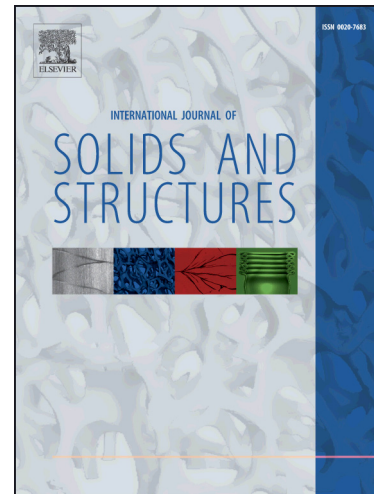
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Multistable grid and honeycomb shells

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Abstract

The manufacturing of multistable shells has been dominated by the use of pre-stressed and composite materials. Here we advocate the use of common materials through a simple design that requires no pre-stressing and has an initially developable geometry. A rudimentary demonstrator is constructed and serves as the starting point for further study. An existing homogenisation model for a lattice structure is combined with an analytical strain energy model from the literature to show the mechanical properties needed to construct an initially developable, bistable grid shell. The concept is also tested in a commercial Finite Element package, where a number of parametric studies are performed. Both the demonstrator and the FE model confirm the validity of the design while a series of parametric studies helps establish the limits of this behaviour with respect to local and global geometry of grid shell and honeycomb structures.

Keywords: multistable, shell, grid, honeycomb, composite

1 Introduction

This work addresses the challenge of designing initially developable, free-standing, multistable shells without the use of composite materials or pre-stressing. Multistable shells have been

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