

Parametric linear finite element stress and stability analysis of isotropic and orthotropic self-supporting Miura-ori structures

Tomi Kankkunen^{ab} · Jarkko Niiranen^a · Jarmo Kouko^b · Miia Palmu^b · Kirsi Peltonen^c

^a Civil engineering
Aalto University
Rakentajanaukio 4, 02150 Espoo,
Finland
e-mail: tomi.kankkunen@aalto.fi,
jarkko.niiranen@aalto.fi

^b Technical Research Centre of
Finland
VTT
P.O. Box 1000, FI-02044 VTT,
Finland
e-mail: jarmo.kouko@vtt.fi,
miia.palmu@vtt.fi

^c Mathematics and Systems
Analysis
Aalto University
P.O. Box 11000 (Otakaari 1B)
FI-00076
e-mail: kirsi.peltonen@aalto.fi

Abstract

Sandwich structures with Miura-ori cores have been studied especially in aerospace industry. However, by removing the face sheets one can obtain esthetical, multifunctional, self-supporting structures for various applications, such as packaging. This study focuses on the mechanical performance of planar, self-supporting Miura-ori structures under compressive loads. Through systematic variations of both origami geometry and base material orientation, this study performs linear stress and stability analyses by utilizing the finite element method. The results reveal the effects of the geometric parameters and the material orthotropy on the structural performance, finally resulting in parameter ranges forming a basis for structural design.

Keywords:

Origami structures, Miura-ori, paper fold, finite element analysis, structural analysis, packing

References

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