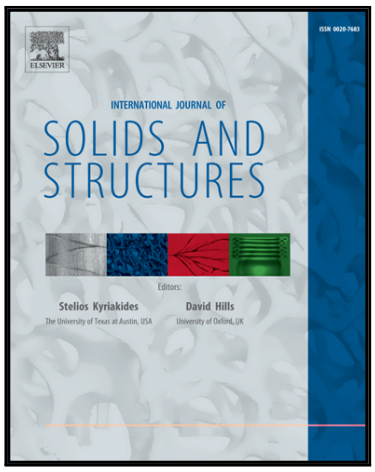

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PII: S0020-7683(16)30323-7
DOI: 10.1016/j.ijsolstr.2016.11.006
Reference: SAS 9358

To appear in: *International Journal of Solids and Structures*

Received date: 29 July 2016
Revised date: 21 October 2016
Accepted date: 2 November 2016

Please cite this article as: James Bird, Matthew Santer, Jonathan Morrison, The determination and enhancement of compliant modes for actuation in structural assemblies, *International Journal of Solids and Structures* (2016), doi: 10.1016/j.ijsolstr.2016.11.006

The determination and enhancement of compliant modes for actuation in structural assemblies

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Abstract

Linear algebra methods for determining modes of kinematic and static indeterminacy in jointed frames are extended to reveal modes of compliance in otherwise rigid assemblies. These modes are extracted from a structural model, based on finite elements, via a singular value decomposition and yield the ways in which a structure can be most easily deformed. This modal approach also allows for the formulation of a reduced-order structural model, whereby relevant modes are selected and used as the basis for the optimisation of a complaint structure. The method detailed is shown to be a useful design tool, demonstrated by its application to a structure based on the Kagome lattice geometry. For certain frameworks, first order effects produce tightening under actuation. As a result, a scheme to adjust the modes to take nonlinear effects into account is also given.

Keywords: Adaptive structures, Kagome lattice, SVD
2010 MSC: 00-01, 99-00

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