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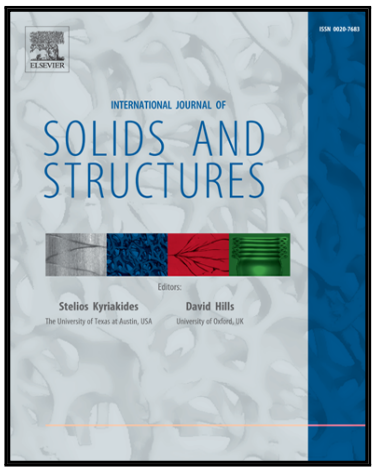

Perfectly Matched Layers for flexural waves in Kirchhoff-Love plates

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PII: S0020-7683(17)30514-0
DOI: 10.1016/j.ijsolstr.2017.11.009
Reference: SAS 9798

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

Received date: 24 June 2017
Revised date: 16 October 2017
Accepted date: 10 November 2017

Please cite this article as: M. Morvaridi, M. Brun, Perfectly Matched Layers for flexural waves in Kirchhoff-Love plates, *International Journal of Solids and Structures* (2017), doi: 10.1016/j.ijsolstr.2017.11.009

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Perfectly Matched Layers for flexural waves in Kirchhoff-Love plates

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Abstract

We propose Perfectly Matched Layers (PMLs) for flexural waves in plate structures. The analytical model is based on transformation optics techniques applied to the biharmonic fourth-order partial differential equation describing flexural vibrations in Kirchhoff-Love plates. We show that perfect boundary conditions are not an optimal solution, since they depend on the incident waves. The full analytical form of PMLs and zero reflection conditions at the boundary between homogeneous and PML domains are given. The implementation in a Finite Element (FEM) code is described and an eigenfrequency analysis is given as a possible methodology to check the implementation itself. A measure of the performances of the PMLs is introduced and the effects of element discretization, boundary conditions, frequency, dimension of the PML, amount of transformation and dissipation are detailed. It is shown that the model gives excellent results also when the applied load approaches the PML domain.

Keywords: Flexural Waves, Plates, Geometric Transformation, Perfectly Matched Layers, Cloaking, Harmonic Analysis

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Preprint submitted to International Journal of Solids and Structures

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