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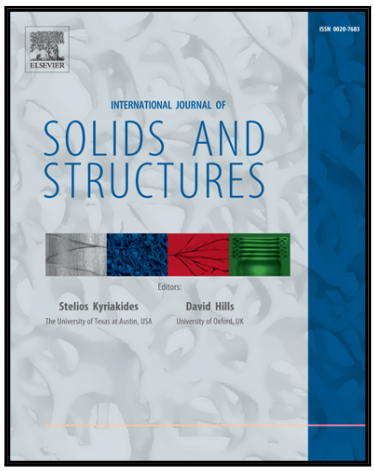

Perfectly Matched Layers for flexural waves: an exact analytical model

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Perfectly Matched Layers for flexural waves: an exact analytical model

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Abstract

In this paper we present an analytical model of Perfectly Matched Layers for flexural waves within elongated beam structures. The model is based on transformation optics techniques and it is shown to work both in time harmonic and transient regimes. A comparison between flexural and longitudinal waves is detailed and it is shown that the bending problem requires special interface conditions. A connection with transformation of eigenfrequencies and eigenmodes is given and the effect of the additional boundary conditions introduced at the border of the Perfectly Matched Layer domain is discussed in detailed. Such a model is particularly useful for Finite Element analyses pertaining propagating flexural waves in infinite domain.

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

1. Introduction

In engineering applications the necessity to model unbounded domains is often required. This is particular important in modeling of soil-structure interaction [1, 2, 3], fluid-solid interaction [4, 5], ground-borne noise and

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