

Simulation And Comparison Of A Band Gap Metamaterial Using A Relaxed Micromorphic Model

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Abstract

We present here an architected band-gap metamaterial, filtering mechanical waves in specific ranges of frequencies which, by its very specific geometry, challenges the simulation of linear elasticity problems including such elements. This unorthodox behaviour can be described as a continuous medium using the relaxed micromorphic model (RMM). We compare the frequency response of a finite micro-structured plate, coupled with piezoelectric actuators, using the RMM with the classical Cauchy material model. It has been shown that the RMM is able to describe the dynamic behaviour of such systems in both low and band-gap frequencies. Such modelization can be easily implemented in FE softwares as COMSOL Multiphysics® and significantly reduces the computational time of those systems.

Figures used in the abstract

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Figure 1 : Cell geometry

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Figure 2 : Constitutive equations

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Figure 3 : Cauchy band-gap

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Figure 4 : Micromorphic band-gap