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Transmission of Elastic Waves and Localised Modes in Composite Structures

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This work addresses the spectral analysis of elasticity problems in doubly periodic composite structures presented either by arrays of inclusions embedded into an elastic matrix or discrete lattice structures. Particular attention is paid to filtering properties, i.e. the presence of stop bands within the spectrum, and localised modes for composite structures containing defects. First, we consider a problem of propagation of elastic waves through an elastic medium containing an array of coated inclusions and show that the parameters of the coating can be tuned in such a way that, in the long-wave approximation, the elastic system responds as a homogeneous medium without inclusions. Further, we note that it is efficient to model localised eigen-modes using approximations involving lattice structures and show how to approximate accurately high-contrast densely packed composite structures by discrete lattices.

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