ANALYSIS AND DESIGN OF ELASTODYNAMIC WAVEGUIDES AND FILTERS

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It is well known that periodic composite materials exhibit dispersive behavior. This behavior can engender band-gap structures in which waves of certain frequency bands cannot propagate through the structure. The band-gap structure can be further exploited to create elastodynamic waveguides. Both band-gap and waveguide structures have practical application towards, e.g., vibration isolation and equipment protection.

This presentation highlights our ongoing research efforts in the Computational Mechanics Laboratory at the University of Michigan on modeling the elastodynamic behavior of composite structures. Global-local modeling, employing multiple scales and different sets of basis functions is shown. Analytical derivations and direct numerical simulations for 1D domains are presented to demonstrate several salient features of stopband behavior. Stopband design for infinite periodic 2D cells is discussed and is shown to be applicable to the design of finite periodic structures. Finally, methodology for creating 2D waveguides is highlighted by exploiting the results from the previous 1D and 2D studies.

References

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