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Multiscale dynamic modelling of thin and periodic structures

Modern trends in multiscale dynamic modelling of periodic and thin functionally graded structures are discussed. Similarity of the long wave procedures underlying two-dimensional shell and plate approximations and homogenization for periodic media is demonstrated, beginning with correspondence between shell thickness and periodicity cell size. The presented comparative study of two toy problems, dealing with a periodic string and anti-plane shear of a layered strip, subject to anti-plane shear, aims at clarifying the proposed vison. The main focus is on high frequency schemes, including high frequency long-wave approximations for thin structures and high frequency homogenization for periodic media, oriented to qualitative and quantitative analysis of microscale phenomena, in particular arising in modern metamaterials. The theoretical framework is illustrated by evaluating the dynamic response of periodic and layered structures. For the former, both continuous bodies and discrete lattices are considered. Numerical results for dispersion and localization of Floquet-Bloch and Lamb waves are presented. A practically important case of contrast material parameters is briefly addressed. Further prospects for knowledge transfer are also indicated.

Biography

Julius Kaplunov has received his PhD and DSc from the Institute for Problems in *Mechanics*. Moscow. He is a Professor and Head of *Mathematics* Research Centre at Keele University, UK. He has co-authored around 130 publications and served as an editorial board member of a number of reputed journals, such as *Mathematics* and *Mechanics* of *Solids* and *Mechanics of Time Dependent Materials.* His awards and honors include a Humboldt Fellowship at TU Munich, Russian State Prize in Science in Technology, along with visiting positions at University of Alberta, Bordeaux University, University of Modena, City University of Hong-Kong, and Tel-Aviv University.

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