Continuous limit of a traction-unstable metastructure

Andrea Nobili*†[1] and Dipendu Pramanik

[1]Università degli Studi di Modena e Reggio Emilia – Italy

Abstract

The continuous limit for a metamaterial composed of several unit cells which are unstable under traction is developed within the realm of elastodynamics. The resulting variational structure is crucially supplemented by a unilateral constraint, which turns the otherwise linear problem into a complementarity problem. Indeed, the absence of the unilateral constraint significantly alters the response of the system, notably missing the fundamental equilibrium state. We show that proper dealing with the unilaterally constrained Lagrangian leads to the reproduction at the macro-level of all the features exhibited by the microstructure. The Hamiltonian of the system is also discussed and plays a fundamental role in addressing the non-smooth transition between the equilibrium states.

*Speaker

†Corresponding author: andrea.nobili@unimore.it