Title : Explicit second gradients effects in periodic lattices

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Abstract

The classical result for the homogenization of period elastic structures envolves a local minimisation problem. This problem is set on the periodic cell and consists in determining the least energetic configuration at the microscopic level in a cell when the macroscopic strain is prescribed. In the discrete case of a periodic lattice made of nodes linked by extensional and flexional bars, this problem is a simple finite dimensional linear system and we show on different examples the homogenized behavior of such a lattice. We are particularly interested to lattices for which the homogenized rigidity is degenerate. In that case, it has been proved (see the talk "Homogenization of periodic elastic structures leading to second gradient effects") that the homogenized behavior is determined by a second local minimisation problem, similar to the previous one but with a different source term. The problem is again a finite dimensional linear system. As the new source term is a function of the gradient of the macroscopic strain tensor, the homogenized material is a second gradient material. We give examples of lattices exhibiting interesting second gradient effects.