The accelerated adaptive Eyre-Milton scheme for infinitely contrasted heterogeneous materials. Application to homogenization and damage problems.

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Abstract

Sab et al. (2024) have recently proposed an FFT-based iterative algorithm, termed Adaptive Eyre–Milton (AEM), for solving the Lippmann-Schwinger equation in the context of periodic homogenization of infinitely double contrasted linear elastic composites (heterogeneous materials with linear constitutive laws that contain both pores and rigid inclusions). They have demonstrated the unconditional linear convergence of this scheme, regardless of initialization and the chosen reference material. However, numerical simulations have shown that the rate of convergence of AEM strongly depends on the chosen reference material. In Dolbeau et al. (2024), the authors introduced a new version of the AEM scheme where the reference material is updated iteratively, resulting in a fast and versatile scheme, termed Accelerated Adaptive Eyre–Milton (A2EM).
We will present the A2EM scheme and examine the possibility of extending its application to standard nonlinear problems using the finite element method, for example the well-known phase-field damage problem.

References:

K. Sab, J. Bleyer, S. Brisard, M. Dolbeau, 2024. An FFT-based adaptive polarization method for infinitely contrasted media with guaranteed convergence, *Computer Methods in Applied Mechanics and Engineering* 427 (2024) 117012. doi:10.1016/j.cma.2024.117012.
M. Dolbeau, K. Sab, J. Bleyer, (2024) Accelerating the Adaptive Eyre-Milton FFT-based method for infinitely double contrasted media, *Comptes Rendus Mécanique*, to appear.

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