

Finite Element approximation of elliptic homogenization problems in nondivergence-form

Timo Sprekeler¹ Yves Capdeboscq² Endre Süli³

We use uniform $W^{2,p}$ estimates to obtain corrector results for periodic homogenization problems of the form $A(x/\varepsilon) : D^2 u_\varepsilon = f$ subject to a homogeneous Dirichlet boundary condition. We propose and rigorously analyze a numerical scheme based on finite element approximations for such nondivergence-form homogenization problems. The second part of this work focuses on the approximation of the corrector and numerical homogenization for the case of nonuniformly oscillating coefficients. Numerical experiments demonstrate the performance of the scheme.

References:

[1] Y. Capdeboscq, T. Sprekeler, and E. Süli. Finite Element Approximation of Elliptic Homogenization Problems in Nondivergence-Form, 2019, submitted. <https://arxiv.org/abs/1905.11756>

¹University of Oxford, Mathematical Institute, Woodstock Road, Oxford OX2 6GG, UK
timo.sprekeler@maths.ox.ac.uk

²Université de Paris, CNRS, Sorbonne Université, Laboratoire Jacques-Louis Lions UMR7598, Paris, France
yves.capdeboscq@sorbonne-universite.fr

³University of Oxford, Mathematical Institute, Woodstock Road, Oxford OX2 6GG, UK
endre.suli@maths.ox.ac.uk