DE05503885X
Pechstein, Clemens; Scheichl, Robert
Analysis of FETI methods for multiscale PDEs
Numer. Math. 111, No. 2, 293-333 (2008).

MSC Classification: 65N30 65N55

Keywords: finite element tearing and interconnecting methods; multiscale partial differential equations

Review text:

This paper is concerned with the convergence of a variant of the finite element tearing and interconnecting (FETI) methods for a model of elliptic problem with highly heterogeneous (multiscale) coefficients $\alpha(x)$; in particular, α can have strong variation within subdomains and/or jumps that are not aligned with the subdomain interfaces.

Thanks to a minimisation and cut–off arguments, the authors show rigorously that for an arbitrary (positive) coefficient function $\alpha \in L^\infty(\Omega)$ the condition number of the preconditioned FETI system can be bounded by $C(\alpha)(1 + \log(H/h))^2$, where H is the subdomain diameter and h is the mesh size. In addition to this, the coefficient $C(\alpha)$ depends only on the coefficient variation in the vicinity of subdomain interfaces. This yields the important particular case when $\alpha|_{\Omega_i}$ varies only midly in a layer $\Omega_{i,\eta}$ of width η near the boundary of each of the subdomain Ω_i, then $C(\alpha) = \mathcal{O}((H/\eta)^2)$, independent of the variation of α in the remainder $\Omega_i \backslash \Omega_{i,\eta}$ of each subdomain and independent of any jumps of α across subdomain interfaces. The authors, show that this quadratic dependence of $C(\alpha)$ on H/η can be relaxed to a linear dependence under stronger assumptions on the behavior of α in the interior of the subdomains. Numerical tests justifying the theoretical results are presented.

```
This is pdfeTeXk, Version 3.141592-1.30.4-2.2 (Web2C 7.5.5) (format=pdftex 2008.10.24)  21 AUG 2009 09:58
entering extended mode
 %&-line parsing enabled.
**./preview-05503885.tex
(./preview-05503885.tex
(./zb-basic.tex (/data/zmath/texlive/texmf-dist/tex/amstex/base/amstex.tex

AmS-TeX- Version 2.2

Loading definitions for misc utility macros, page layout, accents/punctuation,
line and page breaks, figures, comments, math spacing, fractions, smash command
s, large operator symbols, integrals, operator names, multilevel sub/superscrip
ts, matrices, multiline displays, continued fractions, compound symbols, variou
s kinds of dots, special superscripts, \text, math font commands, \newsymbol, b
old Greek and bold symbols, Euler fonts, math accents, roots, commutative diagr
ams, poor man's bold, syntax check, ... finished) (/data/zmath/texlive/texmf-di
st/tex/plain/amsfonts/amssym.tex) (/data/zmath/texlive/texmf-dist/tex/plain/ams
fonts/cyracc.def))
(./zb-preview.tex)
! Undefined control sequence.
<recently read> \dsp

l.10 ...tioned FETI system can be bounded by $\dsp
                                                  C(\alpha)(1+\log(H/h))^2$...
The control sequence at the end of the top line
of your error message was never \def'ed. If you have
misspelled it (e.g., '\hobx'), type 'I' and the correct
spelling (e.g., 'I\hbox'). Otherwise just continue,
and I'll forget about whatever was undefined.

[1{/data/zmath/texlive/texmf-var/fonts/map/pdftex/updmap/pdftex.map}] )</data/z
math/texlive/texmf-dist/fonts/type1/bluesky/cm/cmmi7.pfb></data/zmath/texlive/t
exmf-dist/fonts/type1/bluesky/cm/cmmi5.pfb></data/zmath/texlive/texmf-dist/font
s/type1/bluesky/cm/cmr7.pfb></data/zmath/texlive/texmf-dist/fonts/type1/bluesky
/cm/cmsy7.pfb></data/zmath/texlive/texmf-dist/fonts/type1/bluesky/cm/cmsy10.pfb
></data/zmath/texlive/texmf-dist/fonts/type1/bluesky/cm/cmmi10.pfb></data/zmath
/texlive/texmf-dist/fonts/type1/bluesky/cm/cmti10.pfb></data/zmath/texlive/texm
f-dist/fonts/type1/bluesky/cm/cmr10.pfb></data/zmath/texlive/texmf-dist/fonts/t
ype1/bluesky/cm/cmbx10.pfb>
Output written on preview-05503885.pdf (1 page, 48142 bytes).
```