

Adaptive finite element approximation of clusters of eigenvalues

Daniele Boffi

Dipartimento di Matematica “F. Casorati”. Università di Pavia
via Ferrata 1, I-27100 Pavia, Italy
daniele.boffi@unipv.it, <http://www-dimat.unipv.it/boffi>

ABSTRACT

We review a priori and a posteriori error estimates for eigenvalues and eigenfunctions arising from partial differential equations [1-2].

In this talk we discuss how the theory applies to multiple eigenvalues [3] and to clusters of eigenvalues. In particular, we focus on a posteriori estimates for nonconforming finite elements [4-5]. It turns out that not only multiple eigenvalues but also clusters of eigenvalues have to be taken into consideration when designing adaptive schemes [6].

In this spirit, we present a result obtained in collaboration with D. Gallistl, F. Gardini, and L. Gastaldi, where it is proved the optimal convergence of the adaptive scheme for the approximation of clusters of eigenvalues arising from elliptic partial differential equations in mixed form.

REFERENCES

- [1] D. Boffi, “Finite element approximation of eigenvalue problems”, *Acta Numer.*, **19**, 1-120 (2010).
- [2] D. Boffi, F. Gardini, L. Gastaldi, “Some remarks on eigenvalue approximation by finite elements”, in *Frontiers in Numerical Analysis – Durham 2010*, Springer lecture notes in Computational Science and Engineering, **85**, 1-77 (2012).
- [3] D. Boffi, L. Gastaldi, “Some remarks on finite element approximation of multiple eigenvalues”, *Appl. Numer. Math.*, **79**, 18-28 (2014).
- [4] E. Dari, R.G. Durán, C. Padra, “A posteriori error estimates for non-conforming approximation of eigenvalue problems”, *Appl. Numer. Math.*, **62**, 580-591 (2012).
- [5] D. Boffi, R.G. Durán, L. Gastaldi, “A posteriori error analysis for nonconforming approximation of multiple eigenvalues”, *ArXiv:1404.5560 [math.NA]*.
- [6] D. Gallistl, “Adaptive nonconforming finite element approximation of eigenvalue clusters”, *Comput. Methods Appl. Math.*, **14**, 509-535 (2014).