

Adaptive solutions of eigenvalue problems for PDEs

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We introduce a new adaptive algorithm (AFEMLA) for elliptic PDE-eigenvalue problems. In contrast to other approaches the algebraic eigenvalue problem does not have to be solved to full accuracy. It incorporates the iterative solution of the resulting finite dimensional algebraic eigenvalue problem in the adaptation process in order to balance the cost with the costs for the iterative eigenvalue method.

In order to determine the error estimates, we only solve the algebraic eigenvalue problem on the current coarse grid and use classical perturbation results from finite dimensional eigenvalue problems to determine the errors on the fine mesh. The accuracy of the method is guaranteed by using a posteriori error estimators that incorporate the discretization errors, approximation errors in the eigenvalue solver and roundoff errors.

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