On the optimality of the inexact inverse iteration coupled with adaptive finite element methods

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In this talk we study the convergence of the inverse iteration where the intermediate problems are solved only approximately. In particular we are interested in finding an approximation of an eigenvector corresponding to the smallest eigenvalue of an elliptic operator L. We show that this inexact inverse iteration converges if the tolerances are chosen appropriately. As a direct consequence using adaptive finite element methods (AFEM) for the approximate solution of the intermediate elliptic problems yields a convergent algorithm. Moreover we will show that under mild assumptions on the operator L the inexact inverse iteration coupled with AFEM exhibits quasi-optimal convergence rates governed by the approximability of the eigenvector. This is surprising since in general the convergence rates of the intermediate elliptic problems deteriorate from convergence rate of the inexact inverse iteration. This is due to the fact that the exact solutions of the intermediate problems are in general not in the same approximation class as the eigenvectors.

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