On the Convergence of a Preconditioned Gradient Subspace Eigensolver with Rayleigh Ritz Acceleration

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The topic of this talk is the convergence analysis of a preconditioned subspace eigensolver for the FE discretizations of self-adjoint and elliptic partial differential operators. This eigensolver aims at the computation of a few of the smallest eigenvalues and the associated invariant subspace. The Rayleigh Ritz procedure is applied on a subspace spanned by the current subspace iterate and its preconditioned residual to accelerate the convergence. The convergence analysis is based on the analysis of the associated vectorial eigensolver and uses the Sion's minimax theorem.

The efficiency of this eigensolver is demonstrated by solving an eigenvalue problem with more than 50 millions degrees of freedom within our AMPE (Adaptive Multigrid Preconditioned Eigensolver) software.

References:

[1] Klaus Neymeyr and Ming Zhou, The block preconditioned steepest descent iteration for elliptic operator eigenvalue problems. Electron. Trans. Numer. Anal. 41, 93-108, 2014.

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