

PRECONDITIONED EIGENSOLVERS—AN OXYMORON?*

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Abstract. A short survey of some results on preconditioned iterative methods for symmetric eigenvalue problems is presented. The survey is by no means complete and reflects the author's personal interests and biases, with emphasis on author's own contributions. The author surveys most of the important theoretical results and ideas which have appeared in the Soviet literature, adding references to work published in the western literature mainly to preserve the integrity of the topic. The aim of this paper is to introduce a systematic classification of preconditioned eigensolvers, separating the choice of a preconditioner from the choice of an iterative method. A formal definition of a preconditioned eigensolver is given. Recent developments in the area are mainly ignored, in particular, on Davidson's method. Domain decomposition methods for eigenproblems are included in the framework of preconditioned eigensolvers.

Key words. eigenvalue, eigenvector, iterative methods, preconditioner, eigensolver, conjugate gradient, Davidson's method, domain decomposition.

AMS subject classifications. 65F15, 65F50, 65N25.

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