

New developments for the block divide-and-conquer eigensolver

Wilfried N. Gansterer¹ and Michael Moldaschl¹

¹ *Faculty of Computer Science, University of Vienna*

emails: wilfried.gansterer@univie.ac.at, michael.moldaschl@univie.ac.at

Abstract

In many situations, the block divide-and-conquer (BD&C) algorithm is an attractive method for computing all eigenpairs (eigenvalues *and* eigenvectors) of symmetric matrices with band or block tridiagonal structure. So far it has been unclear whether it is possible to implement this algorithm such that the computation of eigenvalues *only* can be performed more efficiently than the computation of complete eigenpairs.

We discuss algorithmic challenges and performance trade-offs arising in this context. We present a new variant of the BD&C method and show that our implementation of this new approach achieves speedups over the existing BD&C method if only eigenvalues are computed. Moreover, we summarize experimental comparisons to the routines available in LAPACK.

Key words: block divide-and-conquer eigensolver; banded eigenvalue problems; block tridiagonal eigenvalue problems; runtime performance.