
Dennis C. Smolarski
**Implementing Chebyshev Iteration on Parallel
Architectures: Some Preliminary Results**

Department of Mathematics and Computer Science
Santa Clara University
500 El Camino Real
Santa Clara
CA 95053-0290

`dsmolarski@math.scu.edu`

Paul E. Saylor
F. Douglas Swesty
Ryan S. Szymowski

One of the known bottlenecks to parallel scalability of Krylov subspace algorithms is the need for inner products. For this reason, Chebyshev iteration has often been mentioned, but rarely studied, as an optimal Krylov subspace algorithm for parallel architectures since it does not require the inner products if the iterative parameters are known.

In this paper, we consider CHEBYCODE, a hybrid Chebyshev algorithm developed by Howard Elman, Steve Ashby, and Tom Manteuffel, that estimates iterative parameters by means of variants of the power method. A parallel F90+MPI implementation of this algorithm was recently developed by Ryan Szymowski and we have been employing this algorithm in conjunction with sparse, parallel approximate inverse preconditioners in radiation transport simulations. We present some preliminary results on the scalability and effectiveness of this method in comparison with other Krylov subspace algorithms.