

Seminarium: Grootschalige lineaire algebra en model reductie, voorjaar 2003

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Programma

1ste dag, 4 maart

- WM** LES 1: Krylov ruimten en basis voor Krylov ruimte [35, Ch.2] effect van verlies van orthogonaliteit (zie ook artikel van Daniel, Gragg, Kaufmann and Stewart [10]. Meer informatie in [27, 29, 22, 7, 8, 20, 18, 17, 19]).
- JW** LES 2: Lanczos, Arnoldi, Two-sided Lanczos, met goede afleiding van de gereduceerde matrices [28] (en [1, 36, 3]).

2de dag, 11 maart

- LH** LES 1: Bi-CG, QMR [35, Ch.6] ([11, 16, 6])
- MS** LES 2: CGS [35, Ch.6] ([31]), BiCGSTAB [35, Ch.8] ([34, 6])

3de dag, 18 maart

Geen seminarium

4de dag, 25 maart

- BM** LES 1: Eigenwaarden en Ritz waarden, Ritzvectoren [36, Ch.5] ([26, 3])
- WM** LES 2: Harmonische Ritz waarden, Harmonische Ritzvectoren [36, Ch.5] ([24, 25, 3])

5de dag, 1 april

- JW** LES 1: Jacobi-Davidson [36, Ch.9] ([30, 12])
- LH** LES 2: Jacobi-Davidson en circuitanalyse [9] ([21])

6de dag, 8 april

Geen seminarium

7de dag, 15 april

- MS** LES 1: $f(A)$ [33] ([35, Ch.12]), $\text{sign}(A)$ [2]
- BM** LES 2: QCD [32]

Referenties

- [1] W. E. ARNOLDI, *The principle of minimized iteration in the solution of the matrix eigenvalue problem*, Quart. Appl. Math., 9 (1951), pp. 17–29.
- [2] Z. BAI AND J. DEMMEL, *Using the matrix sign function to compute invariant subspaces*, SIAM J. Matrix Anal. Appl., 19 (1998), pp. 205–225 (electronic).
- [3] Z. BAI, J. DEMMEL, J. DONGARRA, A. RUHE, AND H. VAN DER VORST, eds., *Templates for the solution of algebraic eigenvalue problems*, Society for Industrial and Applied Mathematics (SIAM), Philadelphia, PA, 2000. A practical guide.
- [4] Z. BAI, P. FELDMANN, AND R. W. FREUND, *How to make theoretically passive reduced-order models passive in practice*, in Proceedings of the IEEE 1998 Custom Integrated Circuits Conference, IEEE, 1998, pp. 207–210.
- [5] Z. BAI AND Q. YE, *Error estimation of the Padé approximation of transfer functions via the Lanczos process*, Electron. Trans. Numer. Anal., 7 (1998), pp. 1–17 (electronic). Large scale eigenvalue problems (Argonne, IL, 1997).
- [6] R. BARRETT, M. BERRY, T. F. CHAN, J. DEMMEL, J. DONATO, J. DONGARRA, V. EIJKHOUT, R. POZO, C. ROMINE, AND H. VAN DER VORST, *Templates for the Solution of Linear Systems: Building Blocks for Iterative Methods*, Society for Industrial and Applied Mathematics (SIAM), Philadelphia, PA, 1994.
- [7] A. BJÖRCK, *Solving linear least squares problems by Gram-Schmidt orthogonalisation*, BIT, 7 (1967), pp. 1–21.
- [8] Å. BJÖRCK AND C. C. PAIGE, *Loss and recapture of orthogonality in the modified Gram-Schmidt algorithm*, SIAM J. Matrix Anal. Appl., 13 (1992), pp. 176–190.
- [9] W. BOMHOF, *Jacobi-Davidson methods for eigenvalue problems in pole zero analysis*, Unclassified Report 012/97, National Laboratory, Philips Electronics, Eindhoven, the Netherlands, July 1997.
- [10] J. DANIEL, W. GRAGG, L. KAUFMAN, AND G. STEWART, *Reorthogonalization and stable algorithms for updating the Gram-Schmidt QR factorization*, Math. Comp., 30 (1976), pp. 772–795.
- [11] R. FLETCHER, *Conjugate gradient methods for indefinite systems*, in Numerical Analysis Dundee 1975, Lecture Notes in Mathematics 506, G. Watson, ed., Berlin, Heidelberg, New York, 1976, Springer-Verlag, pp. 73–89.
- [12] D. R. FOKKEMA, G. L. G. SLEIJPEN, AND H. A. VAN DER VORST, *Jacobi-Davidson style QR and QZ algorithms for the reduction of matrix pencils*, SIAM J. Sci. Comput., 20 (1999), pp. 94–125 (electronic).
- [13] R. W. FREUND, *Reduced-order modeling techniques based on Krylov subspaces and their use in circuit simulation*, Tech. Report Numerical Analysis Manuscript No. 98–3–02, Bell Laboratories, Murray Hill, New Jersey, USA, 1998. To appear in *Applied and Computational Control, Signals, and Circuits*.
- [14] ———, *Krylov-subspace methods for reduced-order modeling in circuit simulation*, Tech. Report Numerical Analysis Manuscript No. 98–3–02, Bell Laboratories, Murray Hill, New Jersey, USA, 1999. To appear in ???
- [15] R. W. FREUND AND P. FELDMANN, *Reduced-order modeling of large linear passive multi-terminal circuits using matrix-Padé approximation*, in Proceedings of the Design, Automation and Test in Europe Conference 1998, IEEE Computer Society Press, 1998, pp. 530–537.
- [16] R. W. FREUND AND N. M. NACHTIGAL, *QMR: a quasi-minimal residual method for non-Hermitian linear systems*, Numer. Math., 60 (1991), pp. 315–339.
- [17] L. GIRAUD AND L. J. LANGOU, *Robust selective Gram-Schmidt reorthogonalization*, Technical Report TR/PA/02/52, CERFACS, Toulouse, France, 2002. Submitted to SISC Copper Mountain Special Issue.
- [18] ———, *When modified Gram-Schmidt generates a well-conditioned set of vectors*, IMA Journal of Numerical Analysis, 22 (2002), pp. 521–528.

- [19] L. GIRAUD, L. JUCIEN, AND R. MIRO, *On the round-off error analysis of the Gram-Schmidt algorithm with reorthogonalization*, Technical Report TR/PA/02/33, CERFACS, Toulouse, France, 2002.
- [20] A. GREENBAUM, M. ROZLOŽNÍK, AND Z. STRAKOŠ, *Numerical behaviour of the modified Gram-Schmidt GMRES implementation*, BIT, 37 (1997), pp. 706–719. Direct methods, linear algebra in optimization, iterative methods (Toulouse, 1995/1996).
- [21] E. J. GRIMME, D. C. SORENSEN, AND P. VAN DOOREN, *Model reduction of state space systems via an implicitly restarted Lanczos method*, Numer. Algorithms, 12 (1996), pp. 1–31.
- [22] W. HOFFMANN, *Iterative algorithms for Gram-Schmidt orthogonalization*, Computing, 41 (1989), pp. 335–348.
- [23] C. LANCZOS, *An iteration method for the solution of the eigenvalue problem of linear differential and integral operators*, J. Res. Nat. Bur. Stand., 45 (1950), pp. 255–282.
- [24] R. B. MORGAN, *Computing interior eigenvalues of large matrices*, Linear Algebra Appl., 154/156 (1991), pp. 289–309.
- [25] C. C. PAIGE, B. N. PARLETT, AND H. A. VAN DER VORST, *Approximate solutions and eigenvalue bounds from Krylov subspaces*, Numer. Linear Algebra Appl., 2 (1995), pp. 115–133.
- [26] B. N. PARLETT, *The Symmetric Eigenvalue Problem*, Prentice-Hall Series in Computational Mathematics, Prentice-Hall, Englewood Cliffs, N.J., 1980.
- [27] A. RUHE, *Numerical aspects of Gram-Schmidt orthogonalization of vectors*, Linear Algebra Appl., 52/53 (1983), pp. 591–601.
- [28] Y. SAAD, *Numerical Methods for Large Eigenvalue Problems*, Manchester University Press, Manchester, UK, 1992.
- [29] G. L. G. SLEIJPEN, *Gram-Schmidt orthogonalisation*. Personal notes, Januari 2000.
- [30] G. L. G. SLEIJPEN AND H. A. VAN DER VORST, *A Jacobi-Davidson iteration method for linear eigenvalue problems*, SIAM J. Matrix Anal. Appl., 17 (1996), pp. 401–425.
- [31] P. SONNEVELD, *CGS, a fast Lanczos-type solver for nonsymmetric linear systems*, SIAM J. Sci. Statist. Comput., 10 (1989), pp. 36–52.
- [32] J. VAN DEN ESHOF, *Analysis of nested iteration methods for nonlinear problems*, Ph.D. thesis, Utrecht University, Utrecht, The Netherlands, September 2003.
- [33] H. A. VAN DER VORST, *An iterative solution method for solving $f(A)x = b$, using Krylov subspace information obtained for the symmetric positive definite matrix A* , J. Comput. Appl. Math., 18 (1987), pp. 249–263.
- [34] H. A. VAN DER VORST, *Bi-CGSTAB: A fast and smoothly converging variant of Bi-CG for the solution of nonsymmetric linear systems*, SIAM J. Sci. Stat. Comput., 13 (1992), pp. 631–644.
- [35] H. A. VAN DER VORST, *Iterative methods for large linear systems*. Lecture notes on iterative methods, June 2002.
- [36] H. A. VAN DER VORST, *Computational Methods for Large Eigenvalue Problems*, Elsevier, North Holland, 2003. To be published.