

## References

- [1] R. Alcouffe, A. Brandt, J. Dendy, and J. Painter, *The multigrid method for diffusion equations with strongly discontinuous coefficients*, SIAM J. Sci. Statist. Comput., 2 (1981), pp. 430–454.
- [2] M. Arioli and C. Fassino, *Roundoff error analysis of algorithms based on Krylov subspace methods*, BIT, 36 (1996), pp. 189–205.
- [3] S. F. Ashby, P. N. Brown, M. R. Dorr, and A. C. Hindmarsh, *A linear algebraic analysis of diffusion synthetic acceleration for the Boltzmann transport equation*, SIAM J. Numer. Anal., 32 (1995), pp. 179–214.
- [4] S. F. Ashby, R. D. Falgout, S. G. Smith, and T. W. Fogwell, *Multigrid preconditioned conjugate gradients for the numerical simulation of groundwater flow on the Cray T3D*, American Nuclear Society Proceedings, Portland, OR, 1995.
- [5] S. F. Ashby, T. A. Manteuffel, and P. E. Saylor, *A taxonomy for conjugate gradient methods*, SIAM J. Numer. Anal., 27 (1990), pp. 1542–1568.
- [6] O. Axelsson, *A generalized SSOR method*, BIT, 13 (1972), pp. 442–467.
- [7] O. Axelsson, *Bounds of eigenvalues of preconditioned matrices*, SIAM J. Matrix Anal. Appl., 13 (1992), pp. 847–862.
- [8] O. Axelsson and H. Lu, *On eigenvalue estimates for block incomplete factorization methods*, SIAM J. Matrix Anal. Appl., 16 (1995), pp. 1074–1085.
- [9] N. S. Bakhvalov, *On the convergence of a relaxation method with natural constraints on the elliptic operator*, U.S.S.R. Comput. Math. and Math. Phys., 6 (1966), pp. 101–135.
- [10] 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*, SIAM, Philadelphia, PA, 1995.
- [11] T. Barth and T. Manteuffel, *Variable metric conjugate gradient methods*, in PCG ‘94: Matrix Analysis and Parallel Computing, M. Natori and T. Nodera, eds., Yokohama, 1994.
- [12] T. Barth and T. Manteuffel, *Conjugate gradient algorithms using multiple recursions*, in Linear and Nonlinear Conjugate Gradient-Related Methods, L. Adams and J. L. Nazareth, eds., SIAM, Philadelphia, PA, 1996.
- [13] R. Beauwens, *Approximate factorizations with S/P consistently ordered M-factors*, BIT, 29 (1989), pp. 658–681.
- [14] R. Beauwens, *Modified incomplete factorization strategies*, in Preconditioned Conjugate Gradient Methods, O. Axelsson and L. Kolotilina, eds., Lecture Notes in Mathematics 1457, Springer-Verlag, Berlin, New York, 1990, pp. 1–16.

- [15] M. W. Benson and P. O. Frederickson, *Iterative solution of large sparse systems arising in certain multidimensional approximation problems*, Utilitas Math., 22 (1982), pp. 127–140.
- [16] M. Benzi, C. D. Meyer, and M. Tůma, *A sparse approximate inverse preconditioner for the conjugate gradient method*, SIAM J. Sci. Comput., 17 (1996), pp. 1135–1149.
- [17] M. Benzi and M. Tůma, *A sparse approximate inverse preconditioner for nonsymmetric linear systems*, SIAM J. Sci. Comput., to appear.
- [18] J. H. Bramble, *Multigrid Methods*, Longman Scientific and Technical, Harlow, U.K., 1993.
- [19] A. Brandt, *Multilevel adaptive solutions to boundary value problems*, Math. Comp., 31 (1977), pp. 333–390.
- [20] C. Brezinski, M. Redivo Zaglia, and H. Sadok, *Avoiding breakdown and near-breakdown in Lanczos type algorithms*, Numer. Algorithms, 1 (1991), pp. 199–206.
- [21] W. L. Briggs, *A Multigrid Tutorial*, SIAM, Philadelphia, PA, 1987.
- [22] P. N. Brown, *A theoretical comparison of the Arnoldi and GMRES algorithms*, SIAM J. Sci. Statist. Comput., 20 (1991), pp. 58–78.
- [23] P. N. Brown and A. C. Hindmarsh, *Matrix-free methods for stiff systems of ODE's*, SIAM J. Numer. Anal., 23 (1986), pp. 610–638.
- [24] T. F. Chan and H. C. Elman, *Fourier analysis of iterative methods for elliptic boundary value problems*, SIAM Rev., 31 (1989), pp. 20–49.
- [25] R. Chandra, *Conjugate Gradient Methods for Partial Differential Equations*, Ph.D. dissertation, Yale University, New Haven, CT, 1978.
- [26] P. Concus and G. H. Golub, *A generalized conjugate gradient method for nonsymmetric systems of linear equations*, in Computing Methods in Applied Sciences and Engineering, R. Glowinski and J. L. Lions, eds., Lecture Notes in Economics and Mathematical Systems 134, Springer-Verlag, Berlin, New York, 1976, pp. 56–65.
- [27] P. Concus, G. H. Golub, and D. P. O'Leary, *A generalized conjugate gradient method for the numerical solution of elliptic partial differential equations*, in Sparse Matrix Computations, J. R. Bunch and D. J. Rose, eds., Academic Press, New York, 1976.
- [28] J. Cullum, *Iterative methods for solving  $Ax = b$ , GMRES/FOM versus QMR/BiCG*, Adv. Comput. Math., 6 (1996), pp. 1–24.
- [29] J. Cullum and A. Greenbaum, *Relations between Galerkin and norm-minimizing iterative methods for solving linear systems*, SIAM J. Matrix Anal. Appl., 17 (1996), pp. 223–247.
- [30] J. Cullum and R. Willoughby, *Lanczos Algorithms for Large Symmetric Eigenvalue Computations, Vol. I. Theory*, Birkhäuser Boston, Cambridge, MA, 1985.
- [31] J. Demmel, *The condition number of equivalence transformations that block diagonalize matrix pencils*, SIAM J. Numer. Anal., 20 (1983), pp. 599–610.
- [32] J. J. Dongarra, J. R. Bunch, C. B. Moler, and G. W. Stewart, *LINPACK Users' Guide*, SIAM, Philadelphia, PA, 1979.
- [33] J. Drkošová, A. Greenbaum, M. Rozložník, and Z. Strakoš, *Numerical stability of the GMRES method*, BIT, 3 (1995), pp. 309–330.
- [34] V. Druskin, A. Greenbaum, and L. Knizhnerman, *Using nonorthogonal Lanczos vectors in the computation of matrix functions*, SIAM J. Sci. Comput., to appear.
- [35] V. Druskin and L. Knizhnerman, *Error bounds in the simple Lanczos procedure for computing functions of symmetric matrices and eigenvalues*, Comput. Math. Math. Phys., 31 (1991), pp. 20–30.

- [36] M. Dryja and O. B. Widlund, *Some domain decomposition algorithms for elliptic problems*, in Iterative Methods for Large Linear Systems, L. Hayes and D. Kincaid, eds., Academic Press, San Diego, CA, 1989, pp. 273–291.
- [37] T. Dupont, R. P. Kendall, and H. H. Rachford, Jr., *An approximate factorization procedure for solving self-adjoint elliptic difference equations*, SIAM J. Numer. Anal., 5 (1968), pp. 559–573.
- [38] M. Eiermann, *Fields of values and iterative methods*, Linear Algebra Appl., 180 (1993), pp. 167–197.
- [39] M. Eiermann, *Fields of values and iterative methods*, talk presented at Oberwolfach meeting on Iterative Methods and Scientific Computing, Oberwolfach, Germany, April, 1997, to appear.
- [40] S. Eisenstat, H. Elman, and M. Schultz, *Variational iterative methods for nonsymmetric systems of linear equations*, SIAM J. Numer. Anal., 20 (1983), pp. 345–357.
- [41] S. Eisenstat, J. Lewis, and M. Schultz, *Optimal block diagonal scaling of block 2-cyclic matrices*, Linear Algebra Appl., 44 (1982), pp. 181–186.
- [42] L. Elsner, *A note on optimal block scaling of matrices*, Numer. Math., 44 (1984), pp. 127–128.
- [43] M. Engeli, T. Ginsburg, H. Rutishauser, and E. Stiefel, *Refined Iterative Methods for Computation of the Solution and the Eigenvalues of Self-adjoint Boundary Value Problems*, Birkhäuser-Verlag, Basel, Switzerland, 1959.
- [44] V. Faber, W. Joubert, M. Knill, and T. Manteuffel, *Minimal residual method stronger than polynomial preconditioning*, SIAM J. Matrix Anal. Appl., 17 (1996), pp. 707–729.
- [45] V. Faber and T. Manteuffel, *Necessary and sufficient conditions for the existence of a conjugate gradient method*, SIAM J. Numer. Anal., 21 (1984), pp. 352–362.
- [46] V. Faber and T. Manteuffel, *Orthogonal error methods*, SIAM J. Numer. Anal., 24 (1987), pp. 170–187.
- [47] K. Fan, *Note on M-matrices*, Quart. J. Math. Oxford Ser., 11 (1960), pp. 43–49.
- [48] J. Favard, *Sur les polynomes de Tchebicheff*, C. R. Acad. Sci. Paris, 200 (1935), pp. 2052–2053.
- [49] R. P. Fedorenko, *The speed of convergence of one iterative process*, U.S.S.R. Comput. Math. and Math. Phys., 1 (1961), pp. 1092–1096.
- [50] B. Fischer, *Polynomial Based Iteration Methods for Symmetric Linear Systems*, Wiley-Teubner, Leipzig, 1996.
- [51] R. Fletcher, *Conjugate gradient methods for indefinite systems*, in Proc. Dundee Biennial Conference on Numerical Analysis, G. A. Watson, ed., Springer-Verlag, Berlin, New York, 1975.
- [52] G. E. Forsythe and E. G. Strauss, *On best conditioned matrices*, Proc. Amer. Math. Soc., 6 (1955), pp. 340–345.
- [53] R. W. Freund, *A transpose-free quasi-minimal residual algorithm for non-Hermitian linear systems*, SIAM J. Sci. Comput., 14 (1993), pp. 470–482.
- [54] 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.
- [55] R. Freund and S. Ruscheweyh, *On a class of Chebyshev approximation problems which arise in connection with a conjugate gradient type method*, Numer. Math., 48 (1986), pp. 525–542.
- [56] E. Giladi, G. H. Golub, and J. B. Keller, *Inner and outer iterations for the Chebyshev algorithm*, SCCM-95-10 (1995), Stanford University, Palo Alto. To appear in SIAM J. Numer. Anal.

- [57] G. H. Golub and G. Meurant, *Matrices, moments, and quadratures II or how to compute the norm of the error in iterative methods*, BIT, to appear.
- [58] G. H. Golub and D. P. O'Leary, *Some history of the conjugate gradient and Lanczos algorithms: 1948–1976*, SIAM Rev., 31 (1989), pp. 50–102.
- [59] G. H. Golub and M. L. Overton, *The convergence of inexact Chebyshev and Richardson iterative methods for solving linear systems*, Numer. Math., 53 (1988), pp. 571–593.
- [60] G. H. Golub and Z. Strakoš, *Estimates in Quadratic Formulas*, Numer. Algorithms, 8 (1994), pp. 241–268.
- [61] G. H. Golub and R. S. Varga, *Chebyshev semi-iterative methods, successive overrelaxation iterative methods, and second-order Richardson iterative methods, parts I and II*, Numer. Math., 3 (1961), pp. 147–168.
- [62] J. F. Grcar, *Analyses of the Lanczos Algorithm and of the Approximation Problem in Richardson's Method*, Ph.D. dissertation, University of Illinois, Urbana, IL, 1981.
- [63] A. Greenbaum, *Comparison of splittings used with the conjugate gradient algorithm*, Numer. Math., 33 (1979), pp. 181–194.
- [64] A. Greenbaum, *Analysis of a multigrid method as an iterative technique for solving linear systems*, SIAM J. Numer. Anal., 21 (1984), pp. 473–485.
- [65] A. Greenbaum, *Behavior of slightly perturbed Lanczos and conjugate gradient recurrences*, Linear Algebra Appl., 113 (1989), pp. 7–63.
- [66] A. Greenbaum, *Estimating the attainable accuracy of recursively computed residual methods*, SIAM J. Matrix Anal. Appl., to appear.
- [67] A. Greenbaum, *On the role of the left starting vector in the two-sided Lanczos algorithm*, in Proc. Dundee Biennial Conference on Numerical Analysis, 1997, to appear.
- [68] A. Greenbaum and L. Gurvits, *Max-min properties of matrix factor norms*, SIAM J. Sci. Comput., 15 (1994), pp. 348–358.
- [69] A. Greenbaum, V. Ptak, and Z. Strakoš, *Any nonincreasing convergence curve is possible for GMRES*, SIAM J. Matrix Anal. Appl., 17 (1996), pp. 465–469.
- [70] A. Greenbaum, M. Rozložník, and Z. Strakoš, *Numerical behavior of the MGS GMRES implementation*, BIT, to appear.
- [71] A. Greenbaum and Z. Strakoš, *Predicting the behavior of finite precision Lanczos and conjugate gradient computations*, SIAM J. Matrix Anal. Appl., 13 (1992), pp. 121–137.
- [72] A. Greenbaum and Z. Strakoš, *Matrices that generate the same Krylov residual spaces*, in Recent Advances in Iterative Methods, G. Golub, A. Greenbaum, and M. Luskin, eds., Springer-Verlag, Berlin, New York, 1994, pp. 95–118.
- [73] L. Greengard and V. Rokhlin, *A Fast Algorithm for Particle Simulations*, J. Comput. Phys., 73 (1987), pp. 325–348.
- [74] I. Gustafsson, *A class of 1st order factorization methods*, BIT, 18 (1978), pp. 142–156.
- [75] M. H. Gutknecht, *Changing the norm in conjugate gradient-type algorithms*, SIAM J. Numer. Anal., 30 (1993), pp. 40–56.
- [76] M. H. Gutknecht, *Solving linear systems with the Lanczos process*, Acta Numerica, 6 (1997), pp. 271–398.
- [77] W. Hackbusch, *Iterative Solution of Large Sparse Systems of Equations*, Springer-Verlag, Berlin, New York, 1994.
- [78] W. Hackbusch and U. Trottenberg, *Multigrid Methods*, Springer-Verlag, Berlin, New York, 1982.
- [79] M. R. Hestenes and E. Stiefel, *Methods of conjugate gradients for solving linear*

- systems, J. Res. Nat. Bur. Standards, 49 (1952), pp. 409–435.
- [80] R. A. Horn and C. R. Johnson, *Matrix Analysis*, Cambridge University Press, London, U.K., 1985.
- [81] R. A. Horn and C. R. Johnson, *Topics in Matrix Analysis*, Cambridge University Press, London, U.K., 1991.
- [82] S. A. Hutchinson, J. N. Shadid, and R. S. Tuminaro, *Aztec User's Guide*, SAND95-1559, Sandia National Laboratories, Albuquerque, NM, 1995.
- [83] A. Iserles, *A First Course in the Numerical Analysis of Differential Equations*, Cambridge University Press, London, U.K., 1996.
- [84] D. Jespersen, *Multigrid methods for partial differential equations*, in Studies in Numerical Analysis, Studies in Mathematics 24, Mathematical Association of America, 1984.
- [85] W. D. Joubert, *A robust GMRES-based adaptive polynomial preconditioning algorithm for nonsymmetric linear systems*, SIAM J. Sci. Comput., 15 (1994), pp. 427–439.
- [86] W. D. Joubert and D. M. Young, *Necessary and sufficient conditions for the simplification of generalized conjugate-gradient algorithms*, Linear Algebra Appl., 88/89 (1987), pp. 449–485.
- [87] D. Kershaw, *The incomplete Cholesky conjugate gradient method for the iterative solution of systems of linear equations*, J. Comput. Phys., 26 (1978), pp. 43–65.
- [88] L. Yu. Kolotilina and A. Yu. Yeremin, *Factorized sparse approximate inverse preconditioning I. Theory*, SIAM J. Matrix Anal. Appl., 14 (1993), pp. 45–58.
- [89] C. Lanczos, *An iteration method for the solution of the eigenvalue problem of linear differential and integral operators*, J. Res. Nat. Bur. Standards, 45 (1950), pp. 255–282.
- [90] C. Lanczos, *Solutions of linear equations by minimized iterations*, J. Res. Nat. Bur. Standards, 49 (1952), pp. 33–53.
- [91] E. W. Larsen, *Unconditionally Stable Diffusion-Synthetic Acceleration Methods for the Slab Geometry Discrete Ordinates Equations. Part I: Theory*, Nuclear Sci. Engrg., 82 (1982), pp. 47–63.
- [92] D. R. McCoy and E. W. Larsen, *Unconditionally Stable Diffusion-Synthetic Acceleration Methods for the Slab Geometry Discrete Ordinates Equations. Part II: Numerical Results*, Nuclear Sci. Engrg., 82 (1982), pp. 64–70.
- [93] E. E. Lewis and W. F. Miller, *Computational Methods of Neutron Transport*, John Wiley & Sons, New York, 1984.
- [94] T. A. Manteuffel, *The Tchebychev iteration for nonsymmetric linear systems*, Numer. Math., 28 (1977), pp. 307–327.
- [95] T. A. Manteuffel, *An incomplete factorization technique for positive definite linear systems*, Math. Comp., 34 (1980), pp. 473–497.
- [96] T. Manteuffel, S. McCormick, J. Morel, S. Oliveira, and G. Yang, *A fast multigrid algorithm for isotropic transport problems I: Pure scattering*, SIAM J. Sci. Comput., 16 (1995), pp. 601–635.
- [97] T. Manteuffel, S. McCormick, J. Morel, and G. Yang, *A fast multigrid algorithm for isotropic transport problems II: With absorption*, SIAM J. Sci. Comput., 17 (1996), pp. 1449–1475.
- [98] S. McCormick, *Multigrid Methods*, SIAM, Philadelphia, PA, 1987.
- [99] J. A. Meijerink and H. A. van der Vorst, *An iterative solution method for linear systems of which the coefficient matrix is a symmetric M-matrix*, Math. Comp., 31 (1977), pp. 148–162.
- [100] N. Munksgaard, *Solving Sparse Symmetric Sets of Linear Equations by Precon-*

- ditioned Conjugate Gradients*, ACM Trans. Math. Software, 6 (1980), pp. 206–219.
- [101] N. Nachtigal, *A look-ahead variant of the Lanczos algorithm and its application to the quasi-minimal residual method for non-Hermitian linear systems*, Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge, MA, 1991.
- [102] N. M. Nachtigal, S. Reddy, and L. N. Trefethen, *How fast are nonsymmetric matrix iterations?*, SIAM J. Matrix Anal. Appl., 13 (1992), pp. 778–795.
- [103] N. M. Nachtigal, L. Reichel, and L. N. Trefethen, *A hybrid GMRES algorithm for nonsymmetric linear systems*, SIAM J. Matrix Anal. Appl., 13 (1992), pp. 796–825.
- [104] R. A. Nicolaides, *On the  $L^2$  convergence of an algorithm for solving finite element equations*, Math. Comp., 31 (1977), pp. 892–906.
- [105] A. A. Nikishin and A. Yu. Yeremin, *Variable block CG algorithms for solving large sparse symmetric positive definite linear systems on parallel computers, I: General iterative scheme*, SIAM J. Matrix Anal. Appl., 16 (1995), pp. 1135–1153.
- [106] Y. Notay, *Upper eigenvalue bounds and related modified incomplete factorization strategies*, in Iterative Methods in Linear Algebra, R. Beauwens and P. de Groen, eds., North-Holland, Amsterdam, 1991, pp. 551–562.
- [107] D. P. O’Leary, *The block conjugate gradient algorithm and related methods*, Linear Algebra Appl., 29 (1980), pp. 293–322.
- [108] C. W. Oosterlee and T. Washio, *An evaluation of parallel multigrid as a solver and a preconditioner for singular perturbed problems, Part I. The standard grid sequence*, SIAM J. Sci. Comput., to appear.
- [109] C. C. Paige, *Error Analysis of the Lanczos Algorithm for Tridiagonalizing a Symmetric Matrix*, J. Inst. Math. Appl., 18 (1976), pp. 341–349.
- [110] C. C. Paige, *Accuracy and Effectiveness of the Lanczos Algorithm for the Symmetric Eigenproblem*, Linear Algebra Appl., 34 (1980), pp. 235–258.
- [111] C. C. Paige and M. A. Saunders, *Solution of sparse indefinite systems of linear equations*, SIAM J. Numer. Anal., 11 (1974), pp. 197–209.
- [112] B. N. Parlett, *The Symmetric Eigenvalue Problem*, Prentice-Hall, Englewood Cliffs, NJ, 1980.
- [113] B. N. Parlett, D. R. Taylor, and Z. A. Liu, *A look-ahead Lanczos algorithm for unsymmetric matrices*, Math. Comp., 44 (1985), pp. 105–124.
- [114] C. Pearcy, *An elementary proof of the power inequality for the numerical radius*, Michigan Math. J., 13 (1966), pp. 289–291.
- [115] J. K. Reid, *On the method of conjugate gradients for the solution of large sparse linear systems*, in Large Sparse Sets of Linear Equations, J. K. Reid, ed., Academic Press, New York, 1971.
- [116] Y. Saad, *Preconditioning techniques for nonsymmetric and indefinite linear systems*, J. Comput. Appl. Math., 24 (1988), pp. 89–105.
- [117] Y. Saad, *Iterative Methods for Sparse Linear Systems*, PWS Pub. Co., Boston, MA, 1996.
- [118] Y. Saad and A. Malevsky, *PSPARSLIB: A portable library of distributed memory sparse iterative solvers*, in Proc. Parallel Computing Technologies (PaCT-95), 3rd International Conference, V. E. Malyshkin, et al., ed., St. Petersburg, 1995.
- [119] Y. Saad and M. H. Schultz, *GMRES: A generalized minimal residual algorithm for solving nonsymmetric linear systems*, SIAM J. Sci. Statist. Comput., 7 (1986), pp. 856–869.
- [120] H. A. Schwarz, *Gesammelte Mathematische Abhandlungen*, Vol. 2, Springer, Berlin, 1890, pp. 133–143 (first published in Vierteljahrsschrift Naturforsch. Ges. Zurich, 15 (1870), pp. 272–286).
- [121] H. D. Simon, *The Lanczos algorithm with partial reorthogonalization*, Math.

- Comp., 42 (1984), pp. 115–136.
- [122] G. L. G. Sleijpen, H. A. Van der Vorst, and J. Modersitzki, *The Main Effects of Rounding Errors in Krylov Solvers for Symmetric Linear Systems*, Preprint 1006, Universiteit Utrecht, The Netherlands, 1997.
- [123] B. Smith, P. Bjorstad, and W. Gropp, *Domain Decomposition. Parallel Multilevel Methods for Elliptic Partial Differential Equations*, Cambridge University Press, London, U.K., 1996.
- [124] P. Sonneveld, *CGS, a fast Lanczos-type solver for nonsymmetric linear systems*, SIAM J. Sci. Statist. Comput., 10 (1989), pp. 36–52.
- [125] G. Strang and G. J. Fix, *An Analysis of the Finite Element Method*, Prentice-Hall, Englewood Cliffs, NJ, 1973.
- [126] Z. Strakoš, *On the real convergence rate of the conjugate gradient method*, Linear Algebra Appl., 154/156 (1991), pp. 535–549.
- [127] K. C. Toh, *GMRES vs. ideal GMRES*, SIAM J. Matrix Anal. Appl., 18 (1997), pp. 30–36.
- [128] C. H. Tong, *A Comparative Study of Preconditioned Lanczos Methods for Nonsymmetric Linear Systems*, Sandia report SAND91-8240, 1992.
- [129] L. N. Trefethen, *Approximation theory and numerical linear algebra*, in Algorithms for Approximation II, J. Mason and M. Cox, eds., Chapman and Hall, London, U.K., 1990.
- [130] R. Underwood, *An Iterative Block Lanczos Method for the Solution of Large Sparse Symmetric Eigenproblems*, Technical report STAN-CS-75-496, Computer Science Department, Stanford University, Stanford, CA, 1975.
- [131] A. van der Sluis, *Condition numbers and equilibration matrices*, Numer. Math., 14 (1969), pp. 14–23.
- [132] A. van der Sluis and H. A. van der Vorst, *The rate of convergence of conjugate gradients*, Numer. Math., 48 (1986), pp. 543–560.
- [133] H. A. van der Vorst, *The convergence behavior of preconditioned CG and CG-S in the presence of rounding errors*, in Preconditioned Conjugate Gradient Methods, O. Axelsson and L. Kolotilina, eds., Lecture Notes in Mathematics 1457, Springer-Verlag, Berlin, New York, 1990.
- [134] 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. Comput., 13 (1992), pp. 631–644.
- [135] R. S. Varga, *Matrix Iterative Analysis*, Prentice-Hall, Englewood Cliffs, NJ, 1962.
- [136] R. S. Varga, *Factorization and normalized iterative methods*, in Boundary Problems in Differential Equations, R. E. Langer, ed., 1960, pp. 121–142.
- [137] P. Vinsome, *Orthomin, an iterative method for solving sparse sets of simultaneous linear equations*, in Proc. 4th Symposium on Numerical Simulation of Reservoir Performance, Society of Petroleum Engineers, 1976, pp. 149–159.
- [138] V. V. Voevodin, *The problem of a non-selfadjoint generalization of the conjugate gradient method has been closed*, U.S.S.R. Comput. Math. and Math. Phys., 23 (1983), pp. 143–144.
- [139] H. F. Walker, *Implementation of the GMRES method using Householder transformations*, SIAM J. Sci. Statist. Comput., 9 (1988), pp. 152–163.
- [140] R. Weiss, *Convergence Behavior of Generalized Conjugate Gradient Methods*, Ph.D. dissertation, University of Karlsruhe, Karlsruhe, Germany, 1990.
- [141] P. Wesseling, *An Introduction to Multigrid Methods*, Wiley, Chichester, U.K., 1992.

- [142] O. Widlund, *A Lanczos method for a class of nonsymmetric systems of linear equations*, SIAM J. Numer. Anal., 15 (1978), pp. 801–812.
- [143] H. Wozniakowski, *Roundoff error analysis of a new class of conjugate gradient algorithms*, Linear Algebra Appl., 29 (1980), pp. 507–529.
- [144] D. M. Young, *Iterative Solution of Large Linear Systems*, Academic Press, New York, 1971.
- [145] D. M. Young and K. C. Jea, *Generalized conjugate gradient acceleration of nonsymmetrizable iterative methods*, Linear Algebra Appl. 34, 1980, pp. 159–194.
- [146] H. Yserentant, *Old and new convergence proofs for multigrid methods*, Acta Numerica, 2 (1993), pp. 285–326.