

List of Publications

Achi Brandt

- [1] Brandt, A., A generalization of a combinatorial theorem of Sparre Andersen about sums of random variables, *Math. Scand.* **9** (1961) 325–358.
- [2] Brandt A. and Gillis, J., Magnetohydrodynamic flow in the inlet region of a straight channel, *Phys. of Fluids* **9** (1966) 690–699.
- [3] Brandt, A., Estimates for difference quotients of solutions of Poisson type difference equations, *Math. Comp.* **20** (1966) 473–499.
- [4] Brandt, A., Interior estimates for second order elliptic differential (or finite-difference) equations via the maximum principle, *Israel J. Math.* **7** (1969) 95–121.
- [5] Brandt, A. and Kelson, I., Single particle theory of fission, *Phys. Ref.* **183** (1969) 1025–1054.
- [6] Brandt, A. and Gillis, J., Asymptotic approach to Hartmann Poiseuille flows, *J. Comp. Phys.* **3** (1969) 523–538.
- [7] Brandt, A., Interior Schauder estimates for parabolic differential equations via the maximum principle, *Israel J. Math.* **7** (1969) 254–262.
- [8] Abarbanel, S., Bennett, S., Brandt, A. and Gillis, J., Velocity profiles of flow at low Reynolds numbers, *J. Appl. Mech.* **37** (1970) 2–4.
- [9] Brandt, A. and Intrator, Y., The assignment problem with three job categories, *Cas. Pest. Mat.* **96** (1971) 8–11.
- [10] Brandt, A., Bresler, E., Dinar, N. and Ben-Asher, I., Infiltration from a trickle source; I. Mathematical models, *Soil Sci. Soc. Am. Proc.* **35** (1971) 675–682.
- [11] Bressler, E., Heller, J., Dinar, N., Ben-Asher, I., Brandt, B. and Goldberg, D., Infiltration from a trickle source; II. Experimental data and theoretical predictions, *Soil Sci. Soc. Am. Proc.* **35** (1971) 683–689.
- [12] Brandt, A., Multi-level adaptive technique (MLAT) for fast numerical solutions to boundary value problems, in *Proc. 3rd Int. Conf. on Numerical Methods in Fluid Mechanics* (Cabannes, H. and Temam, R., eds.), Lecture Notes in Physics 18, Springer-Verlag, 1973, pp. 82–89.
- [13] Brandt, A., Generalized local maximum principles for elliptic and parabolic difference equations, *Math. Comp.* **27** (1973) 685–718.
- [14] Brandt, A., Multi-level adaptive technique (MLAT); I. The multi-grid method, IBM Research Report RC-6026, IBM T.J. Watson Research Center, Yorktown Heights, New York, 1976.

- [15] South, J.C. and Brandt, A., Application of a multi-level grid method to transonic flow calculations, in *Transonic Flow Problems in Turbo Machinery* (Adam, T.C. and Platzler, M.F., eds.), Hemisphere, Washington, 1977, pp. 180–207.
- [16] Brandt, A., Multi-level adaptive solutions to boundary value problems, *Math. Comp.* **31** (1977) 333–390.
- [17] Brandt, A., Multi-level adaptive techniques (MLAT) for partial differential equations: ideas and software, in *Mathematical Software, III* (Rice, J.R., ed.), Academic Press, New York, 1977, pp. 273–314.
- [18] Brandt, A. and Intrator, J., Fast algorithms for long transportation problems, *Comp. Ops. Res.* **5** (1978) 263–271.
- [19] Brandt, A., Multi-level adaptive techniques (MLAT) for singular perturbation problems, in *Numerical Analysis of Singular Perturbation Problems* (Hemker, P.W. and Miller, J.J.H., eds.), Academic Press, New York, 1979, 53–142.
- [20] Brandt, A. and Dinar, N., Multi-grid solutions to elliptic flow problems, in *Numerical Methods for Partial Differential Equations* (Parter, S., ed.), Academic Press, New York, 1979, pp. 53–147.
- [21] Brandt, A., Multi-level adaptive finite elements methods; I. Variational problems, in *Special Topics of Applied Mathematics* (Frehse, J., Pallaschke, D. and Trottenberg, U., eds.), North Holland, 1980, pp. 91–128.
- [22] Brandt, A., Dendy, J.E., Jr. and Ruppel H., The multi-grid method for semi-implicit hydrodynamics codes, *J. Comp. Phys.* **34** (1980) 348–370.
- [23] Brandt, A., Multi-level adaptive finite-element computations in fluid dynamics, *AIAA J.* **18** (1980) 1165–1172.
- [24] Brandt, A., Numerical stability and fast solutions to boundary value problems, in *Boundary and Interior Layers — Computational and Asymptotic Methods* (Miller, J.J.H., ed.), Boole Press, Dublin, 1980, pp. 29–49.
- [25] Alcouffe, R.E., Brandt, A., Dendy, J.E., Jr. and Painter, J.W., The multi-grid methods for the diffusion equation with strongly discontinuous coefficients, *SIAM J. Sci. Stat. Comp.* **2** (1981) 430–454.
- [26] Brandt, A., Stages in developing multigrid solutions, in *Proc. 2nd Int. Congr. on Numerical Methods for Engineering* (Absi, E., Glowinski, R., Lascaux, P. and Veysseyre, H., eds.), Dunod, Paris, 1980, pp. 23–43.
- [27] Brandt, A., Multi-grid solvers on parallel computers, in *Elliptic Problem Solvers* (Schultz, M., ed.), Academic Press, New York, 1981, pp. 39–84.
- [28] Brandt, A., Multi-grid solvers for non-elliptic and singular-perturbation steady-state problems, Weizmann Institute of Science, Rehovot, December 1981.

- [29] Brandt, A., Multi-grid solutions to steady-state compressible Navier-Stokes equations, I, in *Computing Methods in Applied Sciences and Engineering, V* (Glowinski, R. and Lions, J.L., eds.), North Holland, 1982, pp. 407–422.
- [30] Brandt, A., Guide to multigrid development, in *Multigrid Methods* (Hackbusch, W. and Trottenberg, U., eds.), Springer-Verlag, 1982, pp. 220–312.
- [31] Brandt, A., Introductory remarks on multigrid methods, in *Numerical Methods for Fluid Dynamics* (Morton, K.W. and Baines, M.J., eds.), Academic Press, New York, 1982, pp. 127–134.
- [32] Brandt, A., McCormick, S. and Ruge, J., Algebraic multigrid (AMG) for automatic multigrid solution with application to geodetic computations, Institute for Computational Studies, POB 1852, Fort Collins, Colorado, 1982.
- [33] Brandt, A., McCormick, S. and Ruge, J., Multi-grid methods for differential eigenproblems, *SIAM J. Sci. Stat. Comp.* **4** (1983) 244–260.
- [34] Brandt, A. and Cryer, C.W., Multi-grid algorithms for the solution of linear complementarity problems arising from free boundary problems, *SIAM J. Sci. Stat. Comp.* **4** (1983) 655–684.
- [35] Barkai, D. and Brandt, A., Vectorized multigrid Poisson solver, *Appl. Math. Comp.* **13** (1983) 215–227.
- [36] Brandt, A. and Ophir, D., GRIDPACK: Toward unification of general grid programming, in *PDE Software: Modules Interfaces and Systems* (Engquist, B. and Smedsaas, T., eds.), North Holland, 1984, pp. 269–288.
- [37] Brandt, A., McCormick, S. and Ruge, J., Algebraic multigrid (AMG) for sparse matrix equations, in *Sparsity and its Applications* (Evans, D.J., ed.), Cambridge University Press, Cambridge, 1984, pp. 257–284.
- [38] Brandt, A., *Multigrid Techniques: 1984 Guide, with Applications to Fluid Dynamics*, 1984, 191 pages, ISBN-3-88457-081-1; GMD-Studien Nr. 85; Available from GMD-AIW, Postfach 1316, D-53731, St. Augustin 1, Germany, 1984.
- [39] Brandt, A., Local and multi-level parallel processing mill, in *Rechnerarchitekturen für die Numerische Simulation auf der Basis Superschneller Lösungsverfahren, I* (Trottenberg, U. and Wypior, P., eds.), GMD-Studien Nr. 88, 1984, pp. 31–40.
- [40] Brandt, A., Fulton, S.R. and Taylor, G.D., Improved spectral multigrid methods for periodic elliptic problems, *J. Comp. Phys.* **58** (1985) 96–112.
- [41] Brandt, A., Introduction — levels and scales, in *Multigrid Methods for Integral and Differential Problems* (Paddon, D. and Holstein, H., eds.), Clarendon Press, Oxford, 1985, pp. 1–10.
- [42] Brandt, A. and Ta'asan, S., Multigrid solutions to quasi-elliptic schemes, in

- Progress and Supercomputing in Computational Fluid Dynamics* (Murman, E.M. and Abarbanel, S.S., eds.), Birkhäuser, Boston, 1985, pp. 235–255.
- [43] Brandt, A., Algebraic multigrid theory: The symmetric case, in *Preliminary Proc. Int. Multigrid Conf.*, Copper Mountain, Colorado, April 6–8, 1983; *Appl. Math. Comp.* **19** (1986) 23–56.
- [44] Brandt, A. and Ta’asan, S., Multigrid method for nearly singular and slightly indefinite problems, in *Multigrid Methods, II* (Hackbusch, W. and Trottenberg, U., eds.), Springer-Verlag, 1986, pp. 100–122.
- [45] Brandt, A., Ron, D. and Amit, D.J., Multi-level approaches to discrete-state and stochastic problems, in *Multigrid Methods, II* (Hackbusch, W. and Trottenberg, U., eds.), Springer-Verlag, 1986, pp. 66–99.
- [46] Bai, D. and Brandt, A., Local mesh refinement multilevel techniques, *SIAM J. Sci. Stat. Comp.* **8** (1987) 109–134.
- [47] Brandt, A., Multi-level approaches to large scale problems, in *Proc. ICM-86* (Int. Congr. of Mathematicians, Berkeley, CA, August 1986), 1987, pp. 1319–1334.
- [48] Brandt, A. and Lanza, A., Multigrid in general relativity: I. Schwarzschild spacetime, *Class. Quantum Grav.* **5** (1988) 713–732.
- [49] Brandt, A., Multilevel computations: Review and recent developments, in *Multigrid Methods: Theory, Applications and Supercomputing* (McCormick, S.F., ed.), Marcel-Dekker, 1988, pp. 35–62.
- [50] Ruge, J. and Brandt, A., A multigrid approach for elasticity problems on “thin” domains, in *Multigrid Methods: Theory, Applications and Supercomputing* (McCormick, S.F., ed.), Marcel-Dekker, 1988, pp. 541–555.
- [51] Kandel, D., Domany, E., Ron, D., Brandt A. and Loh, E., Jr., Simulations without critical slowing down, *Phys. Rev. Lett.* **60** (1988) 1591–1594.
- [52] Brandt, A., Rigorous local mode analysis of multigrid, in *Preliminary Proc. 4th Copper Mountain Conf. on Multigrid Methods*, Copper Mountain, Colorado, April 1989.
- [53] Kandel, D., Domany, E. and Brandt, A., Simulations without critical slowing down — Ising and 3-state Potts models, *Phys. Rev. B* **40** (1989) 330–344.
- [54] Brandt, A., The Weizmann Institute Research in Multilevel Computation: 1988 Report, in *Proc. 4th Copper Mountain Conf. on Multigrid Methods* (Mandel, J. et al, eds.), SIAM, 1989, pp. 13–53.
- [55] Brandt, A. and Lubrecht, A.A., Multilevel matrix multiplication and fast solution of integral equations, *J. Comp. Phys.* **90** (1990) 348–370.
- [56] Ben-Av, R., Brandt, A. and Solomon, S., The fermionic matrix, instantons, zero modes and multigrid, *Nucl. Phys. B* **329** (1990) 193.

- [57] Brandt, A., The scope of multiresolution iterative computations, *SIAM News* **23** (1990) 8–9.
- [58] Brandt, A. and Yavneh, I., Inadequacy of first-order upwind difference scheme for some recirculating flows, *J. Comp. Phys.* **93** (1991) 128–143.
- [59] Brandt, A., Multilevel computations of integral transforms and particle interactions with oscillatory kernels, *Comp. Phys. Comm.* **65** (1991) 24–38.
- [60] Ben-Av, R., Brandt, A., Harmatz, M., Katznelson, E., Lauwers, P.G., Solomon, S. and Wolowesky, K., Fermion simulation using parallel transported multigrid, *Phys. Lett. B* **253** (1991) 185.
- [61] Balsara, D.S. and Brandt, A., Multilevel methods for fast solution of N-body and hybrid systems, in *Multigrid Methods, III* (Hackbusch, W. and Trottenberg, U., eds.), Birkhäuser Verlag, Basel, 1991, pp. 131–142.
- [62] Mikulinsky, V. and Brandt, A., Multigrid treatment of free boundary conditions, in *Multigrid Methods: Special Topics and Applications, II* (Hackbusch, W. and Trottenberg, U., eds.), GMD-Studien Nr. 189, 1991, pp. 940–949.
- [63] Brandt, A. and Greenwald, J., Parabolic multigrid revisited, in *Multigrid Methods, III* (Hackbusch, W. and Trottenberg, U., eds.), Birkhäuser Verlag, Basel, 1991, pp. 143–154.
- [64] Ruge, J., Brandt, A., McWilliams, J. and Milliff, R., Multigrid methods applied to turbulent flow problems, in *Multigrid Methods, III* (Hackbusch, W. and Trottenberg, U., eds.), Birkhäuser Verlag, Basel, 1991, pp. 91–103.
- [65] Harmatz, M. and Lauwers, P.G. with Ben-Av, R., Brandt, A., Katznelson, E., Solomon, S. and Wolowesky, K., Parallel-transported multigrid and its application to the Schwinger model, *Nucl. Phys. B* (Proc. Suppl.) **20** (1991).
- [66] Brandt, A. and Yavneh, I., Improved coarse-grid correction for high-Reynolds flows, in *Proc. 5th Copper Mountain Conf. on Multigrid Methods*, Copper Mountain, Colorado, April, 1991.
- [67] Brandt, A. and Yavneh, I., On multigrid solution of high-Reynolds incompressible entering flows, *J. Comp. Phys.* **101** (1992) 151–164.
- [68] Brandt, A., Multiscale computational methods: research activities, in *Proc. 1991 Hang Zhou International Conf. on Scientific Computation* (Chan, T. and Shi, Z.-C., eds.), World Scientific Publishing Co., Singapore, 1992, pp. 1–7.
- [69] Brandt, A., Multigrid methods in lattice field computations, *Nucl. Phys. B* (Proc. Suppl.) **26** (1992) 137–180.
- [70] Brandt, A. and Yavneh, I., Accelerated multigrid convergence and high-Reynolds recirculating flows, *SIAM J. Sci. Comp.* **14** (1993) 607–626.

- [71] Sidilkover, D. and Brandt, A., Multigrid solution to steady-state two-dimensional conservation laws, *SIAM J. Num. Anal.* **30** (1993), 249.
- [72] Brandt, A., Rigorous quantitative analysis of multigrid: I. Constant coefficients two level cycle with L_2 norm, *SIAM J. Num. Anal.* **31** (1994) 1695–1730.
- [73] Brandt, A., Galun, M. and Ron, D., Optimal multigrid algorithms for calculating thermodynamic limits, *J. Stat. Phys.* **74** (1994) 313–348.
- [74] Brandt, A. and Diskin, B., Multigrid solvers on decomposed domains, in Domain Decomposition Methods in Science and Engineering (A. Quarteroni, J. Periaux, Yu. A. Kuznetsov and O. Widlund, eds.) *Contemp. Math.*, **V. 157**, American Mathematical Society, 1994, pp. 135–155.
- [75] Brandt, A. and Mikulinsky, V., Recombining iterants in multigrid algorithms and problems with small islands, *SIAM J. Sci. Comp.* **16** (1995) 20–28.
- [76] Bates, J.R., Li, Y., Brandt, A., McCormick, S.F. and Ruge, J., A global shallow water numerical model based on the semi-Lagrangian advection of potential vorticity, *Quart. J. Roy. Met. Soc.* **121** (1995) 1981–2005.
- [77] Brandt, A., Multiscale research in molecular mechanics, Gauss Center Report WI/GC–3, The Weizmann Institute of Science, Rehovot, April 1995.
- [78] Adler, J., Brandt, A., Janke, W. and Shmulyian, S., Three state potts antiferromagnet on the triangular lattice, *J. Phys. A: Math. Gen.* **28** (1995) 5117–5129.
- [79] Brandt, A. and Venner, C.H., Multilevel evaluation of integral transforms on adaptive grids, Gauss Center Report WI/GC–5, The Weizmann Institute of Science, Rehovot, April 1996. Multigrid Methods V, Lecture Notes in Computational Science and Engineering 3 (W. Hackbusch and G. Wittum, eds.), Springer Verlag, Berlin, (1999) pp. 20–44.
- [80] Brandt, A. and Dym, J., Fast robust discontinuity detection using multiple scales.
- [81] Brandt, A. and Zaslavsky, L.Y., Multiscale algorithm for atmospheric data assimilation, *SIAM J. Sci. Comp.*, Vol. 18 (1997), No. 3.
- [82] Brandt, A., Mann, J. and Brodski, M., An $O(N^2 \log N)$ multilevel backprojection method, Gauss Center Report WI/GC–6, January 1997.
- [83] Brandt, A. and Dym, J., Effective boundary treatment for the biharmonic Dirichlet problem, in *Proc. Seventh Copper Mountain Conference on Multigrid Methods* (N.D. Melson et al, eds.) NASA Conference Publication 3339 (1996) 97–108.
- [84] Ruge, J.W., Li, Y., McCormick, S., Brandt, A. and Bates, J.R., A nonlinear multigrid solver for a semi-Lagrangian potential vorticity-based shallow-

- water model on the sphere, *SIAM J. Sci. Comp.*, **21** (2000) 2381–2399.
- [85] Schlick, T. and Brandt, A., A multigrid tutorial with application to molecular dynamics (a report on a workshop), *IEEE Computational Science and Engineering*, **3** (1996) 78–83.
- [86] Brandt, A. and Diskin, B., Multigrid solvers for non-aligned sonic flows: the constant coefficient case. Gauss Center Report WI/GC–8, Weizmann Institute of Science, October, 1997. *Computer & Fluids* **28** (1999) 511–549.
- [87] Brandt, A. and Galun, M., Optimal multigrid algorithm for the massive Gaussian model and path integrals, *J. Stat. Phys.*, **82** (1996) 1503–1518.
- [88] Yavneh, I., Venner, C.H. and Brandt, A., Fast multigrid solution of the advection problem with closed characteristics, *SIAM J. Sci. Comp.* **19** (1998) 111–125.
- [89] Brandt, A. and Galun, M., Optimal multigrid algorithms for variable-coupling isotropic Gaussian models, *J. Stat. Phys.* **88** (1997) 637–664.
- [90] Sharon, E., Brandt, A. and Basri, R., Completion energies and scale. IEEE Conference on Computer Vision and Pattern Recognition (CVPR–97), pp. 884–890, Puerto Rico, 1997. Report CS97–19, The Weizmann Institute of Science, Rehovot, Israel. *IEEE Trans. on Pattern Analysis and Machine Intelligence* **22** (2000) 1117–1131.
- [91] Brandt, A., The Gauss Center Research in Scientific Computation, Gauss Center Report WI/GC–7, March 1997. Also appears at MGNET as part of the Preliminary Proceeding of the Eighth Copper Mountain Conference on Multigrid Methods. Extended version in *Electronic Trans. Num. An.* **6** (1997), 1–34.
- [92] Brandt, A. and Livshits, I., Wave-ray multigrid method for standing wave equations, *Electronic Trans. Num. An.* **6** (1997), 162–181.
- [93] Brandt, A. and Venner, C.H., Multilevel evaluation of integral transforms with asymptotically smooth kernels, Gauss Center Report WI/GC–2, The Weizmann Institute of Science, Rehovot, April 1995; *SIAM J. Sci. Comp.* **19** (1998), 468–492.
- [94] Brandt, A., Barriers to Achieving Textbook Multigrid Efficiency in CFD, ICASE Interim Report No. 32, NASA/CR-1998-207647. Gauss-Center Report WI/GC–10, June, 1998 (updated December, 1999). Appears as Appendix C in the textbook *Multigrid*, by U. Trottenberg, C.W. Oosterlee and A. Schüller, Academic Press, London, 2000.
- [95] Brandt, A. and Dym, J., Fast computation of multiple line integrals, *SIAM J. Sci. Comp.* **20** (1999) 1417–1429.
- [96] Brandt, A., Israeli, M., Yavneh, I. and Siegal, A., Multigrid solution of an elliptic boundary-value problem with integral constraints, *SIAM J. Sci. Comp.* **21** (2000) 1357–1369.

- [97] Brandt, A. and Diskin, B., Multigrid solvers for non-aligned sonic flows, *SIAM J. Sci. Comp.* **21** (1999) 473–501.
- [98] Brandt, A. and Galun, M., Statistically Optimal Multigrid Algorithms for the Anharmonic Crystal Model, Gauss-Center Report WI/GC–9, March, 1998.
- [99] Brandt, A., Mann, J., Brodski, M. and Galun, M., A fast and accurate multilevel inversion of the Radon transform, *SIAM J. Appl. Math.* **60** (1999) 437–462.
- [100] Bai, D. and Brandt, A., Multiscale computation of molecular systems, in *Proc. AFOSR Grantees and Contractors Meeting in Computational and Physical Mathematics*, Wright-Patterson AFB, Ohio, July 20–22, 1998.
- [101] Li, Y., Ruge, J., Bates, J.R. and Brandt, A., A proposed adiabatic formulation of three-dimensional global atmospheric models based on potential vorticity. *Tellus* 52A (2000) 129–139.
- [102] Sharon, E., Brandt, A. and Basri, R., Fast multiscale image segmentation. *Proc. IEEE Conf. on Computer Vision and Pattern Recognition*, South Carolina, 2000, pp. 70-77.
- [103] Brandt, A. and Ron, D., Renormalization multigrid (RMG): Statistically optimal renormalization group flow and coarse-to-fine Monte Carlo acceleration, Gauss Center Report WI/GC–11, June 1999. *J. Stat. Phys.* **102** (2001) 231–257.
- [104] Brandt, A., Multiscale scientific computation: six year summary. Gauss Center Report WI/GC-12, May 1999. Also in MGNET.
- [105] Brandt, A., General highly accurate algebraic coarsening schemes. Gauss Center Report WI/GC–13, May 1999. *Electronic Trans. Num. Anal.* **10** (2000) 1–20.
- [106] Thomas, J.L., Diskin, B. and Brandt, A., Distributed relaxation multigrid and defect correction applied to the compressible Navier Stokes equations, AIAA paper 99–3334, *Proc. 14th AIAA CFD Conference*, Norfolk, VA, July, 1999.
- [107] Thomas, J.L., Diskin, B. and Brandt, A., Textbook multigrid efficiency for the incompressible Navier-Stokes equations: High Reynolds number wakes and boundary layers. ICASE Report No. 99–51 (1999). *Computers and Fluids*, to appear.
- [108] Brandt, A., Bernholc, J. and Binder, K. (Eds.), *Multiscale Computational Methods in Chemistry and Physics*. NATO Science Series: Computer and System Sciences, Vol. 177, IOS Press, Amsterdam (2001).
- [109] Bai, D. and Brandt, A., Multiscale computation of polymer models. In [108], pp. 250–266.

- [110] Sandak, B. and Brandt, A., Multiscale fast summation of long range charge and dipolar interactions. In [108], pp. 6–31. Also: *J. Comp. Chem.*, **22** (2001), 717–731.
- [111] Livne, O. and Brandt, A., $O(N \log N)$ multilevel calculation of N eigenfunctions. In [108], pp. 112–136.
- [112] Brandt, A. and Iliyn, V., Multilevel approach in statistical physics of liquids. In [108], pp. 187–197.
- [113] Brandt, A. and Galun, M., Fast and accurate multiscale methods for image reconstruction. In [108], pp. 360–362.
- [114] Brandt, A. and Ron, D., Renormalization multigrid (RMG): coarse-to-fine Monte Carlo acceleration and optimal derivation of macroscopic descriptions. In [108], pp. 163–186.
- [115] Thomas, J.L., Diskin, B., Brandt, A. and South, J.C. Jr., General framework for achieving textbook multigrid efficiency: quasi-1-D Euler example. In: *Frontiers of Computational Fluid Dynamics — 2002* (D.A. Caughey and M.M. Hafez, eds.), World Scientific Publishing Company, Singapore, pp. 61–80.
- [116] Brandt, A. and Livshits, I., Accuracy properties of the multigrid algorithm for Helmholtz equations. *SIAM J. Num. Anal.*, in press.
- [117] Livne, O. and Brandt, A., N roots of secular equation in $O(N)$ operations, submitted to *SIAM J. Matrix Anal. Appl.*, **24** (2002) 439–453.
- [118] Brandt, A., Multiscale scientific computation: review 2001. In Barth, T.J., Chan, T.F. and Haimes, R. (eds.): *Multiscale and Multiresolution Methods: Theory and Applications*, Springer Verlag, Heidelberg, 2001, pp. 1–96. Available in www.wisdom.weizmann.ac.il/~achi/review00.ps.
- [119] Brandt, A., Diskin, B. and Thomas, J.L., Textbook multigrid efficiency for computational fluid dynamics simulations, AIAA paper 2001–2570, *15th AIAA Computational Fluid Dynamics Conference*, Anaheim, CA, June 11–14, 2001.
- [120] Sharon, E., Brandt, A. and Basri, R., Segmentation and boundary detection using multiscale intensity measurements, *Proc. IEEE Conf. on Computer Vision and Pattern Recognition*, Hawaii, 2001.
- [121] Livne, O.E., Brandt, A. and Boag, A., Multigrid Analysis of Scattering by Large Planar Structures. *Micro. Opt. Tech. Let.* **32** (2002) 454–458.
- [122] Brandt, A. and Ilyin, V., Multilevel Monte Carlo methods for studying large-scale phenomena in fluids. In *Proc. Conf. Physics of Liquid Matter: Modern Problems* (Kiev, Ukraine, Sept. 14–19, 2001); *J. of Molecular Liquids*, **105** (2003) 253–256.
- [123] Livne, O.E. and Brandt, A., Multiscale Eigenbasis Calculations: N Eigen-

- functions in $O(N \log N)$. In Barth, T.J., Chan, T.F. and Haimes, R. (eds.): *Multiscale and Multiresolution Methods: Theory and Applications*, Lecture Notes in Computational Science and Engineering, Springer-Verlag, Heidelberg, **20** (2001) 347–358.
- [124] Livne, O.E. and Brandt, A. Local Mode Analysis of Multicolor and Composite Relaxation Schemes, *Computers and Math. with Applications*, **47** (2004) 301–317.
- [125] Livne, O.E. and Brandt, A., Formal Fourier Analysis of Multicolor and Composite Relaxation Schemes, Gauss Center Report WI/GC-14, Weizmann Institute, January, 2002.
- [126] Thomas, J.L., Diskin, B. and Brandt, A., Textbook multigrid for fluid simulations, *Annual Reviews in Fluid Mechanics* **35** (2003) 317–340.
- [127] Ron, D., Swendsen, R.H. and Brandt, A., Computer simulations at the fixed point using an inverse renormalization group transformation, *Physica A* **346** (2005) 387–399.
- [128] Livne, O.E., Brandt, A. and Boag, A., Multigrid analysis by large quasi-planar structures.
- [129] Ron, D., Swendsen, R.H. and Brandt, A., Inverse Monte Carlo renormalization group transformations for critical phenomena, *Phys. Rev. Lett.*, **89** (2002), #27.
- [130] Brandt, A. and Ron, D., Multigrid solvers and Multilevel Optimization Strategies. In: *Multilevel Optimization and VLSICAD*, (J. Cong and J.R. Shinnerl, eds.), Kluwer Academic Publishers, Boston, 2003, pp. 1–69.
- [131] Boag, A., Michielssen, E. and Brandt, A., Non uniform polar grid algorithm for fast field evaluation, *IEEE Antenas and Wireless Propagation Lett.* **1** (2002) 142–145.
- [132] Brandt, A., Multiscale computation: from fast solvers to systematic up-scaling. In: *Computational Fluid and Solid Mechanics* (K.J. Bathe, ed.), Elsevier (2003) 1871–1873.
- [133] Brandt, A. and Livshits, I., Remarks on the wave-ray multigrid solvers for Helmholtz equations. In: *Computational Fluid and Solid Mechanics* (K.J. Bathe, ed.), Elsevier (2003) 1874.
- [134] Goldschmidt, Y., Sharon, E., Quintana, F.J., Cohen, I.R. and Brandt, A., Adaptive methods for classification of biological microarray data from multiple experiments, Technical Report MCS03–07, Dept. of Computer Science & Applied Math., Weizmann Institute of Science, July 2003.
- [135] Brandt, A., Multiscale calculation of many eigenfunctions. Technical Report MCS03–10, Dept. of Computer Science & Applied Math., Weizmann Institute of Science, August 2003. *SIAM J. on Multiscale Modeling and Simulation*, submitted.

- [136] Safro, I., Ron, D. and Brandt, A., Graph minimum linear arrangement by multilevel weighted edge contractions. *J. of Algorithms*, 2005.
- [137] Galun, M., Sharon, E., Basri, R., and Brandt, A., Texture segmentation by multiscale aggregation of filter responses and shape elements. ICCV, I: 716–723, 2003, Nice.
- [138] Gorelick, L., Galun, M., Sharon, E., Basri, R. and Brandt, A., “Shape Representation and Classification Using the Poisson Equation”. CVPR 2:61–67, 2004.
- [139] Garb, Kh., Brandt, A. and Boag, A., Directional aggregation approach for fast field evaluation, AP-S/USRI 2004 paper #1484, 2004 IEEE AP-S International Symposium on Antenas and Propagation, Monterey, California, June 20–26.
- [140] Brandt, A. and Gandlin, R., Multigrid for Atmospheric Data Assimilation Analysis. In: *Hyperbolic Problems: Theory, Numerics, Applications* (T.Y. Hou and E. Tadmor, eds.), Springer 2003, pp. 369–376.
- [141] Brandt, A. and Ilyin, V., Multilevel Monte Carlo method for simulations of fluids, condmat/0304686, 30 Apr. 2003, 12pp.
- [142] Brandt, A., Ilyin, V. and Skarboviychuk, A., Multilevel Monte Carlo methods for studying fluids under gravity, Report WI/GC–15, 2003, 16pp.
- [143] Gandlin, R. and Brandt, A., Two multigrid algorithms for an inverse problem in electrical impedance tomography, Proc. 2003 Copper Mountain Conf. Multigrid Methods, *Num. Lin. Alg. with Appl.*, submitted.
- [144] Brandt, A., Systematic multiscaling in materials science computations, Proc. 2nd Int. Conf. on Multiscale Materials Modeling, Oct. 2004, to appear.
- [145] Brandt, A. and Gandlin, R., Residual control for data assimilation: Fourier Analysis.
- [146] Ron, D., Wishko-Stern, S. and Brandt, A., An Algebraic Multigrid-based Algorithm for Bisectioning General Graphs. Technical Report MCS05–01, January 2005.
- [147] Safro, I., Ron, D. and Brandt, A., Multilevel algorithm for the minimum 2-sum problem. *J. Graph Theory and Applications*, submitted.
- [148] Kushnir, D., Galun, M. and Brandt, A., Fast multiscale clustering and manifold identification in 2D and 3D. *Pattern Recognition*, submitted.
- [149] Sharon, E., Galun, M., Sharon, D., Basri, R. and Brandt, A., Hierarchy and adaptivity in segmenting visual scenes, submitted to *Nature*.
- [150] Brandt, A., Multiscale solvers and systematic upscaling in computational physics, *Computer Physics Communication*, **169** (2005) 438–441.
- [151] Diskin, B., Harik, V.M., Ounais, Z. and Brandt, A., Systematic upscaling

for multiscale modeling of multifunctional polymer nanocomposites. Submitted to ASC.

- [152] Safro, I., Ron, D. and Brandt, A., Multilevel algorithms for linear ordering problems, *J. Sci. Comp.*, submitted.
- [153] Goldschmidt, Y., Galun, M., Sharon, E., Basri, R. and Brandt, A., Fast multilevel clustering, Technical Report MCS05–09, Computer Science and Applied Mathematics, The Weizmann Institute of Science.
- [154] Axelrod, A., Eyal, E., Galun, M., Furman-Haran, E., Gomori, M.J., Basri, R., Degani, H. and Brandt, A., Automatic three-dimensional segmentation of MRI images applied to the rat uterus. SPIE 2006.
- [155] Brandt, A., Ilyin, V., Makedonska, N. and Suwan, I. Multilevel summation and Monte Carlo simulations.
- [156] Schumacher, J. Kushnir, D., Brandt, A., Sreenivasan, K.R. and Zilken, H. Statistics and gemogry in high-Schmidt number scalar mixing, iTi Turbulence Conference Proc., 2005.
- [157] Brandt, A., Multiscale methods for data assimilation and feedback optimal control, *Physica D.*, to appear.
- [158] Zlochinn, M. and Brandt, A., Systematic upscaling for Feinman path integrals, Progress Report MCS05–10, Dept. of Computer Science and Applied Mathematics, The Weizmann Institute of Science.
- [159] Kushnir, D., Schumacher, J. and Brandt, A., Geometry of intensive scalar mixing events in turbulence, *Phys. Rev. Lett.*, submitted.
- [160] Axelrod-Ballin, A., Galun, M., Gomori, M.J., Filippi, M., Valsasina, D., Basri, R. and Brandt, A., Integrated segmentation and classification approach applied to multiple sclerosis analysis, CVPR 2006.

Patents

Brandt, A., Mann, J. and Brodski, M., *A Fast and Accurate Radon Transform Inversion Scheme*, Assigned to Yeda Research and Development Co. Ltd., August 1995. U.S. Patent and Trademark Office Application No. 08/659,595, filed 06/06/96. U.S. Patent No. 5,778,038, granted July 7, 1998 under the title “Computerized Tomography Scanner and Method of Performing Computerized Tomography”. European Patent Office Application No. 97108722.6-2305, filed 05/30/97.

Brandt, A., Sharon, E. and Basri, R., *Fast Multiscale Image Segmentation*, assigned to Yeda Research and Development Co., Ltd., Nov. 2000. U.S. Patent and Trademark Office Application No. PCT/US01/43991, July, 2003, entitled: “Method and Apparatus for Data Clustering Including Segmentation and Boundary Detection”.