

List of Publications of Peter Bastian

November 13, 2012

Refereed Journal Publications

- [1] P. Bastian and G. Horton. Parallelization of robust multigrid methods: Ilu factorization and frequency decomposition method. *SIAM J. Sci. Stat. Comput.*, 12(6):1457–1470, 1991. doi:10.1137/0912079.
- [2] P. Bastian, K. Birken, S. Lang, K. Johannsen, N. Neuß, H. Rentz-Reichert, and C. Wieners. UG: A flexible software toolbox for solving partial differential equations. *Computing and Visualization in Science*, 1:27–40, 1997. doi:10.1007/s007910050003.
- [3] P. Bastian, K. Eckstein, and S. Lang. Parallel adaptive multigrid methods in plane linear elasticity problems. *Numerical Linear Algebra with Applications*, 4(3):153 – 176, 1997.
- [4] P. Bastian. Load balancing for adaptive multigrid methods. *SIAM J. Sci. Stat. Comput.*, 19(4):1303–1321, 1998. doi:10.1137/S1064827596297562.
- [5] R. Helmig, H. Class, R. Huber, H. Sheta, J. Ewing, R. Hinkelmann, H. Jakobs, and P. Bastian. Architecture of the modular program system MUFTE–UG for simulating multiphase flow and transport processes in heterogeneous porous media. *Mathematische Geologie*, 1998. Band 2.
- [6] P. Bastian, W. Hackbusch, and G. Wittum. Additive and multiplicative multigrid – a comparison. *Computing*, 60:345–368, 1998. doi:10.1007/BF02684380.
- [7] P. Bastian and R. Helmig. Efficient fully-coupled solution techniques for two-phase flow in porous media. Parallel multigrid solution and large scale computations. *Adv. Water Res.*, 23:199–216, 1999. doi:10.1016/S0309-1708(99)00014-7.
- [8] H. Class, R. Helmig, and P. Bastian. Numerical simulation of non-isothermal multiphase multicomponent processes in porous media. 1. An efficient solution technique. *Adv. Wat. Res.*, 25(5):533–550, 2002. doi:10.1016/S0309-1708(02)00014-3.
- [9] P. Bastian and B. Rivière. Superconvergence and H(div)-projection for discontinuous Galerkin methods. *Int. J. Numer. Meth. Fluids.*, 42(10):1043–1057, 2003. doi:10.1002/flid.562.
- [10] P. Bastian and S. Lang. Couplex benchmark computations with UG. *Computational Geosciences*, 8(2):125–147, 2004. doi:10.1023/B:COMG.0000035075.31334.a2.

- [11] V. Reichenberger, H. Jakobs, P. Bastian, and R. Helmig. A mixed-dimensional finite volume method for multiphase flow in fractured porous media. *Adv. Wat. Res.*, 29(7):1020–1036, 2006. doi:10.1016/j.advwatres.2005.09.001.
- [12] T. Neubauer and P. Bastian. On a monotonicity preserving Eulerian-Lagrangian localized adjoint method for advection-diffusion equations. *Adv. Wat. Res.*, 28(12):1292–1309, 2005. doi:10.1016/j.advwatres.2005.04.010.
- [13] I. A. Watson, R. S. Crouch, P. Bastian, and S. E. Oswald. Advantages of using adaptive remeshing and parallel computing for modelling biodegradation in groundwater. *Adv. Wat. Res.*, 28(11):1143–1158, 2005. doi:10.1016/j.advwatres.2005.01.003.
- [14] P. Bastian and C. Wieners. Multigrid methods on adaptively refined grids. *IEEE Computing in Science and Engineering*, 8(6):44–54, 2006. doi:10.1109/MCSE.2006.116.
- [15] O. Ippisch, H.-J. Vogel, and P. Bastian. Validity limits for the van genuchten-mualem model and implications for parameter estimation and numerical simulation. *Advances in Water Resources*, 29(12):1780–1789, 2006. doi:10.1016/j.advwatres.2005.12.011.
- [16] H.-J. Vogel, I. Cousin, O. Ippisch, and P. Bastian. The dominant role of structure for solute transport in soil. experimental evidence and modelling of structure and transport. *Hydrol. Earth Syst. Sci.*, 10(4):495–506, 2006. Available from: <http://www.hydrol-earth-syst-sci.net/10/495/2006/>.
- [17] P. S. Drouvelis, P. Schmelcher, and P. Bastian. Parallel implementation of the recursive Green’s function method. *Journal of Computational Physics*, 215(2):741–756, 2006. arXiv:cond-mat/0507415. doi:10.1016/j.jcp.2005.11.010.
- [18] P. Bastian, M. Blatt, A. Dedner, C. Engwer, R. Klöfkorn, M. Ohlberger, and O. Sander. A generic grid interface for parallel and adaptive scientific computing. part I: abstract framework. *Computing*, 82(2-3):103–119, 2008. doi:10.1007/s00607-008-0003-x.
- [19] P. Bastian, M. Blatt, A. Dedner, C. Engwer, R. Klöfkorn, R. Kornhuber, M. Ohlberger, and O. Sander. A generic grid interface for parallel and adaptive scientific computing. part II: implementation and tests in DUNE. *Computing*, 82(2-3):121–138, 2008. doi:10.1007/s00607-008-0003-x.
- [20] P. Bastian and M. Blatt. On the generic parallelisation of iterative solvers for the finite element method. *Int. J. Computational Science and Engineering*, 4(1):56–69, 2008. doi:10.1504/IJCSE.2008.021112.
- [21] P. Bastian, A. Chavarria-Krauser, C. Engwer, W. Jäger, S. Marnach, and M. Ptashnyk. Modelling in vitro growth of dense root networks. *Journal of Theoretical Biology*, 254(1):99–109, 2008. doi:10.1016/j.jtbi.2008.04.014.
- [22] C. Engwer and P. Bastian. An unfitted finite element method using Discontinuous Galerkin. *Int. J. Num. Meth. in Engineering*, 79(12):1557–1576, 2009. doi:10.1002/nme.2631.
- [23] Markus Blatt and Peter Bastian. C++ components describing parallel domain decomposition and communication. *International Journal of Parallel, Emergent and Distributed Systems*, 24(6):467–477, 2009. doi:10.1080/17445760902758511.

- [24] Peter Bastian, Christian Engwer, Jorrit Fahlke, and Olaf Ippisch. An unfitted discontinuous galerkin method for pore-scale simulations of solute transport. *Mathematics and Computers in Simulation*, 81(10):2051 – 2061, 2011. Available from: <http://www.sciencedirect.com/science/article/pii/S0378475410004258>, doi:10.1016/j.matcom.2010.12.024.
- [25] P. Bastian, F. Heimann, and S. Marnach. Generic implementation of finite element methods in the distributed and unified numerics environment (DUNE). *Kybernetika*, 46(2):294–315, 2010.
- [26] S. Lang, P. Drouvelis, E. Tafaj, P. Bastian, and B. Sakmann. Fast extraction of neuron morphologies from large-scale sbfsem image stacks. *J. Comput Neurosci*, 31(3):533–545, 2011.
- [27] Peter Bastian, Markus Blatt, and Robert Scheichl. Algebraic multigrid for discontinuous galerkin discretizations of heterogeneous elliptic problems. *Numerical Linear Algebra with Applications*, 19(2):367–388, 2012. Available from: <http://dx.doi.org/10.1002/nla.1816>, doi:10.1002/nla.1816.
- [28] F. Heimann, C. Engwer, O. Ippisch, and P. Bastian. An unfitted interior penalty discontinuous Galerkin method for incompressible Navier-Stokes two-phase flow. *International Journal for Numerical Methods in Fluids*, pages n/a–n/a, 2012. Available from: <http://dx.doi.org/10.1002/flid.3653>, doi:10.1002/flid.3653.
- [29] H. Rimmel, B. Paech, P. Bastian, and C. Engwer. System testing a scientific framework using a regression-test environment. *Computing in Science Engineering*, 14(2):38 –45, march-april 2012. doi:10.1109/MCSE.2011.115.
- [30] Ronnie L. Schwede, Adrian Ngo, Peter Bastian, Olaf Ippisch, Wei Li, and Olaf A. Cirpka. Efficient parallelization of geostatistical inversion using the quasi-linear approach. *Computers & Geosciences*, 44(0):78 – 85, 2012. Available from: <http://www.sciencedirect.com/science/article/pii/S0098300412001021>, doi:10.1016/j.cageo.2012.03.014.
- [31] S. Schlatter, H.-J. Vogel, O. Ippisch, P. Bastian, K. Roth, G. Schenk, H. Schelle, W. Durner, R. Kasteel, and J. Vanderborght. Virtual soils: Assessment of the effects of soil structure on the hydraulic behavior of cultivated soils. *Vadose Zone Journal*, 2011. submitted.
- [32] Rebecca Neumann, Peter Bastian, and Olaf Ippisch. Modeling and simulation of two-phase two-component flow with disappearing nonwetting phase. *Computational Geosciences*, pages 1–11, 2012. doi:10.1007/s10596-012-9321-3.

Refereed Proceedings Publications

- [33] P. Bastian. Higher order discontinuous galerkin methods for flow and transport in porous media. In E. Bänsch, editor, *Challenges in Scientific Computing – CISC 2002*, number 35 in LNCSE, pages 1–22, 2003.
- [34] M. Blatt and P. Bastian. The iterative solver template library. In B. Kagström, E. Elmroth, J. Dongarra, and J. Wasniewski, editors, *Applied Parallel Computing. State of the Art in Scientific Computing*, number 4699 in Lecture Notes in Scientific Computing, pages 666–675, 2007.

- [35] C. Engwer, P. Bastian, and S. P. Kuttanikkad. An Unfitted Discontinuous Galerkin Finite Element Method for Pore Scale Simulations. In *9th International Workshop on State-of-the-Art in Scientific and Parallel Computing*, LNCS. Springer-Verlag, 2008. accepted for publication.
- [36] S. Lang, E. Tafaj, and P. Bastian. Reconstruction of neuronal structures from em-data by 3d-segmentation operators. In Arjan Kuiper, Bettina Heise, and Leila Muresan, editors, *Challenges in the Biosciences: Image Analysis and Pattern Recognition Aspects*, volume 232 of *OAGM Workshop proceedings*, 2008. ISBN 978-3-85403-232-8.
- [37] H. Valtokari, B. Paech, C. Engwer, and P. Bastian. Supporting testing of scientific frameworks using software product line engineering — a proposed approach. In J. Carver, editor, *Fourth International Workshop on Software Engineering for Computational Science and Engineering*, 2011.

Thesis etc.

- [38] P. Bastian. Die Frequenzerlegungsmethode als robustes Mehrgitterverfahren: Implementierung und Parallelisierung. Technical Report 10, Diplomarbeit Universität Erlangen, Erlangen, 1989. Arbeitsberichte des Instituts für mathematische Maschinen und Datenverarbeitung (Informatik), Band 22.
- [39] P. Bastian. *Parallele adaptive Mehrgitterverfahren*. PhD thesis, Universität Heidelberg, 1994. ICA-Bericht 94-1.
- [40] P. Bastian. Numerical computation of multiphase flow in porous media. Habilitationsschrift, 1999.

Books

- [41] P. Bastian. *Parallele adaptive Mehrgitterverfahren*. Teubner Skripten zur Numerik. Teubner-Verlag, 1996.
- [42] P. Luksch, U. Maier, S. Rathmeier, M. Weidmann, F. Unger, P. Bastian, V. Reichenberger, and A. Haas. *Software Engineering Methods for Parallel Applications in Scientific Computing — Project Report*. Shaker, 1998. ISBN 3-8265-4503-6.

Course Material

- [43] P. Bastian, K. Johannsen, and V. Reichenberger. *UG Tutorial*, 1999.
- [44] P. Bastian. Paralleles Rechnen, 2008. Vorlesungsskript.
- [45] P. Bastian. Parallele Lösung großer linearer Gleichungssysteme, 2009. Vorlesungsskript.
- [46] P. Bastian. Informatik I — Programmieren und Softwaretechnik, 2001. Vorlesungsskript.
- [47] P. Bastian. Numerische und stochastische Grundlagen der Informatik, 2009. Vorlesungsskript.
- [48] P. Bastian. Numerik partieller Differentialgleichungen, 2008. Vorlesungsskript.

- [49] P. Bastian. Finite-Element-Verfahren und schnelle Löser, 2008. Vorlesungsskript.
- [50] P. Bastian. Grundlagen der Modellbildung und Simulation, 2008. Vorlesungsskript.

Nonrefereed Publications

- [51] P. Bastian, J. H. Ferziger, G. Horton, and J. Volkert. Adaptive multigrid solution of the convection-diffusion equation on the dirmu multiprocessor. In *Proc. of the Fourth GAMM Seminar*, Notes on Numerical Fluid Mechanics. Vieweg, 1988.
- [52] P. Bastian and G. Horton. Parallelization of robust multigrid methods: Ilu factorization and frequency decomposition method. In *Proc. of the Fifth GAMM Seminar*, Notes on Numerical Fluid Mechanics. Vieweg, 1989.
- [53] P. Bastian, J. Burmeister, and G. Horton. Implementation of a parallel multigrid method for parabolic partial differential equations. In *Parallel Algorithms for Partial Differential Equations*, volume 31 of *Notes on Numerical Fluid Mechanics*. Vieweg, 1991.
- [54] P. Bastian. Locally refined solution of unsymmetric and nonlinear problems. In *Proceedings of the 8th GAMM Seminar*, volume 46 of *Notes on Numerical Fluid Mechanics*, pages 12–21. Vieweg, 1993.
- [55] P. Bastian. Parallel adaptive multigrid methods. Technical Report 93–60, Interdisziplinäres Zentrum für Wissenschaftliches Rechnen, 1993.
- [56] P. Bastian and G. Wittum. Adaptive multigrid methods: The UG concept. In *Proceedings of the 9th GAMM Seminar Kiel*, Notes on Numerical Fluid Mechanics. Vieweg, 1994.
- [57] P. Bastian and G. Wittum. On robust and adaptive multigrid methods. In P. Wesseling and P. Hemker, editors, *Proc. of the 4th European Multigrid Conference*. Birkhäuser, 1994.
- [58] K. Birken and P. Bastian. Dynamic Distributed Data (DDD) in a parallel programming environment – specification and functionality. Forschungs- und Entwicklungsberichte RUS–22, Rechenzentrum der Universität Stuttgart, Germany, September 1994.
- [59] P. Bastian. Dynamic load balancing for parallel adaptive multigrid methods on unstructured meshes. In S. Wagner, editor, *Computational Fluid Dynamics on Parallel Systems*, volume 50 of *Notes on Numerical Fluid Mechanics*, Braunschweig, 1995. Vieweg.
- [60] P. Bastian. Parallel adaptive multigrid methods. In *Proceedings Internationale Bautagung*, Berlin, 1995. A.A. Balkema.
- [61] R. Helmig, P. Bastian, C. Braun, M. Emmert, R. Huber, and H. Sheta. Architecture of a modular program for simulating multiphase flow and transport processes in heterogenous media. In A. Müller, editor, *Conference on Hydroinformatics*, ETH Zürich, 1996. A.A. Balkema.
- [62] P. Bastian, K. Birken, K. Johannsen, S. Lang, N. Neuss, H. Rentz-Reichert, and C. Wieners. Parallel unstructured grid computations. In W. Hackbusch, editor, *Proceedings of the 14th GAMM Seminar Kiel*, Notes on Numerical Fluid Mechanics. Vieweg, 1998.

- [63] S. Paxion, D. Thévenin, P. Bastian, and S. Candel. Using multigrid methods for the computation of reactive flows at low mach numbers. In C.H. Bruneau, editor, *Sixteenth International Conference on Numerical Methods in Fluid Dynamics*, volume 515 of *Lecture Notes in Physics*, pages 536—541. Springer-Verlag, 1998.
- [64] S. Paxion, D. Thévenin, P. Bastian, and S. Candel. Towards low-mach number multigrid simulations on distributed-memory parallel computers using detailed chemistry. In *Proceedings 7th International Conference on Numerical Combustion*, page 57, York, 1998.
- [65] P. Bastian, K. Johannsen, and B. Huurdeman. Parallel adaptive solution techniques for groundwater flow problems. In *Proceedings of the SIAM Conference on Parallel Processing*, San Antonio, 1999.
- [66] P. Bastian, K. Birken, K. Johannsen, S. Lang, V. Reichenberger, C. Wieners, G. Wittum, and C. Wrobel. A parallel software-platform for solving problems of partial differential equations using unstructured grids and adaptive multigrid methods. In E. Krause and W. Jäger, editors, *High performance computing in science and engineering*, pages 326–339. Springer, 1999.
- [67] P. Bastian, K. Birken, K. Johannsen, S. Lang, V. Reichenberger, C. Wieners, G. Wittum, and C. Wrobel. Parallel solutions of partial differential equations with adaptive multigrid methods on unstructured grids. In *High performance computing in science and engineering II*, 1999.
- [68] P. Bastian, K. Johannsen, S. Lang, S. Nägele, C. Wieners, V. Reichenberger, G. Wittum, and C. Wrobel. Advances in high-performance computing: Multigrid methods for partial differential equations and its applications. In *High performance computing in science and engineering III*, 2000.
- [69] P. Bastian, K. Birken, and S. Lang. High level software tools for unstructured adaptive grids on massively parallel systems. In *Proc. of 9th SIAM Conf. on Parallel Processing for Scientific Computing*, page published on CD, 1999.
- [70] H. J. Vogel, P. Bastian, and K. Roth. Downscaling hydraulischer Eigenschaften zur Schätzung von Transportparametern. *Mitteilgn. Dtsch. Bodenkundl. Gesellsch.*, 91:278–281, 1999.
- [71] P. Bastian, Z. Chen, R. E. Ewing, R. Helmig, H. Jakobs, and V. Reichenberger. Numerical solution of multiphase flow in fractured porous media. In Z. Chen, R. E. Ewing, and Z. C. Shi, editors, *Numerical treatment of multiphase flows in porous media*, pages 50–68. Springer-Verlag, 2000.
- [72] P. Bastian and V. Reichenberger. Multigrid for higher order discontinuous Galerkin finite elements applied to groundwater flow. Technical Report 2000-37, SFB 359, 2000.
- [73] P. Bastian, K. Birken, K. Johannsen, S. Lang, V. Reichenberger, C. Wieners, and G. Wittum. High-accuracy simulation of density driven flow in porous media. Technical report, University Heidelberg, 2001.
- [74] S. Paxion, R. Baron, A. Gordner, N. Neuss, P. Bastian, D. Thévenin, and G. Wittum. Development of a parallel unstructured multigrid solver for laminar flame simulations with detailed chemistry and transport. In E. H. Hirschel, editor, *Numerical Flow Simulation II*, volume 75 of *Notes on Numerical Fluid Mechanics*, pages 181–198. Springer-Verlag, 2001.

- [75] H.-J. Vogel, K. Roth, and P. Bastian. Using bulk density measured by x-ray tomography to estimate the hydraulic structure of soil. *Transactions 17th World Congress os Soil Science, Bangkok, 2002*, pages 1218/1–1218/2, 2002.
- [76] P. Bastian, M. Droske, C. Engwer, R. Klöfkorn, T. Neubauer, M. Ohlberger, and M. Rumpf. Towards a unified framework for scientific computing. In R. Kornhuber, R.H.W. Hoppe, D.E. Keyes, J. Périaux, O. Pironneau, and J. Xu, editors, *Proceedings of the 15th Conference on Domain Decomposition Methods*, number 40 in LNCSE, pages 167–174. Springer-Verlag, 2004.
- [77] P. Bastian and B. Rivière. Discontinuous galerkin methods for two-phase flow in porous media. Technical Report 2004–28, IWR (SFB 359), Universität Heidelberg, 2004.
- [78] P. Bastian and T. Ludwig. Helics – Ein Rechner der Superklasse. Ruperto Carola, Forschungsmagazin der Universität Heidelberg, 2004.
- [79] C. Engwer and P. Bastian. A Discontinuous Galerkin method for simulations in complex domains. IWR-Preprint, 2005.
- [80] P. Bastian, O. Ippisch, F. Rezanezhad, H. J. Vogel, and K. Roth. Numerical simulation and experimental studies of unsaturated water flow in heterogeneous systems. In R. Rannacher et al., editor, *Reactive Flows, Diffusion and Transport*. Springer, Berlin-Heidelberg, 2005.
- [81] C. Engwer and P. Bastian. Solving partial differential equations in complicated domains. Oberwolfach Reports, 2005.