MARK F. ADAMS

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EDUCATION

Ph.D. in Civil Engineering   1998
    University of California, Berkeley
    Dissertation: "Multigrid Equation Solvers for Large Scale Nonlinear Finite
    Element Simulations"
    Co-chairs: Prof. R.L. Taylor and Prof. James Demmel
B.A. in Architecture   1983
    University of California, Berkeley

AWARDS & HONORS

Gordon Bell Prize, Supercomputing   2004

John von Neumann Research Fellowship, Sandia National Laboratory   2000

Carl Benz Award, Best Industrial Application, Mannheim Supercomputer Conference
                                                                                    1999

Best Student Paper, 5th Copper Mountain Conference on Iterative Methods   1998

PROFESSIONAL EXPERIENCE

Staff Scientist   2013-present
    Scalable Solvers Group
    Computational Research Division
    Lawrence Berkeley National Laboratory
Adjunct Research Scientist   2013-present
    Department of Applied Physics and Applied Mathematics
    Columbia University
Research Scientist   2004-2013
    Department of Applied Physics and Applied Mathematics
    Columbia University
Technical Staff   2002-2004
    Computational Sciences, Computer Sciences and Mathematics Center
    Sandia National Laboratories
John von Neumann Research Fellow   2000-2002
    Computational Sciences, Computer Sciences and Mathematics Center
    Sandia National Laboratories

Postdoctoral Appointment   1999-2000
    Department of Computer Science
    University of California, Berkeley
    with Prof. James Demmel, Department of Computer Science
Graduate Student Researcher   1996-1998
    Department of Computer Science
    University of California, Berkeley
Summer Intern   1998
    Center for Applied Scientific Computing
    Lawrence Livermore National Laboratory

RESEARCH INTERESTS

Scalable solver, mesh, and discretization methods; fast solver algorithms for emerging architectures; algebraic multigrid; particle-in-cell solvers and extreme-scale methods for plasma physics simulations; extreme-scale computer and emerging architecture benchmarking; application engagement and software deployment through the Portable Extensible Toolkit for Scientific Computing numerical methods library.

SELECTED PUBLICATIONS

Composite Matrix Construction for Structured Grid Adaptive Mesh Refinement, In preparation, [with D. F. Martin, P. W. McCorquodale].

GAMG: The Native Algebraic Multigrid Framework in PETSc, In preparation, [with G. N. Wells, T. Isaac].

Segmental Refinement: A Multigrid Technique for Data Locality, Accepted to SISC 2016, [with J. Brown, M. Knepley, R. Samtaney].

High Resolution Simulation of Pore-Scale Reactive Transport Processes Associated With Carbon Sequestration, Computing in Science and Engineering, No. 6, Vol. 16, p. 22-31, 2014 [with D. Trebotich, C. I. Steefel, S. Molins, C. Shen].

PETSc Users Manual, Technical Report ANL-95/11−Revision 3.5, Argonne National Laboratory, 2014 [with S. Balay, K. Buschelman, V. Eijkhout, W. D. Gropp, D. Kaushik, M. G. Knepley, L. Curfman McInnes, B. F. Smith, H. Zhang].

Chombo Software Package for AMR Applications−Design Document, Lawrence Berkeley National Laboratory Technical Report LBNL-6616E, 2014 [with P. Colella, D. T. Graves, J. N. Johnson, N. D. Keen, T. J. Ligocki, D. F. Martin, P. W. McCorquodale, D. Modiano, P. O. Schwartz, T. D. Sternberg, B. Van Straalen].

HPGMG 1.0: A Benchmark for Ranking High Performance Computing Systems,

Lawrence Berkeley National Laboratory Technical Report LBNL-6630E, 2014 [with J. Brown, J. Shalf, B. Van Straalen, E. Strohmaier, S. Williams].

Low-Communication Techniques for Extreme-scale Multilevel Solvers, Exascale Mathematics Workshop, DOE Office of Advanced Scientific Computing Research, 2013 [with J. Brown, M. Knepley].

Adaptive coarse space construction and nonlinear smoothers for heterogeneous Stokes problems, AGU Fall Meeting, San Francisco, December 3-7, 2012 [J. Brown, M. Knepley, B. Smith].

Toward Textbook Multigrid Efficiency for Fully Implicit Resistive Magnetohydrodynamics, JCP, Vol. 229, No. 18, p. 6208–19, 2010 [with R. Samtaney, A. Brandt].

High-Resolution Peripheral Quantitative Computed Tomography Can Assess Microstructural and Mechanical Properties of Human Distal Tibial Bone, Journal of Bone and Mineral Research, Vol. 25, No. 4, p. 746-756, 2010 [with X. Liu, X. Zhang, K. Sekhon, D. McMahon, E. Shane, J. Bilezikian, X. Guo].

Scaling to 150K Cores: Recent Algorithm and Performance Engineering Developments Enabling XGC1 to Run at Scale, J. of Phys.: Conference Series, 180, 2009 [with S. Ku, P. Worley, E. D'Azevedo, J. Cummings, C. S. Chang].

Algebraic Multigrid Techniques for Strongly Indefinite Linear Systems from Direct Frequency Response Analysis in Solid Mechanics, Computational Mechanics, Vol. 39, No. 4, p. 497-507, 2007.

Performance of Particle in Cell Methods on Highly Concurrent Computational Architectures, J. of Phys.: Conference Series, No. 78, 2007 [with S. Ethier, N. Wickmann].

Cortical and Trabecular Load Sharing in the Human Vertebral Body, Journal of Bone and Mineral Research, 21(2), p. 307-314, 200 [with S. K. Eswaran, A. Gupta, T. M. Keaveny].

Ultrascalable Implicit Finite Element Analyses in Solid Mechanics With Over Half a Billion Degrees of Freedom, ACM/IEEE Proceedings of SC2004: High Performance Networking and Computing, 2004 [with H. H. Bayraktar, T. M. Keaveny, P. Papadopoulos].

Algebraic Multigrid Methods for Constrained Linear Systems with Applications to Contact Problems in Solid Mechanics, Numerical Linear Algebra with Applications, Vol. 11, Nos. 2-3, p. 141-153, 2004.

Parallel Multigrid Smoothing: Polynomial Versus Gauss-Seidel, Journal of

Computational Physics, Vol. 188, No. 2, p. 593-610, 2004 [with M. Brezina, J. J. Hu, R. Tuminaro].

Applications of Algebraic Multigrid to Large-Scale Finite Element Analysis of Whole Bone Micro-Mechanics on the IBM SP, ACM/IEEE Proceedings of SC2003: High Performance Networking and Computing, 2003 [with H. H. Bayraktar, T. M. Keaveny, P. Papadopoulos].

Evaluation of Three Unstructured Multigrid Methods on 3D Finite Element Problems in Solid Mechanics, International Journal for Numerical Methods in Engineering, Vol. 55, No. 1, p. 519-534, 2002.

A Distributed Memory Unstructured Gauss-Seidel Algorithm for Multigrid Smoothers, ACM/IEEE Proceedings of SC2001: High Performance Networking and Computing, 2001.

Parallel Multigrid Solvers for 3D Unstructured Finite Element Problems in Large Deformation Elasticity and Plasticity, International Journal for Numerical Methods in Engineering, Vol. 48, No. 8, p. 1241-1262, 2000.

Parallel Multigrid Solver Algorithms and Implementations for 3D Unstructured Finite Element Problems, ACM/IEEE Proceedings of SC1999: High Performance Networking and Computing, 1999 [with J. Demmel].

PROFESSIONAL SERVICE ACTIVITIES

SISC for Special Section, manuscript reviewer, 2016

SISC Software and High-Performance Computing Section, manuscript reviewer, 2016

Platform for Advanced Scientific Computing (PASC) conference, Technical Program Committee, 2016

SISC Software and High-Performance Computing Section, manuscript reviewer, 2015

International Conference for High Performance Computing, Networking, Storage and Analysis, manuscript reviewer, 2015

International Conference for High Performance Computing, Networking, Storage and Analysis, Birds-of-a-Feather session chair, *High Performance Geometric Multigrid (HPGMG): An HPC Benchmark for Modern Architectures and Metric for Machine Ranking,* 2014 and 2015

DOE Early Career Award Review Committee, 2013

SISC Software and High-Performance Computing Section, manuscript reviewer, 2013

International Conference for High Performance Computing, Networking, Storage and Analysis, Technical Program Committee, 2012

International Parallel & Distributed Processing Symposium, Technical Papers Committee, 2012

Computer Methods in Biomechanics and Biomedical Engineering, manuscript reviewer, 2012

National Science Foundation, grant review committee, 2012

National Science Foundation, grant review committee, 2011

Swiss National Supercomputing Centre, grant application reviewer, 2011

Copper Mountain Conference on Multigrid Methods, manuscript reviewer, 2011

INVITED TALKS

Experimental investigation of the asymptotics of segmental refinement multigrid
King Abdullah University of Science and Technology, Thule, Saudi Arabia, 2016

High Performance Geometric Multigrid: A New Computer Architecture Benchmark
International High Performance Computing Forum, Tianjin City, China, 2015

Segmental Refinement: A Multigrid Technique for Data Locality
PRISM visiting fellow
Imperial College of London, London, United Kingdom, 2015

Multigrid short course
EPSRC UK-USA HPC Network visiting fellow
Cambridge University, Cambridge, United Kingdom, 2015

Multigrid for Memory (Movement) Constrained Architectures; Back to the 70's;
Multigrid short course
King Abdullah University of Science and Technology, Thule, Saudi Arabia, 2014

Multigrid short course
King Abdullah University of Science and Technology, Thule, Saudi Arabia, 2011

Nonlinear Multigrid Methods for Fully Implicit Resistive Magnetohydrodynamics Simulations; *Multigrid short course*
King Abdullah University of Science and Technology, Thule, Saudi Arabia, 2010

Algebraic Multgirid Solvers for Micromechanical Analyses of Human Trabecular Bone
Mannheim Supercomputer Conference, Mannheim, Germany, 1999