

Curriculum Vitae¹

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SPECIALIZATION

Applied Mathematics/ Numerical Analysis/ Numerical Methods for Partial Differential Equations

EMPLOYMENT HISTORY

Apr. 2006 – present, Associate Professor of Mathematics, New Mexico Institute of Mining and Technology, Socorro, New Mexico, U.S.A.

Aug. 2001 – Apr. 2006, Assistant Professor of Mathematics, New Mexico Institute of Mining and Technology, Socorro, New Mexico, U.S.A.

May 2000 – May 2001, Post-Doctoral Fellow, Department of Mathematical and Computer Sciences, Colorado School of Mines, Golden, Colorado, U.S.A.

Aug. 1999 – May 2000, Visiting Assistant Professor of Mathematics, Colorado State University, Fort Collins, Colorado, U.S.A.

Nov. 1998 – Aug. 1999, Professional Research Assistant, Department of Computer Science, University of Colorado at Boulder, Boulder, Colorado, U.S.A.

Jan. 1998 – May 1999, Adjunct Instructor, Department of Mathematical and Computer Sciences, Colorado School of Mines, Golden, Colorado, U.S.A.

Aug. 1994 – Dec. 1997, Research Assistant, Center for Computational Sciences, University of Kentucky, Lexington, Kentucky, U.S.A.

Aug. 1992 – May 1994, Teaching Assistant, Department of Mathematics, University of Kentucky, Lexington, Kentucky, U.S.A.

Jul. 1988 – Nov. 1989, Assistant Lecturer, Chair of Applied Analysis, Faculty of Mechanics and Applied Mathematics, Kazakh State University, Almaty, Kazakhstan.

EDUCATION

- Ph.D. in Mathematics 1998, University of Kentucky, Lexington, Kentucky, U.S.A.

¹Updated July, 2007.

Dissertation – “*Orthogonal spline collocation for nonlinear elliptic boundary value problems*”; adviser – Prof. Bernard Bialecki; major concentration – numerical analysis; minor concentration – partial differential equations.

- Candidate of Physical and Mathematical Sciences (1992), Kazakh State University, Almaty, Kazakhstan

Specialization – application of computers, mathematical modeling and mathematical methods in scientific research; dissertation – “*Finite difference schemes for nonlinear differential equations modeling filtration and hydraulic processes*”; adviser – Prof. Shaltay Smagulov

- Higher Education Diploma with Honors in Applied Mathematics (1988), Kazakh State University, Almaty, Kazakhstan (the Soviet equivalent to M.S. in Mathematics)

Specialization – computational methods for solving problems in mathematics, economics and control; thesis – “*Finite difference schemes for Saint-Venant’s equations*”; adviser – Prof. Shaltay Smagulov

RESEARCH INTERESTS

Numerical simulation of fluid flow in filters.

Numerical methods for PDEs with discontinuous coefficients

Quadrature finite element Galerkin approximation of a biharmonic problem

Multilevel preconditioners for solving nonselfadjoint or indefinite orthogonal spline collocation problems

Numerical simulations of thermal blooming for a high energy laser

Preconditioned conjugate gradient method for nonselfadjoint or indefinite orthogonal spline collocation problems

Parallel two-level methods for three-dimensional transonic compressible flow simulations on unstructured meshes

Orthogonal spline collocation methods for nonlinear elliptic boundary value problems

Iterative methods for large linear and nonlinear systems of algebraic equations

Matrix decomposition methods for orthogonal spline collocation problems

Additive Schwarz domain decomposition method for nonlinear finite difference problems

Parallel algorithms and programming

Finite difference methods for differential equations modeling filtration and hydraulics processes

TEACHING EXPERIENCE

analytic geometry
calculus
college algebra
discrete mathematics
finite element methods
introductory and advanced linear algebra
methods of applied mathematics
numerical analysis
numerical methods for partial differential equations
numerical modeling and simulation with finite element method
numerical linear algebra
ordinary differential equations
professional development seminar
real analysis

INSTITUTIONAL SERVICE

Academic Tenure and Freedom Committee
Academic Standards and Admission Committee
General Degree Requirements Assessment Committee
Budget, Funding and Support Committee
Dept of Mathematics Search Committees
Ph.D. Committees
Master Thesis Committees

PROFESSIONAL MEMBERSHIPS

Society for Industrial and Applied Mathematics (since 2002)

BOOK REVIEWS

Introduction to Numerical Analysis, by Brian Bradie, Prentice Hall, 2005

JOURNAL ARTICLE REVIEWS

Numerical Methods for Partial Differential Equations, Wiley
Applied Numerical Mathematics, Elsevier
Numerical Algorithms, Springer
Advances in Difference Equations, Hindawi Publishing

LIST OF PUBLICATIONS

1. R. Aitbayev, *Convergence analysis of a quadrature finite element Galerkin method for a biharmonic problem*,” Numerical Methods for Partial Differential Equations, to appear.
2. R. Aitbayev, *An error analysis and the mesh independence principle for a nonlinear collocation problem*, Numerical Methods for Partial Differential Equations, 22(2006), 1216–1237.
3. R. Aitbayev, *Multilevel preconditioners for a quadrature Galerkin solution of a biharmonic problem*, Numerical Methods for Partial Differential Equations, 22(2006), 847–866.
4. R. Aitbayev, *Multilevel Preconditioners for Non-self-adjoint or Indefinite Orthogonal Spline Collocation Problems*, SIAM Journal on Numerical Analysis, 43(2005), 686–706.
5. R. Aitbayev and B. Bialecki, *A preconditioned conjugate gradient method for non-self-adjoint or indefinite orthogonal spline collocation problems*, SIAM Journal on Numerical Analysis, 41 (2003), pp. 589–604.
6. R. Aitbayev and B. Bialecki, *Orthogonal spline collocation for nonlinear Dirichlet problems*, SIAM Journal on Numerical Analysis, 38 (2000), pp. 1582–1602.
7. R. Aitbayev, X.-C. Cai, and M. Paraschivoiu, *Parallel two-level methods for three-dimensional transonic compressible flow simulations on unstructured meshes*, in Parallel Computational Fluid Dynamics: Towards Teraflops, Optimization and Novel Formulations, D. Keyes, A. Ecer, J. Periaux, N. Satofuka and P. Fox (Editors), Elsevier, 2000, pp. 89 – 96.
8. R. Aitbayev, *Orthogonal Spline Collocation for Nonlinear Elliptic Boundary Value Problems*, Ph.D. dissertation, University of Kentucky, 1998.
9. R. Aitbayev and Sh. Smagulov, *Convergence of a finite difference scheme for a quasilinear differential equation with a solution in W_2^2* , in Dynamics of the Fluid with Free Boundaries (The Continuum Dynamics), Issue 107, Hydrodynamics Institute of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk, 1993, pp. 3 – 10 (in Russian).
10. R. Aitbayev, *Study of a finite difference scheme for the diffusion approximation of Saint Venant’s equations (stability and convergence)*, in proceedings of the XXVI USSR National Student Scientific Conference (Mathematics), Novosibirsk State University, Novosibirsk, 1988 (in Russian).
11. R. Aitbayev, *Study of a finite difference scheme for the diffusion analogy of Saint Venant’s equations (a priori estimates)*, in proceedings of Conference of Young Scientists and Specialists of the Kazakh State University, Kazakh State University, Alma-Ata, 1988 (in Russian).

CONFERENCES

- 16th International Conference on Domain Decomposition Methods, New York University, New York City, January 12–15, 2005. Gave a contributed presentation *Convergence Analysis and Multilevel Preconditioners for a Quadrature Galerkin Approximation of a Biharmonic Problem*
- The Eight Copper Mountain Conference on Iterative methods, Copper Mountain, Colorado, March 28 – April 2, 2004. Gave a contributed presentation “*Multilevel preconditioners for nonselfadjoint or indefinite orthogonal spline collocation problems*”.
- Directed Energy Modeling and Simulation Conference, Albuquerque, New Mexico, 25–27 March 2003. *Platform independent interface for using supercomputers in modeling and simulation of directed energy weapons*, S. Tear, D. Driscoll, M. Nunez, R. Aitbayev, V. Romero, S. Doerr, H. Schreiber, T. Lawson, G. Gusciora, C. Holmberg, L. Rigdon (presented by S. Tear).
- Meeting of the Southwestern Section of the Mathematical Association of America, April 2003. Served as a section chair.

WORKSHOPS

- Assessment Workshop, Lisle, Illinois, February 7–9, 2007.
- Workshop, Introduction to COMSOL Multiphysics, organized by Brian Adolf, COMSOL Inc, November 8, 2005, Albuquerque, at Imaging Concepts of New Mexico.
- Introduction to Domain Decomposition Methods, organized by Olof Widlund and David Keyes, January 12, 2005, New York University.
- Introduction to PETSc, organized by the PETSc Project Group, Argonne National Laboratory, January 11, 2005, Columbia University.
- Trilinos Project, organized by Michael Heroux (Sandia National Laboratories), Copper Mountain, Colorado, March 28 – April 2, 2004.
- PDE Constrained Optimization, March 31, 7:30-10:00 pm, organized by Eldad Haber (Emory University), Copper Mountain, Colorado, March 28 – April 2, 2004.