

HEIDI K. THORNQUIST

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EDUCATION

- 1998-2006 *Rice University, Department of Computational and Applied Mathematics (CAAM)*
Graduate Student, Ph.D. Program. Advisor: Danny C. Sorensen
Thesis title: "Fixed-Polynomial Approximate Spectral Transformations for
Preconditioning the Eigenvalue Problem."
Graduating GPA: 3.91/4.0
- 1993-1998 *Humboldt State University (HSU). Bachelor of Arts.*
Major: Mathematics (Applied). Minor: Computer Information Systems.
Graduated summa cum laude, GPA: 3.85/4.0

RELATED OCCUPATIONAL EXPERIENCE

Electrical and Microsystems Modeling Organization.
Computation, Computers, Information, and Mathematics (CCIM) Division.
Sandia National Laboratories.
August 2005 to present.

- Software developer for the Xyce parallel analog circuit simulator.
- Implementing numerical algorithms for reduced-order modeling of circuits and MEMS devices.
- Researching scalable preconditioning methods for parallel linear solvers.

Computational Mathematics and Algorithms Organization.
CCIM Division.
Sandia National Laboratories.
January 2003 to August 2005.

- Software developer for the Trilinos project (R&D100 Award 2004). Lead developer for the Anasazi, Belos, and Teuchos packages (SDKs).
- Developed and implemented block iterative algorithms for computing solutions to linear problems and eigenproblems.

Student Research Assistant.
Rice University, Houston TX.
August 1998 to December 2002.

- Maintained ARPACK software library and provided user support.
- Analyzed ARPACK memory/CPU usage with SGI profiler and HPCView.
- Designed Perl testing script for ARPACK installation.

Graduate Research Assistant, Center for Nonlinear Studies (CNLS).
Theoretical Division.
Los Alamos National Laboratory.
June 2002 to August 2002.

- Developed algebraic and physics-based preconditioners for Newton-Krylov methods, for use in performing linear stability analysis on ocean circulation models.
- Adapted existing FORTRAN code to use new preconditioners in performing bifurcation analysis.
- Analyzed eigenmodes of unstable steady-state solutions with ARPACK, using fixed-polynomial approximate spectral transformations.

Graduate Research Assistant, hypr (high performance preconditioners) Project.
 Institute for Scientific Computing Research (ISCR), Center for Applied Scientific Computing (CASC).
 Lawrence Livermore National Laboratory.
 May 1999 to August 1999.

- Developed a hybrid multigrid algorithm using sparse grids domain decomposition and the Multiple Semicoarsened Grid (MSG) technique for use in preconditioning highly anisotropic problems.
- Implemented hybrid multigrid method in C, and integrated code into the existing hypr library.

Graduate Research Assistant, Simulation of Deregulated Power Market Project.
 Computing Information and Communication Division.
 Los Alamos National Laboratory.
 June 1998 to August 1998.

- Revised graph theory algorithms in existing C code, designed to simulate the power deregulation of a network of producers and consumers. Tested code on a coarse version of the electrical power network in Colorado.
- Analyzed accelerometer data retrieved from a damage identification experiment on seismically retrofitted highway support columns. Developed Matlab code to perform signal analyses on multiple data sets.

ACADEMIC AWARDS AND SCHOLARSHIPS

Phi Kappa Phi Life Member
 HSU Harry S. Kieval Mathematics Scholarship (1997-1998)
 HSU Presidential Scholar (7 semesters, GPA above 3.75)
 California Scholarship Federation (CSF) Life Member

PUBLICATIONS

C. G. Baker, U. L. Hetmaniuk, R. B. Lehoucq, and H. K. Thornquist. Anasazi software for the numerical solution of large-scale eigenvalue problems. Submitted to ACM TOMS [SAND2007-0350].

Michael A. Heroux, Roscoe A. Bartlett, Vicki E. Howle, Robert J. Hoekstra, Jonathan J. Hu, Tamara G. Kolda, Richard B. Lehoucq, Kevin R. Long, Roger P. Pawlowski, Eric T. Phipps, Andrew G. Salinger, Heidi Thornquist, Ray S. Tuminaro, James M. Willenbring, Alan Williams, Kendall S. Stanley. An overview of the Trilinos project. ACM Trans. Math. Softw. 31(3): 397-423, 2005.

Canice O'Brien, Woon-Ho Seo, Heidi K. Thornquist and John F. Donegan. Two-dimensional model of self-pulsation in AlGaAs laser diodes. Accepted conference paper at SPIE Photonics Europe 2004 [SAND2004-1753C].

Christopher L. Barrett, Achla Marathe, Madhav V. Marathe, Doug Cook, Gregory Hicks, Vance Faber, Aravind Srinivasan, Yoram J. Sussmann, Heidi Thornquist. Statistical analysis of algorithms: A case study of market-clearing mechanisms in the power industry. J. Graph. Algorithms Appl. 7(1): 3-31, 2003.

Christopher L. Barrett, Achla Marathe, Madhav V. Marathe, Doug Cook, Gregory Hicks, Vance Faber, Aravind Srinivasan, Yoram J. Sussmann, Heidi Thornquist. Experimental analysis of algorithms for bilateral-contract clearing mechanisms arising in deregulated power industry. *Algorithm Engineering* 2001: 172-184.

PRESENTATIONS

- Trilinos User Group Meeting, Albuquerque, NM, November 2006: *What's New in the Old: Teuchos and Anasazi.*
- Virginia Polytechnic Institute and State University, Blacksburg, VA, April 2006:
 - *An Overview of Trilinos*
 - *Next Generation Iterative Solvers: Belos & Anasazi*
- Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, April 2006: *Fixed-polynomial Approximate Spectral Transformations for Preconditioning the Eigenvalue Problem.*
- SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, CA, February 2006: *Anatomy of a Package: Anasazi.*
- Trilinos User Group Meeting, Albuquerque, NM, November 2005: *Teuchos and Thyra from a Developer's Perspective.*
- SIAM Conference on Computational Science and Engineering, Orlando, FL, February 2005:
 - *Combining Trilinos Packages to Solve Linear Systems*
 - *Solving Eigenvalue Problems with Anasazi*
- Trilinos User Group Meeting, Albuquerque, NM, November 2004:
 - *Teuchos: Utilities for Developers & Users Part I*
 - *Next Generation Iterative Solvers: Anasazi & Belos*
 - *Teuchos: Utilities for Developers & Users Part II*
- Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, March 2004: *An Overview of Belos and Anasazi: Frameworks for Block Linear Solvers / Eigensolvers.*
- DAM / DOE Meeting, Bruyères le Châtel, France, February 2004: *Solving Eigenvalue Problems: Algorithms and Software Implementations.*
- Trilinos User Group Meeting, Albuquerque, NM, October 2003: *An Overview of Belos & Anasazi.*
- Sixth IMACS International Symposium on Iterative Methods in Scientific Computing, Denver, CO, March 2003: *Fixed-polynomial Approximate Spectral Transformations for Preconditioning the Eigenvalue Problem.*

COMPUTER SKILLS

Programming: C++/C, FORTRAN 77/90/95, Python, Perl, MPI, OpenMP, Pthreads, HTML, Visual Basic

Operating Systems: Linux, Mac OS X, Irix, Solaris, MS Windows XP/2K/9x/NT, Compaq Tru64

Libraries: Trilinos, LAPACK, (P)ARPACK, SPARSKIT, SPEIG, SuperLU, hypre

Applications: Matlab, Maple, Mathematica, TotalView, HPCView