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Professional Interests

Parallel and distributed processing, scientific computing, high performance computing, graph algorithms, graph partitioning, numerical simulations, computational science and engineering, novel algorithms development for solving important existing and/or emerging problems, and development of practical software tools implementing these algorithms.

Education

- 2005* Ph.D., University of Minnesota, Scientific Computation Program, Computer Science Department, GPA 3.96/4.00. Thesis Title: "Graph Partitioning for Scientific Computing Applications", advisors: Dr. George Karypis and Dr. Yousef Saad.
- 1997* B.Sc., University of Crete, Department of Mathematics, GPA 7.79/10, Ranking 4/90. Thesis Title: "Domain Decomposition Methods for Elliptic PDEs: The Linear Algebra Viewpoint", advisor: Dr. Apostolos Hadjidimos.

Research Experience

- 2005 -* Marie Curie Fellow, Research Associate, University of Cyprus, Department of Mechanical and Manufacturing Engineering. Currently developing numerical simulation and parallel distributed computing algorithms for complex fluid flow and turbulence problems.
- 2006 November* Visiting Scholar, ETH Zürich, Department of Computer Science, Institute for Computational Science.
- 2006 May-June* Visiting Scholar, Stanford University, Center of Turbulence Research.
- 1999 - 2005* Research Assistant, University of Minnesota, Computer Science Department and the Army High Performance Computing Research Center (AHPCRC) with Dr. George Karypis.
- Developed algorithms for partitioning graphs/meshes used in parallel applications that are run on heterogeneous architecture computers.
 - Developed algorithms for partitioning graphs/meshes so that the induced partitions correspond to matrices with minimal and balanced requirements in terms of the work needed by a direct linear solver. This work is incorporated in the MEIS software package.
 - Parallelized KIVA-3V, which is a transient, three-dimensional, multiphase, multicomponent code for the analysis of chemically reacting flows with sprays, in collaboration with Dr. Sean Garrick from the Mechanical Engineering Department. KIVA was developed at the Los Alamos National Laboratory, and is the most widely used library for engine research.
 - Developed serial and parallel algorithms for the construction of coarse grids for geometric multigrid methods. Built and maintain ParMGridGen, a freely available software package.
- 1997 - 1999* Research Assistant, University of Minnesota, Computer Science Department and the Minnesota Supercomputing Institute (MSI) with Dr. Yousef Saad.
- Implemented new communication data structures and routines for the PPARSLIB software library. Also enhanced and refined other existing routines.
 - Created new capabilities for the finite element suite of the SPARSKIT software library and added performance improvements to other routines.
- 1995 - 1997* Research Assistant, Institute of Applied and Computational Mathematics (IACM), of the Foundation for Research and Technology (FORTH), with Dr. Emmanuel Vavalis and Dr. Nikos Flytzanis. Worked on an interdisciplinary project for the modeling of the static properties of superconducting Josephson junctions. I developed software for the implementation of a split-Galerkin method to solve the Maxwell equations with the quantum Josephson equations describing tunneling phenomena between two superconductors separated by a thin insulator.
- 1995 Summer* Fellowship for the Summer Scholarship Program organized by the Edinburgh Parallel Computing Center (EPCC). A highly competitive program that accepted only fifteen students from all over the world. Worked on the TLG project and created a parallel search engine for the Greek language.
- 1994 - 1996* System operator and consultant, University of Crete, Education Team of the Computing Center.
- 1994 - 1995* System Programmer, University of Crete, Department of Mathematics.

Teaching Experience

- 2006 Spring Instructor, University of Cyprus, Graduate Course “Introduction to Parallel Computing for Engineers”.
- 2005 Spring Guest Lecturer, University of Minnesota, Graduate Course “Introduction to Parallel Computing: Architectures, Algorithms and Programming”, Dr. Vipin Kumar.
- 2004 Spring Guest Lecturer, University of Minnesota, Graduate Course “Introduction to Parallel Computing: Architectures, Algorithms and Programming”, Dr. George Karypis.
- 1996 Fall Teaching Assistant, University of Crete, Undergraduate Course “Introduction to Numerical Linear Algebra”, Dr. Apostolos Hadjidimos.
- 1996 Spring Teaching Assistant, University of Crete, Undergraduate Course “Introduction to Numerical Analysis”, Dr. Emmanuel Vavalis.
- 1995 Spring Teaching Assistant, University of Crete, Undergraduate Course “Introduction to Numerical Analysis”, Dr. Charalambos Makridakis.
- 1993 - 1997 Mathematics Tutor.

Publications

Journal and Refereed Conference Papers

1. “A Grid-Free Abstraction of the Navier-Stokes Equations in Fortran 95/2003” with D. Rouson, X. Xu, S. Kassinos. *ACM Transactions on Mathematical Software*, Vol. 34, No. 1, (2008).
2. “Multilevel Algorithms for Generating Coarse Grids for Multigrid Methods” with G. Karypis. *Supercomputing '01: Proceedings of the 2001 ACM/IEEE conference on Supercomputing (CDROM)*, 45–45 (10 pages), ACM Press New York, (2001). Also *University of Minnesota, Computer Science Department. Technical Report 01-021*, (2001).
3. “Static properties and waveguide modes of a wide lateral window Josephson Junction”, with J.-G. Caputo, N. Efraimidis, N. Flytzanis, N. Lazaridis, Y. Gaididei, E. Vavalis. *International Journal of Modern Physics C: Physics and Computers*, Vol. 11, No. 3, 493-518, (2000).
4. “Split Mode Method for the Elliptic 2D Sine-Gordon Equation: Application to Josephson Junction in Overlap Geometry”, with J.-G. Caputo, N. Flytzanis, Y. Gaididei, E. Vavalis. *International Journal of Modern Physics C: Physics and Computers*, Vol. 9, No. 2, 301-324, (1998).

Conference Papers

5. “Partitioning Algorithms for Parallel Applications on Heterogeneous Architectures” with G. Karypis. *In the 2006 SIAM Conference on Parallel Processing for Scientific Computing*. Also *University of Minnesota, Computer Science Department. Technical Report 06-001*, (2006).
6. “Partitioning Algorithms for Simultaneously Balancing Iterative and Direct Methods” with G. Karypis. *In the 2005 SIAM Conference on Computational Science and Engineering*. Also *University of Minnesota, Army High Performance Computing Research Center. Technical Report 2004-104*, (2004).

Technical Reports

7. “A Portable Library of Parallel Sparse Iterative Solvers”, with Y. Saad, A. Malevsky, G.C. Lo, S. Kusnetsov, M. Sosonkina. *University of Minnesota, Computer Science Department*, (1999).
http://www.cs.umn.edu/~saad/software/p_sparlib/
8. “Thesaurus Linguae Graecae (TLG) Parallel Searching”. Summer Scholarship Program at Edinburgh Parallel Computing Center, Edinburgh Scotland. *Technical Report EPCC-SSP95-04*, (1995).

Theses

9. “Graph Partitioning for Scientific Computing Applications”, with G. Karypis and Y. Saad. *University of Minnesota, Scientific Computation Program, Ph.D. Thesis*, (2005).
10. “Domain Decomposition Methods for Elliptic PDEs: The Linear Algebra Viewpoint”, with Apostolos Hadjidimos. *University of Crete, Department of Mathematics, Undergraduate Thesis*, (1997).

Software Development

<i>ParMGridGen</i>	Developer and Maintainer. Software package for the construction of coarse grids for geometric multi-grid methods. It includes both a serial and a parallel library, and has been downloaded over 3,800 times since 2002. http://www.cs.umn.edu/~moulitsa/software.html
<i>KIVA</i>	Developer of parallel version. Software package for the analysis of chemically reacting flows with sprays.
<i>MEIS</i>	Contributor. Software package for partitioning graphs/meshes and computing fill-reducing orderings of sparse matrices. http://www.cs.umn.edu/~metis
<i>PSPARSLIB</i>	Contributor. Software library with parallel iterative solvers and preconditioners for sparse linear systems. http://www.cs.umn.edu/~saad/software/p_sparslib/
<i>SPARSKIT</i>	Contributor. Software library with tools for sparse matrix manipulations and iterative solvers. http://www.cs.umn.edu/~saad/software/SPARSKIT/sparskit.html

Professional Activities

Affiliations Member of SIAM

Referee

- Cluster Computing: the Journal of Networks, Software Tools and Applications (Springer)
- International Conference On Parallel Processing (ICPP)
- Workshop on Partitioning Mesh-based Applications for Computational Grids (PartGrid-ICCSA)
- IEEE Transactions on Parallel and Distributed Systems (TPDS)
- International Parallel and Distributed Processing Symposium (IPDPS)
- Workshop on Partitioning Applications for Computational Grids (PACGrid-IPDPS)
- Engineering with Computers: An International Journal for Simulation-Based Engineering (Springer)
- Journal of Parallel and Distributed Computing (Elsevier)
- Euro-Par

Presentations

- “Partitioning Algorithms for Parallel Applications on Heterogeneous Architectures”. *The 2006 SIAM Conference on Parallel Processing for Scientific Computing (PP06)*, San Francisco California, February 2006.
- “Partitioning Algorithms for Simultaneously Balancing Iterative and Direct Methods”. *The 2005 SIAM Conference on Computational Science and Engineering (CSE05)*, Orlando Florida, February 2005.
- “Efficient Parallelization of KIVA”. *The Army Research Office Center of Excellence for Propulsion Systems (ARO)*, Madison Wisconsin, September 2002.
- “Multilevel Algorithms for Generating Coarse Grids for Multigrid Methods”. *The IEEE Supercomputing 2001 Conference (SC 2001)*, Denver Colorado, November 2001.

Computer Proficiency

<i>Operating Systems</i>	Unix, MacOS, Microsoft Windows
<i>Programming Languages</i>	C, Fortran, MATLAB, C++
<i>Parallel Programming</i>	Message Passing Interface (MPI), OpenMP

Languages

Greek, English, German, French

References

Available upon request