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Professional Interests

- Scientific computing.
- Combinatorial algorithms.
- Sparse linear algebra.
- Software design.
- Parallel computing.

Education

- 2001: Ph.D. in Computer Science, Old Dominion University, Norfolk, Virginia, USA.
- 1989: M.S. in Computer Engineering, Polytechnic Institute, Bucharest, Romania.
- 1983: Baccalaureate, Gh. Lazar High School, Bucharest, Romania.

Professional Experience

- 2004-present: Associate research scientist, Columbia University, New York, New York, USA.
- 2001-2004: Postdoctoral fellow, Old Dominion University, Norfolk, Virginia, USA.
- 1994-2001: Teaching/research assistant, Old Dominion University, Norfolk, Virginia, USA.
- 1991-1994: Software engineer, Computer Sharing, Bucharest, Romania.
- 1989-1991: Software engineer, Institute for Research in Informatics, Bucharest, Romania.

Software Contributions

- **Oblio**: a direct solver library for solving sparse symmetric linear systems, either positive definite or indefinite. Oblio represents the first direct sparse solver that is written in C++ and uses modern software techniques. High performance is guaranteed by calls to efficient BLAS and LAPACK kernels while flexibility is provided through careful object-oriented design. Most other direct solver libraries provide limited choices in algorithms and data structures, while Oblio is an algorithmic laboratory that provides flexibility in such choices. Among them, various factorization types, factorization algorithms and factor data structures (in-core and out-of-core), for both real and complex valued problems. Other available options are supernode compression, iterative refinement, multiple right hand sides.
- **Milan** (with Mahantesh Halappanavar): a collection of matching algorithms for bipartite and nonbipartite graphs. The package contains both exact and approximation algorithms for the following three problems: maximum cardinality matching, maximum vertex-weight matching and maximum edge-weight matching. Various matching algorithms are available in Milan, ranging from the simplest ones to those that have the best known computational complexity. Techniques such as augmentation along

multiple paths, optimal disjoint set operations and binary heaps for priority queues are employed for the latter. Milan is written in C++, just like Oblio.

- A collection of parallel simulation codes for model magnetohydrodynamics (MHD) problems. The models are two dimensional and cover various MHD regimes, from ideal to resistive to extended. The simulations are performed implicitly using triple nested loops (time, nonlinear, linear) that employ a Newton-Krylov-Schwarz approach. The space discretization is second order accurate while higher order accuracy (third and fourth) is available for the time discretization through backward differentiation. The code is written in C with calls to PETSc, the scalable solver library.

Publications

- Florin Dobrian, Serguei Ovtchinnikov, Xiao-Chuan Cai and David Keyes. *Computational Experiences with Domain-decomposed Implicit Methods for Model Magnetohydrodynamics Problems*. In preparation, 2006.
- Florin Dobrian, Mahantesh Halappanavar and Alex Pothen, *Fast Approximation Algorithms for Bipartite Vertex-Weighted Matching*. Preprint, 2006.
- Serguei Ovtchinnikov, Florin Dobrian, Xiao-Chuan Cai and David Keyes, *Domain-Decomposed Fully Coupled Implicit Methods for a Magnetohydrodynamics Problem*. In Proceedings of the 16th International Conference on Domain Decomposition Methods, 2005.
- Florin Dobrian and Alex Pothen, *Oblio: Design and Performance*. In J. Dongarra, K. Madsen, and J. Wasniewski, editors, State of the Art in Scientific Computing, Lecture Notes in Computer Science 3732, Springer-Verlag, 2005.
- Florin Dobrian and Alex Pothen, *A Comparison between Three External Memory Algorithms for Factoring Sparse Matrices*, In Proceedings of the SIAM Conference on Applied Linear Algebra, 2003.
- Florin Dobrian and Alex Pothen, *The Design of I/O-efficient Sparse Direct Solvers*. In Proceedings of the Supercomputing Conference, 2001.
- Florin Dobrian, *External Memory Algorithms for Factoring Sparse Matrices*. Ph.D. thesis, 2001.
- Florin Dobrian and Alex Pothen. *Oblio: A Sparse Direct Solver Library for Serial and Parallel Computations*. ICASE Technical Report, 2000.
- Florin Dobrian, Gary Kumfert and Alex Pothen, *The Design of Sparse Direct Solvers using Object-oriented Techniques*. In A. M. Bruaset, H. P. Langtangen, and E. Quak, editors, Advances in Software Tools for Scientific Computing, Lecture Notes in Computational Science and Engineering 10, Springer-Verlag, 1999.
- Florin Dobrian, Gary Kumfert and Alex Pothen, *Object-oriented Design for Sparse Direct Solvers*. In D. Caromel, R. R. Oldehoeft, and M. Tholburn, editors, Computing in Object-Oriented Parallel Environments, Lecture Notes in Computer Science 1505, Springer-Verlag, 1998.

Conference Presentations

- *Scalable Implicit Solutions for MHD Models*, 12th SIAM Conference on Parallel Processing for Scientific Computing, February 22–24, 2006, San Francisco, California.
- *One- and Two-Level Schwarz Methods in Reduced Resistive Magnetohydrodynamics*, 12th SIAM Conference on Parallel Processing for Scientific Computing, February 22–24, 2006, San Francisco, California.
- *Fast Approximation Algorithms for Bipartite Vertex-Weighted Matching*, 12th SIAM Conference on Parallel Processing for Scientific Computing, February 22–24, 2006, San Francisco, California.
- *Practical Experiences with Maximum Vertex-Weight Matching Algorithms*, 2nd International Workshop on Combinatorial Scientific Computing, June 21–23, 2005, Toulouse, France.

- *Fast Approximation Algorithms for Preordering Sparse Matrices*, SIAM Conference on Computational Science and Engineering, February 12–15, 2005, Orlando, Florida.
- *Evaluation of Parallel Implicit Methods for a Set of Model MHD Problems*, 16th International Conference on Domain Decomposed Methods, January 12–15, 2005, New York, New York.
- *Computational Experiences with Fully Coupled Implicit Methods for Various Magnetohydrodynamics Problems*, 16th International Conference on Domain Decomposed Methods, January 12–15, 2005, New York, New York.
- *Evaluation of Parallel Implicit Methods for a Model MHD Problem*, SIAM Annual Meeting, July 12–16, 2004, Portland, Oregon.
- *Oblio: Design and Performance*, PARA 2004 Workshop on State-of-the-Art in Scientific Computing, June 20–23, 2004, Copenhagen, Denmark.
- *The Design of a Memory-Efficient Sparse Direct Solver Library*, 11th SIAM Conference on Parallel Processing for Scientific Computing, February 25–27, 2004, San Francisco, California.
- *A Comparison between Three External Memory Algorithms for Factoring Sparse Matrices*, 8th SIAM Conference on Applied Linear Algebra, July 15–19, 2003, Williamsburg, Virginia.
- *Oblio: The Design of a Sparse Direct Solver Library*, SIAM Annual Meeting, June 16–20, 2003, Montreal, Canada.
- *The Design of I/O-Efficient Sparse Direct Solvers*, Supercomputing, November 10–16, 2001, Denver, Colorado.
- *Advanced Software Design for Parallel Sparse Direct Solvers*, Parallel Computational Fluid Dynamics, May 23–26, 1999, Williamsburg, Virginia.
- *Object-Oriented Parallel Factorization for Sparse Symmetric Systems*, 9th SIAM Conference on Parallel Processing for Scientific Computing, March 22–24, 1999, San Antonio, Texas.
- *Object-Oriented Design for Sparse Direct Solvers*, International Symposium on Computing in Object-Oriented Parallel Environments (ISCOPE '98), December 8–11, 1998, Santa Fe, New Mexico.
- *The Object-Oriented Design of a Family of Direct Solvers*, 6th SIAM Conference on Applied Linear Algebra, October 29–November 1, 1997, Snowbird, Utah.

References

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- David Keyes, Fu Foundation Professor of Applied Mathematics, Department of Applied Physics and Applied Mathematics, Columbia University, 200 S. W. Mudd Building, MC 4701, 500 W. 120th Street, New York, NY, 10027, USA, e-mail: kd2112@columbia.edu, phone: 212-854-4458, fax: 212-854-8257.
- Iain Duff, Group Leader of Numerical Analysis, Computational Science and Engineering Department, Rutherford Appleton Laboratory, Chilton, Didcot, Oxfordshire, OX11 0QX, UK, e-mail: i.s.duff@rl.ac.uk, phone: +44 1235 445803, fax: +44 1235 446626.
- Ion Stoica, Assistant Professor, Computer Science Division, University of California at Berkeley, 645 Soda Hall, Berkeley, CA 94720, USA, e-mail: istoica@cs.berkeley.edu, phone: 510-643-4007, fax: 510-643-1289.
- Gary Kumfert, Computer Scientist, Center for Applied Scientific Computing, Lawrence Livermore National Laboratory, Box 808, L-365, Livermore, CA 94551, USA, e-mail: kumfert@llnl.gov, phone: 925-424-2580, fax: 925-424-2477.