Vladimir Kotlyar

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Research Interests

Software systems for high-performance computers. Compilers. Parallel computing. Databases. Computational science.

Education

Cornell University — Ithaca, NY
Ph.D. in Computer Science (expected), Summer 1998
Advisor: Dr. Keshav Pingali
Thesis: *A Relational Query Processing Approach to Compiling Sparse Matrix Codes*

M.S. in Computer Science, Spring 1995

New York University — New York, NY
B.S. *magna cum laude* in Computer Science, 1991

Honors and Awards

- Best Student Paper Finalist at the ACM/IEEE SC '97 conference
- First place in Drew University programming contest
- Second Place in ACM regional scholastic programming contest
- NYU Computer Science Class of 1991 representative
- Member of Phi Beta Kappa
- NYU Scholarship

Work Experience

6/93 - present, Cornell University — Ithaca, NY
Graduate Research Assistant
Participating in the development of the Bernoulli Sparse Compilation Toolkit (*BSCT*). BSCT automatically generates parallel and sequential sparse matrix codes, given the corresponding dense codes and the specification of the data formats. The main problems are the restructuring of computations to produce efficient simultaneous enumeration over multiple data structures, and the development of a proper interface for the specification of sparse matrix formats. BSCT solves this problems by viewing sparse and dense arrays as relations, and the execution of nested loops as the evaluation of relational queries. Experiments on the IBM SP-2 show that the performance of the code generated by BSCT for common numerical kernels is competitive with hand-written libraries.

5/95 - 8/96, IBM TJ Watson Research Center — Yorktown Hts, NY
Summer/co-op intern
Participated in the development of a parallelizing compiler for a Very Long Instruction Word (*VLIW*) architecture. VLIW architectures exploit instruction-level

parallelism (ILP) by grouping several primitive instructions into a single instruction word and executing them in parallel. Unlike contemporary superscalar architectures, VLIW processors do not reorder instructions at run-time and thus rely on a compiler to schedule instructions. I have implemented several important compiler optimizations, including profile-based load-store elimination and partial redundancy elimination, that resulted in 4-10% performance improvement on benchmark codes.

7/91 - 7/92, Seer Technologies, Inc. New York, NY
Software developer
Participated in the implementation of a CASE system for the development of online trading software. Developed translators from various meta-data formats into Seer's proprietary format. Implemented a module for the distribution of the software generated by the CASE system from a mainframe repository to client workstations.

10/89 - 6/91, US Trust Co. New York, NY
Programmer (part-time during academic year)
Participated in the development of a stock trading account recordkeeping system. Optimized accesses to a remote ORACLE database server during the transition of the system from single-user to multi-user client/server operation. This work resulted in orders of magnitude improvement in the performance of the key functions in the system.

Teaching Experience

Spring '97, Cornell University
Taught a graduate-level seminar on program analysis and transformations (jointly with Induprakas Kodukula).

Spring '97, Cornell University Graduate Outreach Program
Taught in local high-schools a mini-course on principles and applications of computer technology (jointly with Induprakas Kodukula).

Fall '94, Cornell University
Developed and taught a graduate-level course about Internet (jointly with David Bau).

Fall '92 - Spring '94, Cornell University
Assisted in the teaching of undergraduate courses on algorithms and theory of computing, and a graduate course on advanced compiler design.

Spring '89 - Fall '89, New York University
Assisted students at NYU L.N. Stern School of Business in the use of computer facilities.

Refereed Publications

Compiling Parallel Code for Sparse Matrix Applications. In *Proceedings of ACM/IEEE SC '97 Conference*, San Jose, CA, November 1997. (with Keshav Pingali and Paul Stodghill). Nominated for the Best Student Paper Award.

A Relational Approach to the Compilation of Sparse Matrix Programs. In *Proceedings of the European Conference on Parallel Computing (Euro Par)*, Passau, Germany, August 1997. (with Keshav Pingali and Paul Stodghill)

Sparse code generation for imperfectly nested loops with dependences. In *Proceedings of the ACM International Conference on Supercomputing*, Vienna, Austria, July 1997. (with Keshav Pingali)

Invited Book Chapter

Solving Alignment Using Elementary Linear Algebra. In *Languages, Compilation Techniques and Run Time Systems for Scalable Parallel Systems.* Santosh Pande and Dharma P. Agrawal, eds. To be published by Springer-Verlag in January 1998. (with David Bau, Indu Kodukula, Keshav Pingali and Paul Stodghill)

Publications

Compiling Parallel Sparse Code for User-Defined Data Structures. In *Proceedings of the SIAM Conference on Parallel Processing for Scientific Computing*, Minneapolis, MN, March 1997. (with Keshav Pingali and Paul Stodghill)

Automatic Parallelization of the Conjugate Gradient Algorithm. In *Proceedings of 8th Workshop on Languages and Compilers for Parallel Computing*, Columbus, OH, August 1995. (with Keshav Pingali and Paul Stodghill)

Solving Alignment Using Elementary Linear Algebra. In *Proceedings of the 7th LCPC workshop*, Ithaca, NY, August 1994. (with David Bau, Indu Kodukula, Keshav Pingali and Paul Stodghill)

Presentations

Compiler Support for Sparse Matrix Computations. At the 45th SIAM Anniversary Meeting, Palo Alto, CA, July 1997.

Compiler Support for Sparse Matrix Computations. At the University Versailles-St. Quentin, France and Leiden University, Netherlands, July 1997. (with Keshav Pingali)

Bernoulli Compiler: Restructuring Compiler Technology for Sparse Matrix Computations. At the Cornell Theory Center Seminar, November 1995

Personal U.S. Citizen

References

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