

BRUCE R. CHILDERS

Updated November 4, 2007

Department of Computer Science
University of Pittsburgh
6409 Sennott Square, 210 S. Bouquet St.
Pittsburgh, PA 15260

Voice: (412) 624-8421
Fax: (412) 624-5249
E-mail: childers@cs.pitt.edu
Web: www.cs.pitt.edu/~childers

PROFESSIONAL INTERESTS

Compilers and software development tools, dynamic translation and virtual machines, computer architecture, and embedded and real-time systems.

EDUCATION

Ph.D. (January 2000), Computer Science, University of Virginia, Charlottesville, Virginia. Thesis title: "Custom embedded counterflow pipelines." Advisor: Prof. Jack W. Davidson.

B.S. (May 1991), Computer Science, College of William and Mary, Williamsburg, Virginia. Graduated cum laude. Honors advisor: Prof. Phil Kearns.

POSITIONS HELD

Associate Professor (September 2006–present), Department of Computer Science and the Computer Engineering Program, University of Pittsburgh

Assistant Professor (January 2000–August 2006), Department of Computer Science and the Computer Engineering Program, University of Pittsburgh.

Research Assistant (January 1992–December 1999), Department of Computer Science, University of Virginia; Supervisor: Prof. Jack W. Davidson.

Research Intern (May–October 1996, June–August 1997), Hewlett-Packard Laboratories, Compiler and Architecture Research; Manager: Dr. Bob Rau.

MIS Programmer (Summers 1993–1995), Motorola, Inc., Corporate Software Research and Development, Schaumburg, Illinois; Manager: Dr. John Barr.

HONORS

IBM Faculty Partnership Award (Academic year 2001), "Power-Aware Information Appliances", sponsored by IBM Austin Center for Advanced Studies.

Teaching Award (Academic year 2001), "CS 3410: Compilers and Processor Architecture for Low Power Systems", Department of Computer Science, University of Pittsburgh.

IBM Faculty Partnership Award (Academic year 2000), "Power-Aware Information Appliances", sponsored by IBM Austin Center for Advanced Studies.

Teaching Award (Academic year 2000), "CS 3410: Compilers and Processor Architecture for Low Power Systems", Department of Computer Science, University of Pittsburgh.

Honors Thesis (May 1991), "Source Code Compaction", accepted for Honors, College of William and Mary, Department of Computer Science.

BOOK CHAPTERS

- B1 Dakai Zhu, Bruce R. Childers, Daniel Mosse', and Rami Melhem, "Power-Aware Mapping of Real-Time Tasks to Multiprocessors", *The Handbook of Parallel Computing: Models, Algorithms, and Applications*, CRC press, 2006.
- B2 Nevine AbouGhazaleh, Daniel Mosse', Bruce R. Childers and Rami Melhem, "Toward the Placement of Power Management Points in Real-Time Applications", in *Compilers and Operating Systems for Low Power*, Kluwer Academic Publishers, 2002.

TUTORIALS

- T1 Bruce R. Childers and Jack W. Davidson, "Building Efficient Software Dynamic Translators", *38th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO-38)*, November 2005.
- T2 Bruce R. Childers and Jack W. Davidson, "Software Dynamic Translation: Challenges, Approaches, and Applications", *ACM/IEEE Int'l. Symposium on Code Generation and Optimization (CGO'05)*, March 2005.

JOURNAL PUBLICATIONS

- J1 Nevine AbouGhazaleh, Bruce R. Childers, Daniel Mosse', and Rami Melhem, "Energy Conservation using Power-Aware Cached DRAM", *IEEE Transactions on Computers*, accepted February 2007.
- J2 Mauricio L. Pilla, Bruce R. Childers, Felipe M. G. Franca, Amarildo T. Da Costa and Philippe O. A. Navaux, "Limits for a Feasible Speculative Trace Reuse Implementation", *International Journal of High Performance Systems Architecture*, InderScience Publishers, 2007.
- J3 Nevine AbouGhazaleh, Bruce Childers, Daniel Mosse', and Rami Melhem, "Power Management in External Memory using Power-Aware Cached-DRAM", accepted for publication in the *International Journal on Embedded Systems*, January 2006.
- J4 Min Zhao, Bruce R. Childers and Mary Lou Soffa, "Profit-driven Scalar Optimization", conditionally accepted subject to revisions, *ACM Transactions on Architecture and Compiler Optimization*, submitted May 2005, accepted May 2006.
- J5 Nevine AbouGhazaleh, Daniel Mosse', Bruce R. Childers, and Rami Melhem, "Collaborative Operating System and Compiler Power Management for Real-Time Applications",

ACM Transactions on Embedded Computing Systems. Submitted January 2004, minor revisions recommended January 2005, accepted April 2005.

- J6 Naveen Kumar, Bruce R. Childers, Daniel Williams, Jack W. Davidson, and Mary Lou Soffa. “Compile-Time Planning for Overhead Reduction in Software Dynamic Translators”, *International Journal on Parallel Programming*. Submitted August 2004, accepted December 2004.
- J7 Bruce R. Childers and Jack W. Davidson, “An Infrastructure for Designing Custom Embedded Wide Counterflow Pipelines”, *Journal of Microprocessors and Microsystems*. Submitted December 2003, revised June 2004, accepted July 2004.
- J8 Bruce R. Childers and Jack W. Davidson, “Custom Wide Counterflow Pipelines for High Performance Embedded Applications”, *IEEE Transactions on Computers*. Submitted December 2001, accepted January 2003, appeared February 2004.
- J9 Dakai Zhu, Rami Melhem, and Bruce R. Childers, “Scheduling with Dynamic Voltage/Speed Adjustment Using Slack Reclamation in Multi-processor Real-Time Systems”, *IEEE Transactions on Parallel and Distributed Systems*. Submitted December 2001, accepted January 2003, appeared July 2003.
- J10 Yuqiang Huang, Bruce R. Childers and Mary Lou Soffa, “Detecting Bugs in Register Allocation”, submitted to *ACM Transactions on Programming Languages and Systems (TOPLAS)*, submitted April 2007, currently under revision Fall 2007.

REFEREED CONFERENCE PUBLICATIONS

When known, acceptance rates are listed.

- C1 Takashi Okumura, Bruce R. Childers and Daniel Mosse’, “Running a Java VM inside an Operating System Kernel: A Networking Case Study”, *ACM International Conference on Virtual Execution Environments (VEE)*, March 2008.
- C2 Nevine AbouGhazaleh, Bruce R. Childers, Daniel Mosse’, and Rami Melhem, “Integrated CPU and Cache Power Management”, *International Conference on High-Performance Embedded Architectures and Compilers (HiPEAC’08)*, January 2008.
- C3 Hyunjin Lee, Sangyeun Cho, and Bruce R. Childers, “Evaluating the Interplay of Yield, Area and Performance in Processor Caches”, *IEEE International Conference on Computer Design (ICCD’07)*, Lake Tahoe, California, October 2007.
- C4 Jose’ Baiocchi, Bruce R. Childers, Jack W. Davidson, Jason Hiser and Jonathan Misurda, “Fragment Cache Management for Dynamic Binary Translators in Embedded Systems”, *International Conference on Compilers, Architecture and Synthesis for Embedded Systems (CASES’07)*, Salzburg, Austria, October 2007.

- C5 Nevine AbouGhazaleh, Alexandre Ferreira, Frank Liberato, Cosmin Rusu, Ruibin Xu, Bruce R. Childers, Daniel Mosse', and Rami Melhem, "Compiler-based Approach for Integrated CPU and L2 Cache Voltage Scaling using Machine Learning", *ACM Symposium on Languages, Compilers and Tools for Embedded Systems (LCTES'07)*, San Diego, California, June 2007.
- C6 Hyunjin Lee, Sangyeun Cho, and Bruce R. Childers, "Performance of Graceful Degradation for Cache Faults", *IEEE International Symposium on VLSI*, Porto Alegre, Brazil, May 2007.
- C7 Jason D. Hiser, Daniel Williams, Wei Hu, Jack W. Davidson, Jason O. Mars, and Bruce R. Childers, "Evaluating Indirect Branch Handling Mechanisms in Software Dynamic Translation Systems", *ACM SIGMICRO International Conference on Code Generation and Optimization (CGO)*, San Jose, California, March 2007.
- C8 Mauricio Pilla, Bruce R. Childers, Philippe Navaux, Felipe Franca, and Amarildo da Costa, "A Speculative Trace Reuse Architecture with Reduced Hardware Requirements", *18th International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD)*, Ouroto, Brazil, October 2006.
- C9 Yuqiang Huang, Bruce R. Childers and Mary Lou Soffa, "Catching and Identifying Bugs in Register Allocation", *Static Analysis Symposium (SAS)*, Seoul, Korea, August 2006.
- C10 Jason D. Hiser, Daniel Williams, Adrian Filipi, Jack W. Davidson, and Bruce R. Childers, "Evaluating Fragment Construction Policies for SDT Systems", *2nd Intl'. Conference on Virtual Execution Environments (VEE'06)*, Ottawa, Canada, June 2006.
- C11 Nevine AbouGhazaleh, Bruce R. Childers, Daniel Mosse', and Rami Melhem, "Near-memory Caching for Improved Energy Consumption", *IEEE Interational Conference on Computer Design (ICCD'05)*, San Jose, CA, October 2005.
- C12 Naveen Kumar, Bruce R. Childers and Mary Lou Soffa, "TDB: A Source-Level Debugger for Dynamically Translated Programs", *ACM SIGPLAN/SIGSOFT Sixth Intl. Symposium on Automated and Analysis-Driven Debugging*, Monterey, CA, September 2005.
- C13 Shukang Zhou, Bruce R. Childers, and Mary Lou Soffa, "Planning for Code Buffer Management in Distributed Virtual Execution Environments", *ACM/USENIX Virtual Execution Environments Conference (VEE'05)*, June 2005. Acceptance rate 29%.
- C14 Jonathan Misurda, James Clause, Juliya L. Reed, Bruce R. Childers and Mary Lou Soffa, "Demand-Driven Structural Testing with Dynamic Instrumentation", *ACM SIGSOFT Intl. Conference on Software Engineering (ICSE)*, May 2005. Acceptance rate 14%.
- C15 Jonathan Misurda, James Clause, Juliya L. Reed, Bruce R. Childers and Mary Lou Soffa, "Jazz: A Tool for Demand-Driven Structural Testing", *14th ETAPS Intl. Conference on Compiler Construction (CC)*, April 2005. Acceptance rate 21%.

- C16 Min Zhao, Bruce R. Childers, and Mary Lou Soffa, “A Model-Based Framework—An Approach for Profit-Driven Optimization”, *ACM/IEEE Int’l. Symposium on Code Generation and Optimization (CGO)*, March 2005. Acceptance rate 33%.
- C17 Mauricio Pilla, Philippe Navaux, Bruce Childers, Amarildo da Costa, and Felipe Franca, “Value Predictors for Reuse through Speculation on Traces”, *IEEE 16th Symp. on Computer Architecture and High Performance Computing (SBAC-PAD)*, Foz do Iguaçu, Brazil, October 2004. Acceptance rate 34%.
- C18 Stacey Shogan and Bruce R. Childers, “Compact Binaries with Code Compression in a Software Dynamic Translator”, *Conference on Design Automation and Test in Europe (DATE)*, February 2004. Acceptance rate 23%.
- C19 Shukang Zhou, Bruce R. Childers, and Naveen Kumar, “Profile Guided Management of Code Partitions for Embedded Systems”, *Conference on Design Automation and Test in Europe (DATE)*, February 2004 (short paper). Acceptance rate 23%.
- C20 M. L. Pilla, P. O. A. Navaux, A. T. da Costa, F. M. G. Franca, B. R. Childers, and M. L. Soffa, “The Limits of Speculative Trace Reuse”, *IEEE 15th Symposium on Computer Architecture and High Performance Computing (SBAC-PAD)*, November 2003. Acceptance rate 30%.
- C21 Min Zhao, Bruce R. Childers and Mary Lou Soffa, “Predicting the Impact of Optimizations for Embedded Systems”, *ACM SIGPLAN Symposium on Languages, Compilers, and Tools for Embedded Systems (LCTES)*, June 2003. Acceptance rate 23%.
- C22 Nevine AbouGhazaleh, Bruce R. Childers, Daniel Mosse, Rami Melhem, and Matt Craven, “Energy Management for Real-Time Embedded Applications with Compiler Support”, *ACM SIGPLAN Symposium on Languages, Compilers, and Tools for Embedded Systems (LCTES)*, June 2003. Acceptance rate 23%.
- C23 Nevine AbouGhazaleh, Daniel Mosse, Bruce R. Childers, Rami Melhem and Matt Craven, “Collaborative Operating System and Compiler Power Management for Real-Time Applications”, *IEEE Real-Time/Embedded Technology and Applications Symposium (RTAS)*, May 2003.
- C24 Ivan Kourtev, Ray Hoare, Steven Levitan, Tom Cain, Bruce R. Childers, and Don Chiarulli, “Short Courses on System-on-a-Chip (SoC) Design”, *IEEE Int’l. Conference on Microelectronic Systems Education (MSE)*, colocated with the Design Automation Conference, May-June 2003.
- C25 Kevin Scott, Naveen Kumar, S. Velusamy, Bruce R. Childers, Jack W. Davidson, and Mary Lou Soffa, “Retargetable and Reconfigurable Software Dynamic Translation”, *ACM/IEEE Int’l. Symposium on Code Generation and Optimization (CGO)*, San Francisco, California, March 2003. Acceptance rate 32%.

- C26 Daki Zhu, Rami Melhem, and Bruce R. Childers, "Scheduling with Dynamic Voltage/Speed Adjustment Using Slack Reclamation in Multi-Processor Real-Time Systems", *22nd IEEE Real-Time Systems Symposium (RTSS)*, London, UK, December 2001. Acceptance rate 21%.
- C27 Bruce R. Childers and Jack W. Davidson, "Custom Wide Counterflow Pipelines for High-Performance Embedded Applications", *Int'l. Conference on Parallel Architecture and Compilation Techniques (PACT')*, October 2000. Acceptance rate 27%.
- C28 Bruce R. Childers and Jack W. Davidson, "An Infrastructure for Designing Custom Embedded Counterflow Pipelines", *Hawaii Int'l. Conf. on System Sciences*, Maui, Hawaii, January 3-7, 2000.
- C29 Bruce R. Childers and Jack W. Davidson, "Architectural Considerations for Application-Specific Counterflow Pipelines", *IEEE Conf. on Adv. Research in VLSI (ARVLSI)*, March 1999.
- C30 Michael Alexander, Mark Bailey, Bruce R. Childers, Jack W. Davidson, and Sanjay Jinturkar, "Memory Bandwidth Optimization for Wide-Bus Machines", *Hawaii Int'l Conf. on System Sciences*, 1(1): 466-475, Wailea, Hawaii, January 1993.

REFEREED WORKSHOP PUBLICATIONS

- W1 Nevine AbouGazala, Alexandre Ferreira, Cosmin Rusu, Ruibin Xu, Bruce R. Childers, Rami Melhem, Daniel Mosse', "Integrated CPU and L2 Cache Frequency/Voltage Scaling using Supervised Learning", *HiPEAC Workshop on Statistical and Machine learning approaches applied to ARchitectures and compilaTion (SMART'07)*, Ghent, Belgium, January 2007.
- W2 Naveen Kumar, Bruce R. Childers and Mary Lou Soffa, "Low Overhead Program Monitoring and Profiling", *ACM SIGPLAN/SIGSOFT Workshop on Program Analysis for Software Tools and Engineering (PASTE'05)*, Lisbon, Portugal, September 2005.
- W3 Naveen Kumar, Jonathan Misurda, Bruce R. Childers, and Mary Lou Soffa, "Instrumentation in Software Dynamic Translators for Self-Managed Systems", *ACM SIGSOFT Workshop on Self-Managing Systems (WOSS'04)*, during the *ACM SIGSOFT Int'l. Symp. on Foundations of Software Engineering*, October 2004.
- W4 Bruce R. Childers, Mary Lou Soffa, Jon Beaver, Lidiya Ber, Juliya Litman, and Jonathan Misurda, "SoftTest: A Framework for Software Testing of Java Programs", *Eclipse Technology Exchange Workshop during the ACM SIGPLAN Conf. on Object-Oriented Programming, Systems, Languages and Applications (OOPSLA'03)*, Anaheim, California, October 27, 2003.
- W5 Naveen Kumar and Bruce R. Childers, "Flexible Instrumentation for Software Dynamic Translation", *Workshop on Exploring the Trace Space for Dynamic Optimization Tech-*

niques, during the *ACM Int'l. Conference on Supercomputing*, San Francisco, California, June 22, 2003.

- W6 Nevine AbouGhazaleh, Daniel Mosse, Bruce R. Childers and Rami Melhem, "Toward The Placement of Power Management Points in Real Time Applications", *Workshop on Compilers and Operating Systems for Low Power (COLP)*, during the *Int'l. Conference on Parallel Architecture and Compilation Techniques (PACT)*, Barcelona, Spain, 2001.
- W7 Buce R. Childers, H. Tang and Rami Melhem, "Adapting Processor Supply Voltage to Instruction-Level Parallelism", *Koolchips 2000*, during the *33rd Int'l. Symp. on Microarchitecture (MICRO-33)*, Monterey, CA, December 10, 2000.
- W8 Tarun Nakra, Bruce R. Childers and Mary Lou Soffa, "Width-Sensitive Scheduling for Resource Constrained VLIW Processors", *ACM Workshop on Feedback-Directed and Dynamic Optimization*, during the *33rd Int'l. Symp. on Microarchitecture (MICRO-33)*, Monterey, CA, December 10, 2000.
- W9 Daniel Mosse', Hakan Aydin, Bruce R. Childers and Rami Melhem, "Compiler-Assisted Dynamic Power-Aware Scheduling for Real-Time Applications", *Workshop on Compilers and Operating Systems for Low Power (COLP)*, during the *Int'l. Conference on Parallel Architecture and Compilation Techniques (PACT'00)*, Philadelphia, PA, October 19, 2000.
- W10 Bruce R. Childers and Tarun Nakra, "Reordering Memory Bus Transactions for Reduced Energy Consumption", *ACM SIGPLAN Workshop on Languages, Compilers, and Tools for Embedded Systems*, during the *ACM Conf. on Programming Language Design and Implementation (PLDI'2000)*, Vancouver, Canada, June 17-21, 2000.
- W11 Bruce R. Childers and Jack W. Davidson, "Automatic Architectural Design of Wide-Issue Counterflow Pipelines", *Workshop on Compiler and Architecture Support for Embedded Systems (CASES)*, Washington, DC, October 1-3, 1999.
- W12 Bruce R. Childers and Jack W. Davidson, "A Design Environment for Counterflow Pipeline Synthesis", *ACM SIGPLAN Workshop on Languages, Compilers, and Tools for Embedded Systems (LCTES'98)*, pp. 223-234, during the *ACM Conf. on Programming Language Design and Implementation (PDLI'98)*, Montreal, Canada, June 19-20, 1998.
- W13 Bruce R. Childers, Jack W. Davidson and Wm. Wulf, "Synthesis of Application-Specific Counterflow Pipelines", *Workshop on Interaction between Compilers and Computer Architecture (INTERACT)*, during the *IEEE Conf. on High-Performance Computer Architecture (HPCA-2)*, San Jose, CA, February 4-8, 1996.

INVITED PAPERS

- I1 Apala Guha, Jason D. Hiser, Naveen Kumar, Jing Yang, Min Zhao, Shukang Zhou, Bruce R. Childers, Jack W. Davidson, Kim Hazelwood and Mary Lou Soffa, "Virtual Execution Environments: Support and Tools", *NSF Next Generation Software Workshop*, during the

Int'l. Parallel and Distributed Processing Symposium, Long Beach, California, March 2007.

- I2 Jason D. Hiser, Naveen Kumar, Min Zhao, Shukang Zhou, Bruce R. Childers, Jack W. Davidson and Mary Lou Soffa, “Techniques and Tools for Dynamic Optimization”, *NSF Next Generation Software Workshop*, during the *Int'l. Parallel and Distributed Processing Symposium*, April 2006.
- I3 Nevine AbouGhazaleh, Bruce Childers, Daniel Mosse', and Rami Melhem, “Energy Conservation in Memory Hierarchies using Power-Aware Cached-DRAM”, *Proceedings of Schloss Dagstuhl Seminar on Power-Aware Computing Systems*, to be published by Schloss Dagstuhl, April 2005.
- I4 Kevin Scott, Naveen Kumar, Bruce R. Childers, Jack W. Davidson and Mary Lou Soffa, “Overhead Reduction Techniques for Software Dynamic Translation”, *NSF Next Generation Software Workshop*, during the *Int'l. Parallel and Distributed Processing Symposium*, April 2004.
- I5 Bruce R. Childers, Jack W. Davidson and Mary Lou Soffa, “Continuous Compilation: A New Approach to Aggressive and Adaptive Code Transformation”, *NSF Next Generation Software Workshop*, during the *Int'l. Parallel and Distributed Processing Symposium*, April 2003.
- I6 Bruce R. Childers, “Power-Aware Information Appliances”, IBM Austin Center for Advanced Studies Conference, invited paper, Austin, Texas, February 1-2, 2001.

TECHNICAL REPORTS

- R1 Bruce R. Childers and Jack W. Davidson, “Rapid Prototyping of Counterflow Pipelines”, UVA Computer Science Technical Report CS-99-01, January 1999.
- R2 Bruce R. Childers and Jack W. Davidson, “Architectural Considerations for Application-Specific Counterflow Pipelines”, UVA Computer Science Technical Report CS-98-31, September 1998.
- R3 Bruce R. Childers and Jack W. Davidson, “Application-Specific Pipelines for Exploiting Instruction-Level Parallelism”, UVA Computer Science Technical Report CS-98-14, May 1998.
- R4 Bruce R. Childers and Jack W. Davidson, “A Design Environment for Counterflow Pipeline Synthesis”, UVA Computer Science Technical Report CS-98-05, March 1998.
- R5 Bruce R. Childers and Jack W. Davidson, “Automatic Counterflow Pipeline Synthesis”, UVA Computer Science Technical Report CS-98-01, January 1998.

SPONSORED PROJECTS

REAct: A Robust Execution Environment for Fragile Multicore Systems (October 2007–October 2008), Bruce Childers (University of Pittsburgh), Mahmut Kandemir (Pennsylvania State University), Mary Jane Irwin (Pennsylvania State University), Jack Davidson (University of Virginia), and Mary Lou Soffa (University of Virginia), National Science Foundation, Division of Computer and Network Systems, Computer Systems Research, Advanced Execution Systems program.

Yield and Reliability Enhancement for On-Chip Multicore Memories in Nanoscale Technology (July 1, 2007–June 30, 2010), Bruce Childers (PI) and Sangyeun Cho (Co-PI), sponsored by the National Science Foundation, Division for Computer and Communication Foundations, Foundations of Computing Processes and Artifacts program.

A Community Resource Development Project for a Retargetable and Reconfigurable Software Dynamic Translation Infrastructure (March 2006–February 2008), Bruce Childers (PI at University of Pittsburgh) and Jack Davidson (PI at University of Virginia), sponsored by the National Science Foundation, Computing Research Infrastructure.

Debugging Dynamic Code Modifications (August 2005–July 2006), Bruce Childers (PI at University of Pittsburgh) and Mary Lou Soffa (PI at University of Virginia), sponsored by the National Science Foundation, Computer Systems Research, Advanced Execution Systems.

Demand-driven Structural Testing (July 2005–June 2006), Bruce Childers (PI), sponsored by the Central Research Development Fund, University of Pittsburgh.

Adapting Program Code Continuously and Aggressively (August 2003–July 2006), Bruce Childers (PI), Mary Lou Soffa (Co-PI) and Jack Davidson (PI at University of Virginia), sponsored by the National Science Foundation, Next Generation Software.

Memory Systems for Cognitive Architectures (July 2004–December 2005), Daniel Mosse' (PI) and Bruce Childers (Co-PI), sponsored by Raytheon.

Jazz: A Tool for Demand-Driven Structural Testing (March 2005), Bruce Childers, Hewlett International Small Grant, University of Pittsburgh.

Research Experience for Undergraduates (July 2004–May 2005), supplement to NSF grant on Adapting Program Code Continuously and Aggressively, Mary Lou Soffa (PI) and Bruce Childers (Co-PI).

Power-Aware Real-Time Systems (July 2000–December 2004), Rami Melhem (PI) and Daniel Mosse' (Co-PI), Bruce Childers served as senior personnel on compiler and architecture development, sponsored by DARPA Power-Aware Computing and Communications (PAC/C) and BAE.

SoftTest: Scalable and Flexible Software Testing of Java Programs (January 2003–December 2003), Bruce Childers and Mary Lou Soffa, sponsored by IBM Research through an Eclipse Innovation Grant, 2002-2003.

Continuous Compilation: A New Approach to Aggressive and Adaptive Code Transformations (August 2002–July 2003), Mary Lou Soffa (PI), Bruce Childers (Co-PI), Jack Davidson (PI at University of Virginia), sponsored by the National Science Foundation, Next Generation Software, 2002-2003.

Power-Aware Information Appliances (AY2001), Bruce Childers (PI), IBM Faculty Partnership Award, IBM Austin Center for Advanced Studies.

Power-Aware Information Appliances (AY2000), Bruce Childers (PI), IBM Faculty Partnership Award, IBM Austin Center for Advanced Studies.

Systems-on-a-chip Education and Training (December 2000–December 2001), Tom Cain (PI), Don Chiarulli (Co-PI), Bruce Childers (Co-PI), Steven Levitan (Co-PI), Raymond Hoare (Co-PI) and Ivan Kourtev (Co-PI), Pittsburgh Digital Greenhouse.

SOFTWARE SYSTEMS

TDB, a source-level debugger for dynamically translated programs. Implemented with the GNU gdb debugger and the Strata software dynamic translator.

Jazz, a software testing tool for demand-driven structural testing of Java programs. Implemented in the Eclipse 3.0 integrated development environment and the IBM Jikes Research Virtual Machine for Java.

INS-OP, Instrumentation Optimizer, targetted to Strata on SPARC/Solaris 8 and the FIST framework.

FIST, A Framework for Instrumentation in Software Dynamic Translators, targetted to Strata on SPARC/Solaris 8 and Jalapeno JVM/JIT on Intel IA-32.

Strata, a retargetable and reconfigurable framework for software dynamic translation.

wcfsim, an extensible and highly reconfigurable simulator (using pipeline descriptions) for wide counterflow pipelines (includes graphical user interface and performance analysis components).

wcfsyn, a hardware/software co-design system for generating custom wide counterflow pipelines from an application's source code using software pipelining and design space exploration.

Systolic synthesis, high-level loop code transformations implemented using the SUIF compiler for reducing amount of hardware generated for a custom systolic processor; Hewlett-Packard Laboratories, Palo Alto, California.

AIR and VHDL generation, an architectural intermediate representation for systolic processor synthesis and an associated VHDL code generator; Hewlett-Packard Laboratories, Palo Alto, California.

tview, a processor trace analysis and graphical viewing tool (emits HTML marked-up version of synthesis design space and processor execution traces and collects performance statistics).

gcc-rce, a complete port of the GNU gcc C compiler to an embedded RISC communications engine; Motorola, Schaumburg, Illinois.

cfpsim, a processor cycle-accurate simulator for counterflow pipelines.

TargetBuilder, an embedded system simulation environment; developed simulation models for a HC08 microcontroller and a Bravo Express pager; Motorola, Schaumburg, Illinois.

PRESENTATIONS

Presentation (October 4, 2007), Fragment Cache Management for Dynamic Binary Translators in Embedded Systems with Srtatchpad, *International Conference on Compilers, Architecture and Synthesis for Embedded Systems (CASES)*, Salzburg, Austria.

Presentation (March 2007), Evaluating Indirect Branch Handling Mechanisms in Software Dynamic Translation Systems, *ACM/IEEE Int'l. Symposium on Code Generation and Optimization*, San Jose, California.

Presentation (January 2007), Integrated CPU and L2 Cache Frequency/Voltage Scaling using Supervised Learning, *Schloss Dagstuhl Seminar on Power-Aware Computing*, Warren, Germany.

Presentation (April 2006), Techniques and Tools for Dynamic Optimization, *NSF Next Generation Software Workshop*, during the *Int'l. Parallel and Distributed Processing Symposium*, Rodos, Greece.

Invited colloquium (May 13, 2005), Continuous Compilation for Aggressive and Adaptive Code Transformation, Center for Embedded Systems, University of California, Irvine, CA.

Invited colloquium (May 4, 2005), Continuous Compilation for Aggressive and Adaptive Code Transformation, North Carolina State University, Raleigh, NC.

Presentation (April 5, 2005), Jazz: A Tool for Demand-Driven Structural Testing, *14th ETAPS Int'l. Conference on Compiler Construction (CC)*.

Invited colloquium (November 11, 2004), Continuous Compilation: A New Approach to Aggressive and Adaptive Code Transformation, Pennsylvania State University, State College, PA.

Presentation (October 31, 2004), Instrumentation in Software Dynamic Translators for Self-Managed Systems *ACM SIGSOFT Workshop on Self-Managing Systems (WOSS'04)*, during the *ACM SIGSOFT Int'l. Symp. on Foundations of Software Engineering*

Invited colloquium (July 1, 2004), Continuous Compilation: A New Approach to Aggressive and Adaptive Code Transformation (emphasis on code instrumentation optimization), COPPE – Sys-

tems Engineering and Computer Science Program, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

Invited colloquium (June 29, 2004), Continuous Compilation: A New Approach to Aggressive and Adaptive Code Transformation (emphasis on profit-driven optimization), Instituto de Informatica, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

Presentation (April 2004), Overhead Reduction in Software Dynamic Translators, *NSF Workshop on Next Generation Software*, during the *International Parallel and Distributed Processing Symposium*, Santa Fe, New Mexico

Presentation (October 27, 2003), Eclipse Technology Workshop, during the *ACM SIGPLAN Conf. on Object-Oriented Programming, Systems, Languages and Applications (OOPSLA'03)*, Anaheim, California

Presentation (April 2003), Continuous Compilation: A New Approach to Aggressive and Adaptive Code Transformation, *NSF Workshop on Next Generation Software*, during the *International Parallel and Distributed Processing Symposium*, Nice, France

Invited talk (February 2001), "Power-Aware Information Appliances" IBM Austin Center for Advanced Studies, Austin, Texas.

Invited colloquium (June 2000), "Reordering memory bus transactions for reduced power consumption", IBM Austin Research Lab, Systems Group, Austin, Texas.

Invited colloquium (March 1998), "Custom Counterflow Pipelines", Hewlett-Packard Inc., Performance Delivery Laboratory, Cupertino, California.

Invited colloquium (February 1998), "Application-Specific Counterflow Pipelines", Center for Computing Science, Institute for Defense Analysis, Bowie, Maryland.

Invited colloquium (August 1996), "Counterflow Pipeline Synthesis", Hewlett-Packard Inc., California Language Laboratory, Cupertino, California.

Poster presentation (October 1995), B. Childers, J. Davidson, and W. Wulf, "A Study on the Potential of Counterflow Pipelines for Application-Specific Microprocessors", School of Engineering and Applied Sciences, presentation to IBM, University of Virginia.

Honors defense (April 1991), "Source Code Compaction", Department of Computer Science, College of William and Mary, Williamsburg, Virginia.

STUDENT ADVISING

Ph.D. Theses

Reuse through Speculation on Traces, Mauricio Lima Pilla, visiting scholar from Federal University of Rio Grande do Sul, Computer Science Institute, Brazil (visited the University of Pittsburgh in 2002-2003, graduated June 2004)

Profit-Driven Optimization, Min Zhao, University of Pittsburgh (received Andrew Mellon Pre-doctoral Fellowship in 2003/2004, graduated August 2006; joined Hewlett-Packard, September 2006)

Debugging Adaptive Code, Naveen Kumar, University of Pittsburgh (received Andrew Mellon Predoctoral Fellowship in 2005/2006; joined VMWare, May 2007)

Checking Static and Dynamic Optimizations, Yuqiang Huang, University of Pittsburgh (expected May 2008)

Compile-Time Planning for Dynamic Optimization, Shukang Zhou, University of Virginia (expected May 2008)

Demand-Driven Structural Testing, Jon Misurda, University of Pittsburgh

Software Dynamic Translation for Embedded Systems, Jose Baiocchi, University of Pittsburgh

M.S. Projects

Instruction Set Support for Fast Indirect Branch Translation, Perry Rajnovic, University of Pittsburgh (graduated August 2007).

A Graphical User Interface for Structural Testing in Eclipse, Brian Smyth, University of Pittsburgh (graduated August 2005).

Demand-Driven Structural Software Testing with Dynamic Instrumentation, Jonathan Misurda, University of Pittsburgh (graduated April 2005, Ph..D. student at University of Pittsburgh)

Demand-Driven Def-Use Testing, Jim Clause, University of Pittsburgh (graduated April 2005, Ph.D. student at Georgia Tech.)

Code Buffer Manangement in Distributed Virtual Execution Environments, Shukang Zhou, University of Pittsburgh (graduated December 2004, Ph.D. student at University of Virginia).

An Integrated Code Coverage System for Software Test and Analysis, Juliya Litman, University of Pittsburgh (graduated April 2004, software engineer at Microsoft)

Understanding and Controlling Static Leakage of Processor Functional Units, Nancy Miller, University of Pittsburgh (graduated April 2003, research staff at Carneige Mellon University)

Trace-Level Value Reuse, Haidong Xia, University of Pittsburgh (graduated December 2003, Ph.D. student at University of Pittsburgh)

Program Profiling Primitives, Joe Slember, University of Pittsburgh (graduated December 2003, Ph.D. student at Carnegie Mellon University)

An API for Program Instrumentation in a Software Dynamic Translator, Sridhar Daita, University of Pittsburgh (graduated December 2003)

Software Dynamic Translation on the MIPS/Irix Platform, Naveen Kumar, University of Pittsburgh (graduated August 2002, Ph.D. student at University of Pittsburgh)

Branch Coverage Analysis for Java Programs, Madhuri Vemulapalli, University of Pittsburgh (graduated May 2001, computer staff at University of Pittsburgh Medical Center).

Adapting Processor Supply Voltage to Instruction-Level Parallelism, Hongliang Tang, University of Pittsburgh (graduated December 2001)

Undergraduate Senior Projects and Independent Research

Overhead Reduction for Indirect Branch Handling in Dynamically Translated Code, Jason Mars, Computer Science undergraduate, Research Experience for Undergraduates (graduated with a B.S., 2005 and now a M.S. student at University of Pittsburgh).

Compact Binaries with Code Compression in a Software Dynamic Translator, Stacey Shogan, Computer Engineering senior project, University of Pittsburgh (graduated April 2004, software engineer at Lockheed-Martin). Her senior project work was published in the *Conference on Design Automation and Test in Europe*, February 2004.

SoftTest: A Framework for Software Testing of Java Programs, Lidiya Ber, CS undergraduate, independent study, University of Pittsburgh (graduated April 2004). Her work was published in the *Eclipse Technology eXchange*, October 2003.

SoftTest: A Framework for Software Testing of Java Programs, Kevin Cammarata, CS undergraduate, University of Pittsburgh (graduated April 2003). His work was published in the *Eclipse Technology eXchange*, October 2003.

Power Measurement, Joe Atzinger, Computer Engineering independent study, University of Pittsburgh, 2002

Cache Line Reordering for Reduced Power Consumption, Craig Williford, Computer Engineering senior project, University of Pittsburgh (graduated May 2002)

Power Measurement, Chris Scott, Computer Engineering independent study, University of Pittsburgh, 2001

PH.D. COMMITTEES

Tarun Nakra, University of Pittsburgh, graduated April 2000.

Mauricio Pilla, Federal University of Rio Grande do Sul, Computer Science Institute, Brazil, graduated June 2004

Leo Selavo, University of Pittsburgh, graduated August 2004

Dakai Zhu, University of Pittsburgh, graduated December 2004

Jason Bakos, University of Pittsburgh, graduated April 2005

Cosmin Rusu, University of Pittsburgh, graduated August 2006

Gregory Kapfhammer, University of Pittsburgh, expected 2007

Takashi Okumura, University of Pittsburgh, expected 2007

Nevine AbouGhazaleh, University of Pittsburgh, expected 2007

Ruibin Xu, University of Pittsburgh, expected 2007

Jiang Zhang, University of Pittsburgh, expected 2008

CONFERENCE/WORKSHOP COMMITTEES

Program committees

- *ACM Symposium on Code Generation and Optimization (CGO'08)*, 2008.
- *Virtual Machines and Intermediate Languages for Emerging Modularization Mechanisms (VMIL)*, 2007
- *Workshop on Integrating System Environments into Software Testing (WISEST 2007)*, 2007.
- *ACM SIGPLAN/SIGSOFT Seventh Int'l. Symposium on Automated and Analysis-Driven Debugging*, 2007
- *Int'l. Conf. on High Performance Embedded Architectures and Compilers (HiPEAC)*, 2007.
- *10th IEEE Workshop on the Interaction between Compilers and Computer Architecture (INTERACT-10)*, during the *12th Int'l. Symposium on High-Performance Computer Architecture (HPCA)*, February 2006.
- *12th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2006.
- *International Conference on Autonomic Computing (ICAC'06)*, 2006.
- *Second Int'l. Workshop on Power-Aware Real-Time Computing (PARC)*, during the *Embedded Software Conference (EMSOFT)*, 2005.
- *FALSE-II: 2nd Workshop on High-Performance Fault-Adaptive Large-Scale Embedded Real-Time Systems*, during the *11th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS'05)*, 2005.
- *International Conference on Autonomic Computing (ICAC'05)*, 2005.
- *11th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2005.

- *First Int'l. Workshop on Power-Aware Real-Time Computing* (during EMSOFT), 2004.
- *ACM SIGPLAN and SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES'04)*, 2004.
- *Workshop on Compilers and Operating Systems for Low Power*, 2003.
- *LARTES 2002*, Austin, Texas (during RTSS), 2002
- *Workshop on Compilers and Operating Systems for Low Power (COLP)*, 2001
- *Int'l. Conference on Parallel Architectures and Compilation Techniques (PACT)*, 2000.

Editorship

- Guest Co-Editor, *Computer Languages, Systems and Structures, Special Issue on Embedded Systems: Compiler-Architecture Interaction*, Elsevier, March 2006–March 2007.
- Guest Editorial Board, *International Journal on Embedded Systems, Special Issue on Power-Aware Real-Time Computing*, Elsevier, 2006.
- Guest Co-Editor, *IEEE Transactions on Computers, Special Issue on Parallel Architectures and Compilation Techniques*, August 2001.

Conference organizing committees

- General chair, *12th Annual Workshop on the Interaction between Compilers and Computer Architecture (INTERACT-12)*, during the *14th Annual Symposium on High Performance Computer Architecture (HPCA)*, Salt Lake City, Utah, February 2008.
- Lead organizer, *Schloss Dagstuhl Seminar on Emerging Uses and Paradigms for Binary Translation*, October 2008.
- Program committee chair, *11th Annual Workshop on the Interaction between Compilers and Computer Architecture (INTERACT-11)*, during the *13th Annual Symposium on High Performance Computer Architecture (HPCA)*, Phoenix, Arizona, February 2007.
- Americas Publication Chair, *ACM SIGPLAN and SIGBED Conference on Languages, Compilers and Tools for Embedded Systems (LCTES'06)*, 2006.
- Student poster chair, *ACM SIGPLAN and SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES'05)*, 2005.
- Session chair, *ACM SIGPLAN and SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES'05)*, 2005.
- Session chair, *ACM SIGPLAN and SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES'04)*, 2004.
- Co-organizer, *Workshop on Constraint-Aware Embedded Systems*, during the *Real-Time Systems Symposium (RTSS'04)*, Cancun, Mexico, 2003.
- Co-organizer, *Workshop on Exploring the Trace Space for Dynamic Optimization Techniques*, during the *ACM International Conference on Supercomputing*, 2003.
- Publications chair, *Int'l. Conference on Parallel Architectures and Compilation Techniques (PACT 2003)*, 2003
- Local Arrangements Co-chair, *Int'l. Conference on Parallel Architectures and Compilation Techniques (PACT'2002)*, 2002
- Session chair, *Int'l. Conference on Parallel Architectures and Compilation Techniques (PACT'2002)*, 2002
- Session Co-organizer, *Work in Progress Session, Int'l. Conference on High-Performance Computer Architecture (HPCA)*, 2002.

- Co-organizer, *Work in Progress Session, International Conference on Parallel Architectures and Compilation Techniques (PACT'2001)*, 2001
- Co-organizer, *IEEE Workshop on Power Management for Real-Time and Embedded Systems*, in conjunction with *IEEE Real-Time Technology and Applications Symposium (RTAS 2001)*, Taipei, Taiwan ROC, 2001.
- Program Web Master, *International Conference on Parallel Architectures and Compilation Techniques (PACT)*, 2000.

PANELS AND REVIEWING

Served as a reviewer for:

- *ACM Transactions on the Design Automation of Electronic Systems (TODAES)*, 2008
- *Int'l. Conf. on High Performance Embedded Architectures and Compilers (HiPEAC)*, 2008.
- *ACM Transactions on Computer Architecture and Compiler Optimization (TACO)*, 2007
- *ACM Transactions on Embedded Systems (TECS)*, 2007
- *IEEE Int'l. Symposium on Performance Analysis of Systems and Software (ISPASS)*, 2007
- *ACM/IEEE Int'l. Symposium on Code Generation and Optimization (CGO)*, 2007
- *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2007
- *ACM Transactions on Architecture and Compiler Optimization (TACO)*, 2006
- *IEEE Transactions on Computers (TC)*, 2006
- *12th Annual Symposium on High-Performance Computer Architecture (HPCA)*, 2006
- *ACM Transactions on the Design Automation of Electronic Systems (TODAES)*, 2006
- *Int'l. Conf. on Compilers, Architecture and Synthesis for Embedded Systems (CASES)*, 2006
- *Kluwer Academic Publisher*, 2006 (book review)
- *John Wiley & Sons*, 2006 (book review)
- *The Computer Journal (Oxford Journals)*, 2005
- *ACM Transactions on Embedded Computing Systems*, 2005
- *Design Automation and Test in Europe (DATE'06) Conference*, 2006
- *IEE Proceedings of Computers and Digital Techniques*, 2005.
- *Conference on Principles of Programming Languages (POPL'06)*, 2006
- *Conference on Parallel Architectures and Compilation Techniques*, 2005
- *ACM Transactions on Software Engineering*, 2005
- *Journal of Microsystems and Microprocessors*, 2005
- *Asia South Pacific Design Automation Conference*, 2005
- *Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 2004.
- *ACM 4th International Conference on Embedded Software (EMSOFT)*, 2004.
- *IEEE Micro*, 2004.
- *ACM/IEEE Int'l. Symposium on Code Generation and Optimization*, 2004.
- *Conference on Principles of Programming Languages (POPL'04)*, 2004.
- *Computer Architecture Letters*, 2003.
- *IEEE Computer*, 2003.
- *7th Int'l. Workshop on Software and Compilers for Embedded Systems*, 2003.
- *SIGPLAN Conference on Programming Language Design and Implementation*, 2003.
- *ACM Symposium on Languages, Compilers and Tools for Embedded Systems*, 2003.
- *ACM/IEEE Int'l. Symposium on Code Generation and Optimization*, 2002.
- *IEEE Transactions on Computers*, 2002.
- *International Parallel and Distributed Processing Symposium*, 2002

Served as a panelist on proposal panels (dates and specific program omitted for confidentiality):

- NSF CISE, CAREER
- NSF CISE, CNS
- NSF CISE, CNS
- NSF CISE, CAREER
- NSF CISE
- NSF CISE
- NSF ITR
- NSF SBIR
- Science Foundation Ireland
- Swedish Research Council

DEPARTMENT/UNIVERSITY SERVICE

- Committee co-chairperson (2006–2007, 2007–2008), Graduate Program and Examinations Committee (GPEC), Computer Science.
- Committee member (2006–2007), Faculty Recruiting Committee, Computer Science.
- Committee chairperson (2005–2006), Graduate Program and Examinations Committee (GPEC), Computer Science.
- Committee member (2006), Department Vision Task Force, Computer Science
- Committee member (2005–2006), The Space Committee, Computer Science
- Committee member (2004–2005), Promotions, Computer Engineering graduate program.
- Committee member (2004–2005), Graduate Admission and Financial Aid (GAFA), Computer Science.
- Committee member (2003–2004), Computer Science Department Annual Research Competition.
- Committee member (2003–2004), Graduate Admission and Financial Aid (GAFA), Computer Science.
- Committee member (2001–2002), Computer Science Department Annual Research Competition.
- Department Web Master (2000–2003), Outreach Committee, Computer Science.

TEACHING EXPERIENCE

Courses taught at the University of Pittsburgh:

- CS 1680 Program Design and Implementation, Fall 2006
- CS/COE 1541 Computer Architecture, Fall 2006
- CS/COE 1541 Computer Architecture, Spring 2006
- CS 3210 Advanced Topics in Programming Languages, Spring 2006
- CS/COE 1541 Computer Architecture, Fall 2005
- CS/COE 1541 Computer Architecture, Spring 2005
- CS/COE 1541 Computer Architecture, Fall 2004
- CS 2410 Graduate Computer Architecture, Fall 2004
- CS/COE 1520 Programming Languages for Web Applications, Spring 2004
- CS 3410 Graduate Seminar: Hardware and Software Dynamic Translation, Spring 2004
- CS/COE 1541 Computer Architecture, Fall 2003
- CS/COE 1520 Programming Languages for Web Applications, Spring 2003

- CS/COE 1541 Computer Architecture, Spring 2003
- CS 2410 Graduate Computer Architecture, Fall 2002
- CS/COE 1541 Computer Architecture, Spring 2002
- CS 2410 Graduate Computer Architecture, Fall 2001
- CS 3410 Graduate Seminar: Compilers, Run-Time Systems, and Processor Architectures for Power-Aware Computing, Spring 2001 (received CS department teaching award for this course).
- CS/COE 1541 Computer Architecture, Fall 2000
- CS 3410 Graduate Seminar: Compilers and Processor Architectures for Low-Powered Embedded Systems, Spring 2000 (received CS department teaching award for this course).

Other teaching experience:

- PDG System on a Chip, System Level Design Course, taught at the University of Pittsburgh, May 2002.
- PDG System on a Chip, System Level Design Course, taught at University of Pittsburgh, January 2002.
- Teaching Assistant, CS216 Computer Data Representation, University of Virginia, Instructor Prof. William Wulf, Spring 1996
- Teaching Assistant, CS101 Introduction to Computer Programming, University of Virginia, Instructor Prof. Jack W. Davidson, Fall 1996 and Spring 1994.
- Teaching Assistant, CS210 Introduction to Computer Science, University of Virginia, Instructor Prof. Tom Olson, Spring 1992.
- Senior Thesis Advisor, advised undergraduate student on senior thesis, "Analysis of execution traces for counterflow pipelines", faculty advisor Prof. Wm. A. Wulf, University of Virginia, Computer Science Department, Fall 1995 and Spring 1996.

ASSOCIATIONS

- Association for Computing Machinery (ACM)
- ACM Special Interest Group on Computer Architecture (SIGARCH)
- ACM Special Interest Group on Programming Languages (SIGPLAN)
- Institute for Electrical and Electronics Engineers (IEEE)
- IEEE Computer Society