Workshop in Memory of Ken Kennedy
Friday, December 7, 2007
9:00am - 4:30pm
Rice University
Duncan Hall - McMurtry Auditorium

9:00 - 9:45:  Registration and Continental Breakfast Martel Hall

9:45 - 10:00: Introduction and Welcome McMurtry Auditorium

10:00 - 10:45: Ken Zadeck
Founder, Chief Technology Officer, NaturalBridge
“The Development of Static Single Assignment Form” McMurtry Auditorium

10:45 - 11:30: Kathryn McKinley
Professor, Computer Science, University of Texas at Austin
“Dynamic Bug Detection for Managed Languages” McMurtry Auditorium

11:30 - 1:00: Lunch Martel Hall and 3092

1:00 - 1:45: Mary Hall
Project Leader, Information Sciences Institute, and Associate Professor, Computer Science, University of Southern California
“A Compiler-Based Strategy for Performance Tuning of Applications” McMurtry Auditorium

1:45 - 2:30: Uli Kremer
Associate Professor, Computer Science, Rutgers University
“Programming Dynamic Networks of Mobile and Stationary Devices” McMurtry Auditorium

2:30 - 3:00: Afternoon Break Martel Hall

3:00 - 3:45: Apan Qasem
Assistant Professor, Computer Science, Texas State University
“Model-guided Automatic Performance Tuning” McMurtry Auditorium

3:45 - 4:30: Preston Briggs
Senior Software Engineer, Google
“Implementing Xappings (also Sets, Maps, Tuples, Tables, etc.)” McMurtry Auditorium
Workshop in Memory of Ken Kennedy
Speaker Bios

Preston Briggs -- Senior Software Engineer, Google

Preston Briggs finished a PhD in Computer Science in 1992. His adviser was Keith Cooper; thus, he was one of Ken’s grandstudents. His thesis was on register allocation, as was Ken’s. Preston’s first job after Rice was with Tera Computer, where Ken was on the Board of Directors. After 11 years at Tera and Cray, he’s now at Google. Thanks to Ken’s extensive publishing, he has an Erdos number of 3.

Mary Hall -- Project Leader, Information Sciences Institute, and Associate Professor, Computer Science, University of Southern California

Dr. Mary Hall is currently a Project Leader at Information Sciences Institute and jointly a Research Associate Professor in Computer Science at University of Southern California, where she has been since 1996. Her research focuses on compiler support for high performance, targeting a variety of architectures from Field-Programmable Gate Arrays (FPGAs) and multimedia extension architectures, to shared-memory multiprocessors and memory hierarchies of high-end systems.

Dr. Hall has published over 70 articles and served on over 40 program committees in compilers and their interaction with architecture, parallel computing, and embedded and reconfigurable computing, including the 2005 program chair of the ACM SIGPLAN PLDI conference, poster chair of SC'05, and workshop co-chair for SC'07 and SC'08.

Uli Kremer -- Associate Professor, Computer Science, Rutgers University

Ulrich Kremer is an Associate Professor in the Department of Computer Science at Rutgers University. He received his PhD and MS in computer science from Rice University in 1995 and 1993, respectively, under the supervision of Ken Kennedy. His research interests include programming environments and advanced optimizing compilers for imperative (Fortran, C), object oriented (Java), and parallel languages (HPF). He has investigated compiler-directed techniques to reduce the power dissipation and energy consumption of programs, in particular reductions in CPU and disk power/energy. More recently, he has worked on new programming abstractions and compiler optimizations for location-aware and resource-aware applications for hybrid networks of mobile and stationary devices. Ulrich has received an NSF CAREER award to support his low power/energy compiler work. In addition, he has been the PI and Co-PI of several other projects funded by NSF or DARPA.
Kathryn McKinley -- *Professor, Computer Science, University of Texas at Austin*

Kathryn S. McKinley is a Professor at the University of Texas at Austin. Her research interests include compilers, runtime systems, and architecture. Her research seeks to enable high level programming languages to achieve high performance, reliability, and availability. She and her collaborators have developed compiler optimizations for improving memory system performance, high performance garbage collection algorithms, scalable explicit memory management algorithms for parallel systems, and cooperative dynamic optimizations for improving the performance of managed languages. She collaborates on the compiler effort for the deployed TRIPS system, which is exploring technology scalability using Explicit Dataflow Graph Execution (EDGE) architectures. Her honors include ACM Distinguished Scientist and an NSF CAREER Award. She is currently an Editor-in-Chief of the ACM Transactions on Programming Language and Systems (TOPLAS) and served as the program chair for the ACM Conference on Programming Language Design and Implementation (PLDI 2007). Her service activities include increasing minority participation in computer science. For example, she organized with Daniel Jimenez the CRAW/CDC Programming Languages Summer School, 2007. She has published over 75 refereed articles and has supervised 8 PhD degrees. Prof. McKinley holds a BA (1985) in electrical engineering and computer science, and an MS (1990) and PhD supervised by Ken Kennedy (1992) in computer science, all from Rice University.

Apan Qasem -- *Assistant Professor, Computer Science, Texas State University*

Apan Qasem is an Assistant Professor at Texas State University. He received his PhD in Computer Science from Rice University in 2007. Before coming to Rice he earned a Masters in Computer Science from Florida State University and a BA in Computer Science and Economics from Ohio Wesleyan University. His native country is Bangladesh.

F. Kenneth Zadeck -- *Founder, Chief Technology Officer, NaturalBridge*

Kenneth Zadeck co-founded NaturalBridge in 1996. He is an expert in Java and has done extensive work regarding the challenges of implementing large server applications in Java. He is also a recognized authority in Static Single Assignment (SSA). At NaturalBridge, Dr. Zadeck led the development of BulletTrain, a state of the art Java compiler and runtime.

Prior to founding NaturalBridge, Dr. Zadeck was a Research Staff Member in the Computer Science Department at IBM T.J. Watson Research Center, where he worked on automatic generation of machine-specific optimizers. From 1986 to 1992 Dr. Zadeck was an Assistant Professor in the Computer Science Department at Brown University. From 1983 to 1986 Dr. Zadeck was a Research Staff Member in the Math Department at IBM T.J. Watson Research Center where he co-developed the Static Single Assignment (SSA) representation used in compiler data flow analysis. Dr. Zadeck is the author of papers on optimization technology, attribute grammar systems, incremental computation, and programming environments. He received his Ph.D., M.S. and B.S. in applied mathematics from Rice University.

Kenneth Zadeck is also the winner (with R. Cytron, J. Ferrante, B. K. Rosen and M. Wegman) of the 2006 ACM SIGPLAN Programming Languages Achievement Award.
Speaker Abstracts

F. Kenneth Zadeck -- Founder, Chief Technology Officer, NaturalBridge

TITLE: The Development of Static Single Assignment Form.

ABSTRACT:
Static Single Assignment (SSA) Form is a way to represent the flow of information within a computer program. It is currently used in almost every commercial optimizing compiler as well as many research compilers.

This talk traces the development of SSA form its beginnings at the IBM Watson Research Labs in the mid 1980’s to the many variants in use today.

Kathryn McKinley -- Professor, Computer Science, University of Texas at Austin

TITLE: Dynamic Bug Detection for Managed Languages

ABSTRACT:
Although managed languages preclude and help prevent some software errors, deployed programs still have errors and crash. This talk overviews a wide range of approaches for detecting bugs and making deployed software more reliable. The talk then presents work that uses on-line techniques which offer debugging information and assistance when programs fail. We present an approach for detecting data structures that are growing. We show how to piggyback on the garbage collector to summarize efficiently (in time and space) the heap by its type relations. Experimental results show this approach is effective at finding memory leaks, i.e., data structure errors of omission. We include a brief discussion of in progress work on tolerating leaks. These results indicate promise for inexpensive approaches that help developers find bugs and help programs run longer.

Mary Hall -- Project Leader, Information Sciences Institute, and Associate Professor, Computer Science, University of Southern California

TITLE: A Compiler-Based Strategy for Performance Tuning of Applications

ABSTRACT:
The enormous and growing complexity of today’s high-end systems have increased the already significant challenges of obtaining high performance on today’s equally complex applications. In this talk, we discuss the role of compiler technology in supporting application developers in a systematic approach to performance tuning of key application computations.

Based on scenarios taken from development of scientific codes, we describe how compiler support can enable the programmer to achieve the same or better performance result in a much more productive way.

We also present examples derived automatically from compiler optimization that show results comparable to hand-tuned performance.
Uli Kremer -- Associate Professor, Computer Science, Rutgers University

TITLE: Programming Dynamic Networks of Mobile and Stationary Devices

ABSTRACT:

Dynamic, opportunistic networks of mobile and stationary devices such as smart phones, PDAs, and fixed surveillance cameras represent a new and exciting distributed system architecture. Building distributed applications on such an architecture poses new design challenges in programming models, languages, compilers, and runtime systems.

This talk will introduce SpatialViews, a high-level language designed for programming dynamic, opportunistic networks. SpatialViews allows specification of virtual networks with nodes providing desired services and residing in interesting spaces. These nodes are discovered dynamically with user-specified time constraints and quality of result (QoR). The programming model supports “best-effort” semantics, i.e., different executions of the same program may result in “correct” answers of different quality. Example applications will be used to illustrate the different features of the SpatialViews language, and to demonstrate the expressiveness of the language and the efficiency of the compiler generated code. Sample applications include sensor network applications that collect and aggregate sensor data within the network, applications that use dynamic service installation and computation offloading, and augmented-reality gaming.

The talk will conclude with a discussion of future opportunities and challenges of programming systems for dynamic networks. Oceanographic research is used as an example, where a collection of autonomous underwater vehicles (AUVs), buoys, and surface vessels collaborate to measure physical conditions within the oceans, or to detect and track a biological phenomenon such as algae plums.

Apan Qasem -- Assistant Professor, Computer Science, Texas State University

TITLE: Model-guided Automatic Performance Tuning

ABSTRACT:

Over the last several decades we have witnessed tremendous change in the landscape of computer architecture. New architectures have emerged at a rapid pace with greater computing capabilities that have often exceeded our expectations. However, the rapid rate of architectural innovations has also been a source of major concern for the high-performance computing community. Each new architecture or even a new model of a given architecture has brought with it new features that have added to the complexity of the target platform. As a result, it has become increasingly difficult to exploit the full potential of modern architectures for complex scientific applications. The gap between the theoretical peak and the actual achievable performance has increased with every step of architectural innovation. As multi-core platforms become more pervasive, this performance gap is likely to increase.

In the talk, I will describe a strategy for application tuning which adapts to the changing nature of computer architecture and its ever increasing complexity. I will give an overview of our tuning framework, explain the core ideas in our tuning models, and discuss some of the challenges in tuning applications for multi-core systems.
Preston Briggs -- Senior Software Engineer, Google

TITLE: Implementing Xappings (also Sets, Maps, Tuples, Tables, etc.)

ABSTRACT:

High-level languages (where both C++ and Scheme might be considered relatively low level) offer interesting implementation challenges and opportunities. SETL provides arbitrarily nested sets, maps, and tuples, along with an extensive assortment of powerful operations for manipulating them. Similarly, Lua achieves much of its power and compactness from its single general data structure, the table. In this talk, I explore ways a compiler might choose to implement xappings, a generalization of these forms introduced by Hillis and Steele in the context of Connection Machine Lisp, along with some possible optimizations.
Travel Information

Hotel Information –
(Rice has negotiated rates, so please mention the university)

**Hilton Houston Plaza/Medical Center**
6633 Travis Street
Houston, TX  77030 USA
Phone: 1-713-313-4000     Fax: 1-713-313-4660

Or

**Marriott - Medical Center**
6580 Fannin Street
Houston, TX  77030 USA
Phone: 1-713-796-0080     Fax: 1-713-770-8100

Transportaion from hotels to Rice:
Each of the above hotels have free shuttles that will drop you off at Duncan Hall. Please arrange shuttle service with the hotel.

Directions to Rice:
http://futureowls.rice.edu/futureowls/Driving_Directions.asp

Duncan Hall Location and Parking:
How to find Duncan Hall: On our interactive map, Duncan Hall is building # 20 (located in the upper right quadrant). Move your mouse over the buildings to see the building number.

Visitor parking is shown in yellow on the interactive map. The visitor parking west of Rice Stadium is free. Shuttle busses pick up and drop off at bus shelters every 10 minutes.
Interactive map of Rice: [http://www.rice.edu/maps/maps.html](http://www.rice.edu/maps/maps.html)

**Limo Service:**
CTI Transportation L.L.C.
PO Box 926277
Houston, TX 77292 USA
Phone: 1-713-688-7800 or 1-800-332-2368    Fax: 1-713-688-8070

**Taxi Service**
Yellow Cab – 713-236-1111    http://www.yellowcabhouston.com/
Fiesta Cab – 713-225-2666      http://www.taxisfiesta.com/
United Cab – 713-699-0000      http://www.unitedcab.com/
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REGISTRATION

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