

Kenneth Knowles

Curriculum Vitae

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Research Interests

Type Systems for Program Specification

I believe that type systems, particularly those featuring *refinement types* and *dependent types* are a beautiful and time-tested approach to program specification. I actively research the practical application of such type systems through techniques such as *hybrid type-checking* and *type inference*.

Models of Parallelism

I believe to meet the grand challenge of parallelism, the *implicit parallelism* in purely functional programs must be organized using *expressive specifications* such as those mentioned above. I am investigating *linguistic constructs* and *mathematical models* of parallelism to achieve this goal.

Education

June 2004 B.S. Computer Science University of California, Berkeley

Honors and Awards

2007 Winter & Spring	University of California, Santa Cruz	Regents Fellow
2004 Fall	University of California, Santa Cruz	Regents Fellow
1999 - 2003	University of California, Berkeley	National Merit Scholar

Research Experience

2004 - present	University of California, Santa Cruz
Graduate student researcher	Professor Cormac Flanagan
Investigation of systems of dependent types and refinement types for program specification, particularly undecidable type systems, including hybrid type checking and type reconstruction.	

2003 - 2004	University of California, Berkeley
Undergraduate researcher	Professor Sara McMains and Ravi Kholluri
Experimental comparison of algorithms for reconstruction of solid models from 3-D laser scanner data, and further comparison of a heuristic optimization of Kholluri's spectral reconstruction algorithm.	

2003-2004	University of California, Berkeley
Undergraduate researcher	Research director Adrian Freed, CNMAT
Prototyped a C++/OpenGL interface for the Open Sound World visual programming language (http://osw.sf.net)	

2003-2004	University of California, Berkeley
Undergraduate researcher	Professor Brian Harvey

Augmented the object system for the UC Berkeley Logo implementation.

Publications

- [1] Kenneth Knowles and Cormac Flanagan. Type Reconstruction for General Refinement Types. In *Proceedings of the European Symposium on Programming*. 2007.
- [2] Jessica Gronski, Aaron Tomb, Kenneth Knowles, Cormac Flanagan, and Stephen Freund. SAGE: Hybrid Checking for Expressive Specifications. In *Proceedings of the Workshop on Scheme and Functional Programming*. 2006

Teaching Experience

Winter 2005 CMPS 104A: Compiler Design Teaching Assistant

Technical Paper Reviewer

2008 ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL)

Misc. Projects

Summer 2007 Google Summer of Code
Updated the Hat tracer for Haskell to work with current standard libraries.

Spring 2007 University of California, Santa Cruz
Parallel SAT Comparison Computer Science 253 - Advanced Programming Languages
Experimentally compared parallelization strategies for boolean 3-SAT using constructs available in the Haskell programming language.

Spring 2005 University of California, Santa Cruz
Row Type Reconstruction Computer Science 290G - Advanced Topics in Software Engineering
Implemented row-polymorphic type reconstruction for a lambda calculus with row types for extensible records and variants.

Spring 2005 University of California, Santa Cruz
Failure Detector Comparison Computer Science 232 - Distributed Systems
Wrote a multithreaded network simulator in Objective Caml and compared various algorithms for failure detection in distributed systems.

Fall 2005 University of California, Santa Cruz
Senate Vote Prediction Computer Science 242 - Machine Learning
Applied machine learning algorithms to the problem of predicting senators' votes on a new bill, using a feature set drawn from the text of senate bills, and the senators' past votes.

Spring 2003 University of California, Berkeley
Markov Chain Music Music 209 - Computer Music
Experimented with generation of music using Markov chains and higher-order functions in Objective Caml.

Fall 2003

Survey of SBA

University of California, Berkeley
Computer Science 263 - Design and Analysis of Programming Languages

Performed survey of set-based analysis, targeting graduate students in computer science (but not necessarily in programming languages.)

Fall 2002

Survey of PCC

University of California, Berkeley
Engineering 190 - Technical Writing

Performed survey of proof-carrying code research, targeting a scientific, but non-computer science audience.