William E. Mansky

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Education

Ph.D. in Computer Science, University of Illinois at Urbana-Champaign: May 2014
Dissertation: Specifying and Verifying Program Transformations with PTRANS, under Elsa L. Gunter

A.B. in Computer Science, Princeton University: June 2008
Graduated cum laude
Senior Thesis: Automating Separation Logic for Concurrent C Minor, under Andrew W. Appel

Research Interests

Programming Languages and Formal Methods: Program verification, reasoning about concurrent programs, formal models for concurrency and concurrent languages, low-Level language semantics, compiler verification, interactive theorem proving

Employment History

Postdoctoral Researcher, Princeton University, September 2016 – present, with Andrew W. Appel

- Participating in the NSF Expedition grant The Science of Deep Specifications, focused on the specification and full formal verification of real-world software systems.
- Exploring verification of concurrent programs in Verifiable C.
- Developing concurrent separation logics for C low-level atomics and verifying fine-grained concurrent algorithms.
- Using separation logic to specify and verify real-world C programs, including web servers, high-performance data structures, and databases.

Postdoctoral Researcher, University of Pennsylvania, August 2014 – August 2016, with Steve Zdancewic

- Assisted in the redesign of Vellvm, a formal semantics of the LLVM intermediate language.
- Investigated the specification of concurrent memory models and memory layout, and the generic design of language semantics with respect to memory model.
- Formally verified algorithms and instrumentation passes for data race detection.

Research Assistant, University of Illinois at Urbana-Champaign, May 2010 – May 2014, with Elsa L. Gunter

- Revised and formalized in Isabelle the semantics of TRANS, a specification language for program transformations as graph rewrites with temporal logic side conditions, which later provided the inspiration for the VeriF-OPT project.
- As part of the NASA-sponsored NextGenAA group, investigated multi-agent models for airplane landing protocols.
- Designed and developed VeriF-OPT, a Verification Framework for Optimizations and Program Transformations.
- Wrote the project description for an NSF grant proposal, which was awarded as NSF Grant #1318191: SHF: Small: VeriF-OPT, a Verification Framework for Optimizations and Program Transformations.

Summer Intern, MIT Lincoln Laboratory, June – August 2011

- Explored applications of formal methods and theorem proving, and specifically Isabelle, to security problems.

Summer Intern, DoCoMo USA Labs, June – August 2009

- Designed a domain-specific language for specifying user interfaces of software, to replace or augment informal English-language specifications, using the rewriting-based Maude language.

Peer-Reviewed Papers

Mansky, W., Appel, A. W., Nogin, A: A Verified Messaging System. *OOPSLA'17: 2017 ACM SIGPLAN International Conference on Object-Oriented Programming Systems, Languages, and Applications.*
Eizenberg, E., Peng, Y., Pigli, T., **Mansky, W.**, Devietti, J.: BARRACUDA: Binary-level Analysis of Runtime RAces in CUDA Programs. *PLDI'17: 38th ACM SIGPLAN Conference on Programming Language Design and Implementation.*
Mansky, W., Peng, Y., Devietti, J., Zdancewic, S.: Verified Instrumentation for Data Race Detection. *CPP'17: 6th ACM SIGPLAN Conference on Certified Programs and Proofs.*
Mansky, W., Gunter, E. L., Griffith, D., Adams, M. D.: Specifying and Executing Optimizations for Generalized Control Flow Graphs. *Science of Computer Programming, Vol. 130.*
Mansky, W., Garbuzov, D., Zdancewic., S.: An Axiomatic Specification for Sequential Memory Models. *CAV'15: 27th International Conference on Computer Aided Verification*.
Kang, J., Hur, C., **Mansky, W.**, Garbuzov, D., Zdancewic, S., Vafeiadis, V.: A Formal C Memory Model Supporting Integer-Pointer Casts. *PLDI'15: 36th ACM SIGPLAN Conference on Programming Language Design and Implementation.*
Li, L., Gunter, E. L., **Mansky, W.**: Symbolic Analysis Tools for CSP. *ICTAC'14: 11th International Colloquium on Theoretical Aspects of Computing.*
Mansky, W., Gunter, E.L.: A Cross-Language Framework for Verifying Compiler Optimizations. *LOLA'14: 5th Workshop on Syntax and Semantics of Low-Level Languages.*
Mansky, W., Gunter, E. L.: Verifying Optimizations for Concurrent Programs. *WPTE'14: First International Workshop on Rewriting Techniques for Program Transformations and Evaluation.*
Mansky, W., Griffith, D., Gunter, E. L.: Specifying and Executing Optimizations for Parallel Programs. *GRAPHITE'14: 3rd Workshop on GRAPH Inspection and Traversal Engineering.*
Mansky, W., Gunter, E. L.: Using Locales to Define a Rely-Guarantee Temporal Logic. *ITP'12: 3rd International Conference on Interactive Theorem Proving.*
Bass, E., Bolton, M., Feigh, K., Griffith, D., Gunter, E. L., **Mansky, W.**, Rushby, J.: Toward a multi-method approach to formalizing human-automation interaction and human-human communications. *SMC'11: 2011 IEEE International Conference on Systems, Man and Cybernetics.*
Mansky, W., Gunter, E. L.: A Framework for Verification of Compiler Optimizations. *ITP'10: First International Conference on Interactive Theorem Proving.*

Other Publications

Mansky, W., Specifying and Verifying Program Transformations with PTRANS. *PhD thesis, University of Illinois at Urbana-Champaign, 2014.*
Mansky, W. The PTRANS Specification Language. *Technical Report, University of Illinois at Urbana-Champaign, 2014.*
Mansky, W.: Automating Separation Logic for Concurrent C Minor. *Senior thesis, Princeton University, 2008, under the supervision of Andrew W. Appel.*

Presentations

A Verified Safe Messaging System. *FCS'17: Workshop on Foundations of Computer Security 2017*.
Verifying Concurrent C Programs. *Invited talk, Carnegie Mellon University, March 20, 2017.*
Reasoning about Concurrent Memory Models. *Invited talk, Princeton University, October 9, 2015.*
Verifying Compiler Optimizations with PTRANS. *MVD'13: Midwest Verification Day 2013.*

Teaching/Mentoring Experience

Mentor, Pennsylvania Governor's School for the Sciences, Fall 2015

- Mentored a high school senior interested in computer science and neuroscience, guiding him through the college application process.

Instructor, University of Illinois at Urbana-Champaign, Summer 2013

- Served as the only instructor for Programming Languages and Compilers, an upper-level undergraduate class that serves as an introduction to programming language theory and compiler structure, with 35 on-campus students and 15 online students.

- Delivered lectures with an emphasis on student participation. Used the Piazza discussion site to communicate with students and respond quickly to their questions and concerns. Developed assignments and exams, graded, held office hours, and supervised a TA.
- On the list of Teachers Ranked as Excellent by their Students.
- In Summer 2014, the course was run with my recorded lectures in place of an instructor, with a TA for grading and proctoring.

Teaching Assistant, University of Illinois at Urbana-Champaign, Fall 2008 – Spring 2009 and Spring 2013

- For one semester, helped to grade assignments, provide support for online students, prepare exams, and provide technical support for Formal Software Development Methods.
- For three semesters, helped to prepare slides and exams, graded assignments, and held office hours for Programming Languages and Compilers.
- For one semester, graded and served as a discussion section leader for Discrete Structures, an introductory course in mathematics and logic for computer science students.

Mentor, Promoting Undergraduate Research Experience program, August 2012 – May 2013

- Mentored two early undergraduates (a freshman and a sophomore) with interest in computer science research.
- Tutored each student in programming languages/formal methods topics of their choice and advised them as they completed self-directed research projects related to my own research – in one case, the description of several compiler optimizations in the PTRANS specification language, and in the other, the extension of the operational semantics of an LLVM-like intermediate language with constructs including arrays and switch statements.

Awards, Grants, and Fellowships

Authored NSF Grant #1318191: SHF: Small: VeriF-OPT, a Verification Framework for Optimizations and Program Transformations, awarded June 2013 in the amount of $466,000

- Proposed to develop a framework for the formal verification of compiler optimizations, with a focus on optimizations for parallel programs, based on the PTRANS specification language.

Mavis Future Faculty Fellow, August 2013 – May 2014

- The fellowship is awarded to engineering students with an interest in academic careers, and supports the development of its recipients in research, teaching, and mentoring. Fellows participate in paper-writing and teaching development workshops, attend engineering education conferences, mentor undergraduates and/or new graduate students, and complete a capstone project.

Graduate Teacher Certificate

- Awarded by the UIUC Center for Teaching Excellence for teaching, reflecting on and discussing teaching with a consultant, and participating in teaching development activities.

Princeton Computer Science Department Senior Thesis Award co-winner, 2008

Service and Professional Memberships

Committee Participation:

- Artifact Evaluation Committee, Symposium on Principles of Programming Languages (POPL 2018)
- Shadow Program Committee, Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2018)
- Program Committee, Workshop on Foundations of Computer Security (FCS 2017)
- Program Committee, Workshop on Rewriting Techniques for Program Transformations and Evaluation (WPTE 2015, 2016, 2017)

Organizer, New Jersey Programming Languages and Systems seminar (NJPLS 2017)

Journal Article Reviews:

- IEEE Transactions on Software Engineering, 2017
- Journal of Functional Programming, 2017

UIUC Computer Science Grad Student Council member, August 2011 – May 2013

- Helped establish a mentoring process for the qualifying exams for new Ph.D. students.
- Participated in panels about graduate student life and preparing for the qualifying exam.
- Worked with another CSGSC member to develop Frontiers of Applications in Computer Science, a seminar in which researchers from non-CS fields present their research and discuss problems in their fields that could be solved with advances in computer science with current CS graduate students. The seminar was designed to broaden students' awareness of the applications of computer science to other research areas and create possibilities for interdisciplinary research.

Member of the Association for Computing Machinery

References

Professor Andrew W. Appel
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