

---

# Nathan Coopriider

1229 University Village  
Salt Lake City, UT 84108  
<http://www.cs.utah.edu/~coop>

home +1 801 585 4713  
cell +1 801 856 3087  
[coop@cs.utah.edu](mailto:coop@cs.utah.edu)

## Research Interest

- Making embedded software efficient and reliable through applied program analysis and transformations

## Education

- PhD, Computer Science, University of Utah. Salt Lake City, UT. Advisor: Prof. John Regehr. Dissertation title: “Dataflow Analysis for Interrupt-driven Microcontroller Software.” Graduation expected Aug 2008.
- BS, Computer Science, Brigham Young University. Provo, UT. Advisor: Prof. Robert P. Burton. Project title: “Extension of Star Coordinates into Three Dimensions.” April 2004.

## Professional Experience

- Research Assistant, School of Computing, University of Utah. Advisor: Prof. John Regehr. August 2004–present.
- Research Assistant, Department of Computer Science, Brigham Young University. Advisor: Prof. Robert P. Burton. September 2003–September 2004.
- Teaching Assistant, Department of Computer Science, Brigham Young University. January 2003–August 2003.
- Teaching Assistant, Department of Mathematics, Brigham Young University. January 2002–April 2002 and August 2002–November 2002.
- Language Modeling Team Intern, Scansoft, Waltham, Massachusetts. Supervisor: Jeff Adams. May 2002–August 2002.

## Refereed Publications

- Nathan Coopriider and John Regehr. Using Sequencing to Trigger a Better Analysis. *ACM SIGBED Review*, 5(1), January 2008.  
<http://www.cs.utah.edu/~coop/me/pubs/rtss07.pdf>
- Nathan Coopriider, Will Archer, Eric Eide, David Gay, and John Regehr. Efficient Memory Safety for TinyOS. To appear in *Proceedings of the 5th ACM Conference on Embedded Networked Sensor Systems (SenSys)*, Sydney, Australia, November 2007. Acceptance rate: 17% (25/149). <http://www.cs.utah.edu/~coop/me/pubs/sensys07.pdf>
- John Regehr and Nathan Coopriider. Interrupt Verification via Thread Verification. In *Electronic Notes in Theoretical Computer Science (ENTCS)*, 174(9):139-150, June 2007.  
<http://www.cs.utah.edu/~coop/me/pubs/entcs07.pdf>

- 
- Nathan Coopriider and John Regehr. Offline Compression for On-Chip RAM. In *Proceedings of the ACM Conference on Programming Language Design and Implementation (PLDI)*, San Diego, California, June 2007. Acceptance rate: 25% (45/178).  
<http://www.cs.utah.edu/~coop/me/pubs/pldi07.pdf>
  - Nathan D. Coopriider and Robert P. Burton. Extension of Star Coordinates into Three Dimensions. In *Proceedings of the SPIE Conference on Visualization and Data Analysis (VDA)*, San Jose, California, January 2007. Acceptance rate: 69% (27/39).  
[http://www.cs.utah.edu/~coop/me/pubs/star\\_coordinates.pdf](http://www.cs.utah.edu/~coop/me/pubs/star_coordinates.pdf)
  - John Regehr, Nathan Coopriider, and David Gay. Atomicity and Visibility in Tiny Embedded Systems. In *Proceedings of the PLOS 2006 Workshop on Linguistic Support for Modern Operating Systems*, San Jose, California, October 2006.  
<http://www.cs.utah.edu/~coop/me/pubs/volatiles.pdf>
  - John Regehr, Nathan Coopriider, Will Archer, and Eric Eide. Efficient Type and Memory Safety for Tiny Embedded Systems. In *Proceedings of the PLOS 2006 Workshop on Linguistic Support for Modern Operating Systems*, San Jose, California, October 2006.  
<http://www.cs.utah.edu/~coop/me/pubs/plos06.pdf>
  - Nathan Coopriider and John Regehr. Pluggable Abstract Domains for Analyzing Embedded Software. In *Proceedings of the ACM Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES)*, Ottawa, Canada, June 2006. Acceptance rate: 25% (21/83).  
<http://www.cs.utah.edu/~coop/me/pubs/cXprop.pdf>

### Non-Refereed Papers

- John Regehr, Nathan Coopriider, Will Archer, and Eric Eide. Memory Safety and Untrusted Extensions for TinyOS. Technical Report number UUCS-06-007, School of Computing, University of Utah, June 2006.  
<http://www.cs.utah.edu/research/techreports/2006/pdf/UUCS-06-007.pdf>

### Presentations

- Nathan Coopriider and John Regehr. cXprop: Postpass optimization for TinyOS applications. Poster in *TinyOS Technology Exchange (TTX)*, Stanford, California, February 2006. <http://www.cs.utah.edu/~coop/research/cxprop/ttx06.pdf>
- Nathan Coopriider and John Regehr. A Static Analysis Framework for Embedded Systems. Presentation in *Utah Regional Verification Workshop (URVW)*, Provo, Utah, May 2005.  
<http://www.cs.utah.edu/~coop/research/cxprop/urvw05.ppt>

### Awards and Scholarships

- NSF Student Travel Grant, *ACM Conference on Embedded Networked Sensor Systems (SenSys)*, Sydney, Australia, 2007
- SPIE Student Travel Contingency Grant, *SPIE Conference on Visualization and Data Analysis (VDA)*, San Jose, California, 2006

- 
- University of Utah Graduate Supplemental Travel Award, *ACM Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES)*, Ottawa, Canada, 2006
  - BYU University Scholarship, 2003, 2002, 1998
  - New Hampshire Management Society Scholarship, 2001
  - John and Amelia Bowers Scholarship, 1999

### Publicly Released Software

- **cXprop** – Leveraged existing CIL framework to develop an abstract interpreter for analyzing and optimizing C programs. Wrote system in Ocaml. Developed interface for pluggable abstract domains. On average, tool reduces TinyOS application code size by 21%, static data size by 11%, and application duty cycle by 6%. Tested system using SPEC 2000 and other real C programs. Published work in the proceedings of LCTES 2006.  
<http://www.cs.utah.edu/~coop/research/cxprop>
- **CComp** – Extended cXprop into a tool for offline compression of on-chip RAM. CComp encodes and packs allocated scalars, pointers, structures, and arrays based on the results of a whole-program analysis in the value set and pointer set domains. Tool can produce a total RAM savings of 22% or give developers access to a flexible spectrum of tradeoffs between RAM consumption, ROM consumption, and CPU efficiency. Published work in the proceedings of PLDI 2007.  
<http://www.cs.utah.edu/~coop/research/ccomp>
- **Safe TinyOS** – Worked with four other researchers to implement type and memory safety in an efficient manner for sensor network nodes running TinyOS. Used a modified version of Deputy to transform the C program output from the nesC compiler. Integrated a source-to-source inliner and cXprop into automated toolchain to reduce performance penalties. Evaluated work using Avrora simulator and by running applications on 8-bit microcontroller based nodes. Published work in the proceedings of SenSys 2007.  
<http://www.cs.utah.edu/~coop/safetinyos/>

### Referee

- Journal of Computer Mathematics 2009
- Transactions on Visualization and Computer Graphics 2009
- IEEE Software 2008
- Journal of Systems and Software 2008
- International Conference on Compilers, Architecture and Syntheses for Embedded Systems (CASES) 2007
- ACM Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES) 2007
- IEEE Transactions on Computers 2006
- IEEE Computer 2005