

Nikos Aréchiga

CONTACT INFORMATION

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RESEARCH INTERESTS

Formal verification, controller synthesis, control systems

EDUCATION

Carnegie Mellon University, Pittsburgh, Pennsylvania USA

Ph.D., Electrical and Computer Engineering, May 2015

- Advisor: Bruce H. Krogh

New Mexico Tech, Socorro, New Mexico USA

B.S., Electrical Engineering with Minor in Mathematics, May 2010

Graduated Summa Cum Laude

ACADEMIC AND PROFESSIONAL EXPERIENCE

Toyota InfoTechnology Center, USA, Mountain View, California, USA *Researcher* **June 2015 - present**

Carnegie Mellon University, Pittsburgh, Pennsylvania USA *Graduate Student* **September 2010 - present**

Developing methods to leverage theorem provers for control design and verification.

Toyota Model-Based Development, Gardena, California USA

Co-op

May 2014 - December 2014

Worked with the Model-Based Development team on ways to leverage simulation-driven tools to compute compute constraints for formally correct controller design.

Toyota Model-Based Development, Gardena, California USA

Co-op

January 2013 - May 2013

Worked with the Model-Based Development team on ways to leverage simulation-driven techniques to improve the automation of automatic reasoning tools applied to verification.

Carnegie Mellon University, Pittsburgh, Pennsylvania USA

Teaching Intern

January - May 2011, January - May 2012

Served as teaching intern for course for upper division undergraduate and master students, covering principles of design of embedded controllers, with an associated lab where students design and implement embedded control experiments. Responsibilities include holding office hours, grading homework assignments, and assisting students with lab experiments.

- 18-474 Embedded Control Systems, Spring 2011, 2012.

MIT Summer Research Program, Cambridge, Massachusetts USA

Summer Research Intern

June 2009 - August 2009

Worked on development of the Distributed Robot Garden, a prototype for an automatic greenhouse. Was responsible for the navigation subsystem, programmed in C++ and using the Robot Operating

System (ROS). The Hagisonic Stargazer sensor was used for localization.

Langmuir Laboratory for Atmospheric Research, Socorro, New Mexico USA

Engineering Intern

December 2007 - May 2010

Worked on development of low-power lightning mapping instrumentation centered around a low-power ARM board. Investigated the Nios II softcore microprocessor for low-power instrumentation applications. Programmed microprocessors in C and FPGAs in Verilog.

New Mexico Tech, Socorro, New Mexico USA

Teaching Assistant

August 2007 - December 2007

Teaching assistant for an introductory course to analog and digital circuit theory. Responsibilities include assisting students with lab exercises and grading.

PEER-REVIEWED
CONFERENCE
PUBLICATIONS

Nikos Aréchiga, James Kapinski, Jyotirmoy Deshmukh, André Platzer, Bruce Krogh *Numerically-aided Deductive Safety Proof for Safety Proof of a Powertrain Control System*. Submitted to NSV 2015

Nikos Aréchiga, James Kapinski, Jyotirmoy Deshmukh, André Platzer, Bruce Krogh *Positive invariant cuts for verification with theorem provers*. Submitted to HSCC 2015

Nikos Aréchiga, Bruce Krogh *Using Formal Methods to Generate Control Envelopes for Safe Controller Design*. Accepted for publication at ACC 2014

James Kapinski, Jyotirmoy Deshmukh, Sriram Sankaranarayanan, Nikos Aréchiga *Simulation-guided Lyapunov Analysis for Hybrid Dynamical Systems*. In Hybrid Systems: Computation and Control 2014.

Nikos Aréchiga, Sarah M. Loos, André Platzer, and Bruce H. Krogh. *Using theorem provers to guarantee closed-loop system properties*. In Dawn Tilbury, editor, American Control Conference, ACC, Montral, Canada, June 27-29. 2012. IEEE

N. Correll, N. Arechiga, A. Bolger, M. Bollini, B. Charrow, A. Clayton, F. Dominguez, K. Donahue, S. Dyar, L. Johnson, H. Liu, A. Patrikalakis, T. Robertson, J. Smith, D. Soltero, M. Tanner, L. White, D. Rus. *Building a Distributed Robot Garden*. In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), St. Louis, MO. 2009. Nominated for Best Paper Award.

JOURNAL
PUBLICATIONS

Jan-David Quesel, Stefan Mitsch, Sarah Loos, Nikos Aréchiga, and André Platzer. How to model and prove hybrid systems with KeYmaera: A tutorial on safety. STTT. 2015. Springer-Verlag.

COMPUTER SKILLS

- Specialized Packages: MATLAB, Mathematica, some Maple
- Languages: C, C++, Java, some Python and Unix shell scripting, some Lisp
- Nios II embedded programming, as well as FPGA programming in Verilog
- Operating Systems: Unix/Linux, Windows.

HONORS AND
AWARDS

- Leo Finzi Memorial Fellowship
- Finalist for NTF Best Paper Award at the Int. Conf. on Intelligent Robots and Systems (IROS), St. Louis, MO, USA, 2009 (1698 papers).
- New Mexico Tech Electrical Engineering Student of the Year Award, 2010
- Induction into Tau Beta Pi Engineering Honor Society, 2009