Soonho Kong

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Research Interests

Automated reasoning and its applications toward robust CPS (Cyber-Physical Systems).

Education

Carnegie Mellon University	Aug 2010 – Jun 2016
Ph.D. in Computer Science Department (All But Dissertation)	
Advisor: Prof. Edmund M. Clarke	
Seoul National University	Mar 2007 – Aug 2009
Master of Science in Computer Science and Engineering	
Advisor: Prof. Kwangkeun Yi	
Seoul National University	Mar 2000 – Feb 2007
Bachelor of Science in Computer Science and Engineering	

Publications

[1] Sicun Gao, James Kapinski, Jyotirmoy Deshmukh, Nima Roohi, Armando Solar-Lezama, Nikos Arechiga, and Soonho Kong. "Numerically-Robust Inductive Proof Rules for Continuous Dynamical Systems". In: *Computer Aided Verification*. Ed. by Isil Dillig and Serdar Tasiran. Cham: Springer International Publishing, 2019, pp. 137–154.

[2] Calvin Huang, Soonho Kong, Sicun Gao, and Damien Zufferey. "Evaluating Branching Heuristics in Interval Constraint Propagation for Satisfiability". In: *Numerical Software Verification*. Ed. by Majid Zamani and Damien Zufferey. Cham: Springer International Publishing, 2019, pp. 85–100.

[3] Daniel Jackson, Jonathan DeCastro, Soonho Kong, Dimitrios Koutentakis, Angela Feng Ping Leong, Armando Solar-Lezama, Mike Wang, and Xin Zhang. "Certified Control for Self-Driving Cars". In: *DARS 2019: 4th Workshop On The Design And Analysis Of Robust Systems*. 2019.

[4] Soonho Kong, Armando Solar-Lezama, and Sicun Gao. "Delta-Decision Procedures for Exists-Forall Problems over the Reals". In: *Computer Aided Verification*. Ed. by Hana Chockler and Georg Weissenbacher. CAV'18. Cham: Springer International Publishing, 2018, pp. 219–235.

[5] Kyungmin Bae, Peter Csaba Ölveczky, Soonho Kong, Sicun Gao, and Edmund M. Clarke. "SMT-Based Analysis of Virtually Synchronous Distributed Hybrid Systems". In: *Hybrid Systems: Computation and Control*. HSCC'16. Vienna, Austria: ACM, 2016, pp. 145–154.

[6] Md. Ariful Islam, Greg Byrne, Soonho Kong, Edmund M. Clarke, Rance Cleaveland, Flavio H. Fenton, Radu Grosu, Paul L. Jones, and Scott A. Smolka. "Bifurcation Analysis of Cardiac Alternans Using delta-Decidability". In: *Computational Methods in Systems Biology*. Ed. by Ezio Bartocci, Pietro Lio, and Nicola Paoletti. CMSB'16. Cham: Springer International Publishing, 2016, pp. 132–146.

[7] Seunghak Lee, Soonho Kong, and Eric P. Xing. "A network-driven approach for genome-wide association mapping". In: *Bioinformatics* 32.12 (2016), pp. i164–i173.

[8] Yungbum Jung, Soonho Kong, Cristina David, Bow-Yaw Wang, and Kwangkeun Yi. "Automatically inferring loop invariants via algorithmic learning". In: *Mathematical Structures in Computer Science* 25.4 (2015), pp. 892–915.

[9] Soonho Kong, Sicun Gao, Wei Chen, and Edmund Clarke. "dReach: Delta-Reachability Analysis for Hybrid Systems". In: *Tools and Algorithms for the Construction and Analysis of Systems*. TACAS'15. New York, NY, USA: Springer-Verlag New York, Inc., 2015, pp. 200–205.

[10] Bing Liu, Soonho Kong, Sicun Gao, Paolo Zuliani, and Edmund M. Clarke. "Towards Personalized Prostate Cancer Therapy Using Delta-reachability Analysis". In: *Hybrid Systems: Computation and Control*. HSCC'15. Seattle, Washington: ACM, 2015, pp. 227–232.

[11] Leonardo de Moura, Soonho Kong, Jeremy Avigad, Floris van Doorn, and Jakob von Raumer. "The Lean Theorem Prover (System Description)". In: *Automated Deduction*. Ed. by Amy P. Felty and Aart Middeldorp. CADE'15. Cham: Springer International Publishing, 2015, pp. 378–388.

[12] Qinsi Wang, Paolo Zuliani, Soonho Kong, Sicun Gao, and Edmund M. Clarke. "SReach: A Probabilistic Bounded Delta-Reachability Analyzer for Stochastic Hybrid Systems". In: *Computational Methods in Systems Biology*. Ed. by Olivier Roux and Jérémie Bourdon. CMSB'15. Cham: Springer International Publishing, 2015, pp. 15–27.

[13] Sicun Gao, Soonho Kong, and Edmund M. Clarke. "Proof Generation from Delta-Decisions". In: *Symbolic and Numeric Algorithms for Scientific Computing*. SYNASC'14. Sept. 2014, pp. 156–163.

[14] Bing Liu, Soonho Kong, Sicun Gao, Paolo Zuliani, and Edmund M. Clarke. "Parameter Synthesis for Cardiac Cell Hybrid Models Using δ-Decisions". In: *Computational Methods in Systems Biology*. Ed. by Pedro Mendes, Joseph O. Dada, and Kieran Smallbone. CMSB'14. Cham: Springer International Publishing, 2014, pp. 99–113.

[15] Sagar Chaki, Arie Gurfinkel, Soonho Kong, and Ofer Strichman. "Compositional Sequentialization of Periodic Programs". In: *Verification, Model Checking, and Abstract Interpretation*. VMCAI'13. Rome, Italy: Springer-Verlag New York, Inc., 2013, pp. 536–554.

[16] Sicun Gao, Soonho Kong, and Edmund M. Clarke. "dReal: An SMT Solver for Nonlinear Theories over the Reals". In: *Automated Deduction*. CADE'13. Lake Placid, NY: Springer-Verlag, 2013, pp. 208–214.

[17] Sicun Gao, Soonho Kong, and Edmund M. Clarke. "Satisfiability modulo ODEs". In: *Formal Methods in Computer-Aided Design*. FMCAD'13. 2013, pp. 105–112.

[18] Yungbum Jung, Soonho Kong, Bow-Yaw Wang, and Kwangkeun Yi. "Deriving Invariants by Algorithmic Learning, Decision Procedures, and Predicate Abstraction". In: *Verification, Model Checking, and Abstract Interpretation*. VMCAI'10. Madrid, Spain: Springer-Verlag, 2010, pp. 180–196.

[19] Soonho Kong, Yungbum Jung, Cristina David, Bow-Yaw Wang, and Kwangkeun Yi. "Automatically Inferring Quantified Loop Invariants by Algorithmic Learning from Simple Templates". In: *Asian Conference on Programming Languages and Systems.* APLAS'10. Shanghai, China: Springer-Verlag, 2010, pp. 328–343.

[20] Soonho Kong, Wontae Choi, and Kwangkeun Yi. "Abstract Parsing for Two-staged Languages with Concatenation". In: *Generative Programming and Component Engineering.* GPCE'09. Denver, Colorado, USA: ACM, 2009, pp. 109–116.

[21] Soonho Kong, Wontae Choi, and Kwangkeun Yi. "PCC Framework for Program-Generators". In: *Workshop on Proof-Carrying Code and Software Certification.* 2009.

[22] Soonho Kong, Nikolai Tillmann, and Jonathan de Halleux. "Automated Testing of Environment-Dependent Programs - A Case Study of Modeling the File System for Pex". In: *Information Technology: New Generations.* ITNG'09. Apr. 2009, pp. 758–762.

Software

Drake : A planning, control, and analysis toolbox for nonlinear dynamical systems
dReal : SMT Solver for Nonlinear Theories of the Reals

Honors & Awards

Kwanjeong Scholarship	Aug 2010 – May 2015
Kwanjeong Education Foundation	
National Graduate Science & Technology Scholarship	Sep 2008 – Aug 2009
Korea Student Aid Foundation(KOSAF)	
Brain Korea 21 Global Internship (MSR & MSRA)	Aug 2008 – Nov 2008
Korea Research Foundation	Aug 2007 – Feb 2008

Professional Activities

Program Committee Member:

- HSCC 2020: Hybrid Systems: Computation and Control: Repeatability Evaluation

- MEMOCODE 2019: Formal Methods and Models for System Design

- HSCC 2019: Hybrid Systems: Computation and Control: Repeatability Evaluation

- NSV 2019: Numerical Software Verification 2019

- DARS 2019: 4th Workshop on the Design and Analysis of Robust Systems

- WSC 2018: Winter Simulation Conference 2018 (Cyber-Physical Systems track)

- DARS 2018: Third Workshop on Design and Analysis of Robust Systems

External Reviewer: POPL 2020, ATVA 2015, ASE 2014, FoSSaCS 2013, POPL 2013, APLAS 2012, SAS 2012, GPCE 2010, SPLASH 2010, CAV 2010, VMCAI 2010, SAS 2009, DEFECTS 2009, APLAS 2007