

Dr Ralf Huuck – Curriculum Vitae

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Dr Ralf Huuck

NICTA

+61 2 8306 0493

ralf.huuck@nicta.com.au

<http://www.nicta.com.au/people/huuckr>

Research Areas

My main research interests are in the formal analysis and verification of large-scale real-life embedded systems. This includes working on tools an techniques related to **model checking, abstract interpretation, SMT solving** and **static analysis**. Applications areas are software bug detection, automated quality assurance and software security.

Employment History

07/2008 – present, Senior Researcher

NICTA, Sydney, Australia

06/2009 – present, Chief Technology Officer

Red Lizard Software Pty Ltd

02/2004 – 06/2008 Researcher

with Assoc. Prof. Ron van der Meyden,
National ICT Australia Ltd,
Sydney, Australia

03/1999 – 04/2003 Research Associate

with Prof. Willem-Paul de Roever,
Department of Computer Science and Applied
Mathematics, University of Kiel, Germany.

06/1998 – 01/1999 Research Assistant

with Dr. Wai Wong,
Department of Computer Science,
Hong Kong Baptist University, China.

06/1996 – 08/1997 Software Analyst

Deutsche System Technik GmbH, Kiel and
Gesellschaft fur Software Entwicklung GmbH, Munich, Germany.

Visiting Appointments

05/2003 – 12/2003 Visiting Research Fellow

with Dr. Kai Engelhardt,
School of Computer Science and Engineering,
University of New South Wales, Sydney, Australia

12/2001 – 01/2002 Visiting Research Fellow

with Dr. Wai Wong,
Department of Computer Science,
Hong Kong Baptist University, China.

05/2001 – 09/2001 Visiting Research Fellow

with Prof. Yassine Lakhnech,
Verimag, Grenoble, France.

Education

Ph.D., Computer Science, Christian-Albrechts-Universität zu Kiel, 2003.
Dissertation: Software Verification for Programmable Logic Controllers.
Referees: Yassine Lakhnech, Willem-Paul de Roever, Oded Maler, Thomas Wilke

M.Sc., Computer Science, Christian-Albrechts-Universität zu Kiel, 1998
Thesis: Transforming Timed Condition/Event Systems into Timed Automata:
An Approach to Automatic Verification.

Funding and Principle Investigator

Goanna

Novel solution for model checking based static analysis of industrial C/C++ code to detect previously unknown security vulnerabilities and serious software bugs. Now available for academic and commercial customers. Funded by NICTA.

BugMT

Australian Academy of Science grant to discover software bugs in large scale complex multi-threaded code. Principle investigation on run-time verification and static analysis together with Cyrille Artho, AIST, Japan.

SoftSpez

German DFG funded project on developing formal analysis techniques for industrial control systems. Outcomes include the first complete formal semantics for the SFC and IL programming languages as used in industrial controllers (PLCs) and automated

Neville Roach Laboratory, Kensington, Level 4, 223 Anzac Parade, Kensington NSW 2052,
Locked Bag 6016, The University of New South Wales, Kensington NSW 1466, Australia,
Tel +61 2 8306 0400 **Fax** +61 2 8306 0404 ABN 62 102 206 173 www.nicta.com.au

verification tools for both languages. Joint work with the Process Dynamics and Operations lead group by Sebastian Engell, Dortmund, Germany.

KONDISK

German DFG funded project that developed new automata theoretic approaches for the specification and verification of discrete-continuous systems. Joint work with the Process Dynamics and Operations group lead by Sebastian Engell, Dortmund, Germany.

VHS

European ESPRIT project on the Verification of Hybrid Systems. Developed automata based models for hybrid systems analysis and applied work on a number of industrial case studies. I have been an investigator only in this multi-national large scale project.

Professional Activities

Steering Committee Member for Systems Software Verification conference (SSV)

Reviewer for the Deutsche Forschungsgesellschaft (DFG), Germany

Reviewer for the Netherlands Organisation for Scientific Research (NWO), Netherlands

Chair for Systems Software Verification conference (SSV), 2012

PC Member for Formal Techniques for Safety-Critical Systems (FTSCS), 2012

PC Member for Harnessing Theories for Tool Support in Software (TTSS), 2011

PC Member for Harnessing Theories for Tool Support in Software (TTSS), 2010

PC Member for Symposium on Formal Methods (FM), 2009

PC Member for Harnessing Theories for Tool Support in Software (TTSS), 2009

Chair for Systems Software Verification conference (SSV), 2009

Guest Editor, JAR Special Issue on Operating System Verification, 2008

Chair for Systems Software Verification conference (SSV), 2008

Member of the IEEE

Patents

Ralf Huuck, Ansgar Fehnker, Patrick Jayet, Felix Rauch

Generating a transition system for use with model checking.

National ICT Australia Dec, 10 2009: US 20090307664

Ralf Huuck, Felix Rauch, Bernhard Blackham, Sean Seefried

Multi language software code analysis.

National ICT Australia Jul, 7 2011: US 20110167410

Publications

Ralf Huuck

Formal Verification, Engineering and Business Value

International Workshop on Formal Techniques for Safety-Critical Systems (FTSCS) 2012, Kyoto, Japan, November, 2012.

Ralf Huuck, Ansgar Fehnker, Maximilian Junker and Alexander Knapp

SMT-based false positive elimination in static program analysis

International Conference on Formal Engineering Methods (ICFEM) 2012, Kyoto, Japan, November, 2012.

Ralf Huuck and Ansgar Fehnker

Model checking driven static analysis for the real world

Innovations in Systems and Software Engineering, Springer-Verlag, October, 2012, 10.1007/s11334-012-0192-5

Mark Bradley, Franck Cassez, Ansgar Fehnker, Thomas Given-Wilson and Ralf Huuck

High performance static analysis for industry

Tools for Automatic Program Analysis (TAPAS 2012), Deauville, France, ENTCS, September, 2012., September, 2012

Mark Bradley, Franck Cassez, Ansgar Fehnker, Thomas Given-Wilson, Ralf Huuck and Maximilian Junker

GoannaSMT, A Static Analyzer with SMT-based Refinement

Tools for Automatic Program Analysis (TAPAS 2012), Deauville, France, ENTCS, September, 2012., September, 2012

Ralf Huuck, Ansgar Fehnker, and Rodiger Wolf

Model Checking Dataflow for Malicious Input

Proceedings of the 6th Workshop on Embedded Systems Security Taipei, Taiwan, Oct 2011. ACM, Article 4, 10 pages, ISBN: 978-1-4503-0819-9

Mark Bradley, Ansgar Fehnker, Ralf Huuck, and Paul Steckler
Goanna Static Analysis at the NIST Static Analysis Tool Exposition
Report on the Third Static Analysis Tool Exposition (SATE 2010) U.S. National Institute of Standards and Technology (NIST) Special Publication (SP) 500-283, October, 2011.

Mark Bradley, Ansgar Fehnker, and Ralf Huuck
Cyber security at software development time
Proceedings of the IEEE Defense Science Research Conference and Expo (DSR), 2011 Singapore, Aug 3-5 2011. IEEE, ISBN: 978-1-4244-9276-3

Andreas Vogelsang, Ansgar Fehnker, Ralf Huuck and Wolfgang Reif
Software Metrics in Static Program Analysis
12th International Conference on Formal Engineering Methods (ICFEM 2010) Lecture Notes in Computer Science, 2010, Volume 6447/2010, 485-500

Kai Engelhardt, Ralf Huuck
Smaller Abstractions for ACTL* without Next
In the Festschrift of Correctness, Concurrency, and Compositionality for Willem-Paul de Roever, Lecture Notes in Computer Science, 2010, Volume 5930, Pages 250-259

Ansgar Fehnker, Ralf Huuck, Sean Seefried
Counterexample Guided Path Reduction for Static Program Analysis
In the Festschrift of Correctness, Concurrency, and Compositionality for Willem-Paul de Roever, Lecture Notes in Computer Science, 2010, Volume 5930, Pages 322-341

Michael Vistein, Frank Ortmeier, Wolfgang Reif, Ralf Huuck, Ansgar Fehnker
An Abstract Specification Language for Static Program Analysis
4th International Workshop on Systems Software Verification (SSV 2009) Electronic Notes in Theoretical Computer Science (ENTCS) Volume 254, Pages 181-197, October, 2009

Jörg Brauer, Ralf Huuck and Bastian Schlich
Interprocedural Pointer Analysis in Goanna
4th International Workshop on Systems Software Verification (SSV 2009) Electronic Notes in Theoretical Computer Science (ENTCS)

Ansgar Fehnker, Ralf Huuck, Sean Seefried, Michael Tapp
Fade to Grey: Tuning Static Program Analysis
3rd International Workshop on Harnessing Theories for Tool Support in Software

(TTSS'09) Electronic Notes in Theoretical Computer Science (ENTCS) Volume 266, pp. 17-32
October, 2010.

Ansgar Fehnker, Ralf Huuck and Sean Seefried

Incremental False Path Elimination for Static Software Analysis

ATVA '09 Proceedings of the 7th International Symposium on Automated Technology for Verification and Analysis Lecture Notes in Computer Science, 2009, Volume 5799/2009.

Ansgar Fehnker, Ralf Huuck, Bastian Schlich, and Michael Tapp

Automatic Bug Detection in Microcontroller Software by Static Program Analysis

35th International Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM), January 24-30, 2009, Czech Republic

Ansgar Fehnker, Joerg Brauer, Ralf Huuck, Sean Seefried

Goanna: Syntactic Software Model Checking

6th International Symposium on Automated Technology for Verification and Analysis (ATVA), October 20-23, 2008 Seoul, Korea.

Ansgar Fehnker, Ralf Huuck, Felix Rauch, Sean Seefried

Some Assembly Required - Program Analysis of Embedded System Code

Proceedings of the Eighth IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM), 28th-29th September 2008, Beijing, China

Ansgar Fehnker, Ralf Huuck, Felix Rauch and Sean Seefried

Analysing Embedded System Software

Proceedings of C/C++ Verification Workshop, Oxford, UK, July, 2007

Ansgar Fehnker, Ralf Huuck, Patrick Jayet, Michel Lussenburg and Felix Rauch

Model checking software at compile time

Proceedings of the 1st IEEE & IFIP International Symposium on Theoretical Aspects of Software Engineering, Shanghai, China, June, 2007

Ansgar Fehnker, Ralf Huuck, Patrick Jayet, Michel Lussenburg and Felix Rauch

Goanna - A Static Model Checker In the proceedings of *11th International Workshop on Formal Methods for Industrial Critical Systems (FMICS)*, Bonn, Germany, August, 2006.

Kevin Elphinstone, Gernot Heiser, Ralf Huuck, Stefan M. Petters and Sergio Ruocco.
L4cars. In the proceedings of *Embedded Security in Cars (escar 2005)*, Cologne, Germany, November, 2005.

Gerwin Klein, Ralf Huuck

High Assurance System Software. In: Tony Cant (ed), *Proc. 10th Australian Workshop on Safety Critical Systems and Software (SCS'05)*, Conferences in Research and Practice in Information Technology, 55, 2005.

Ralf Huuck

Semantics and Analysis of Instruction List Programs

Proceedings of the Second Workshop on Semantic Foundations of Engineering Design Languages (SFEDL 2004). *Electronic Notes in Theoretical Computer Science 115*, Elsevier, pages 3-18, January 2005.

Nanette Bauer, Ralf Huuck, Ben Lukoschus, Sebastian Engell.

A Unifying Semantics for Sequential Function Charts.

Integration of Software Specification Techniques for Applications in Engineering, Priority Program SoftSpez of the German Research Foundation (DFG), Final Report. *Lecture Notes in Computer Science 3147*, Springer 2004, pages 400-418. ISBN 3-540-23135-8

Nanette Bauer, Sebastian Engell, Ralf Huuck, Sven Lohmann, Ben Lukoschus, Manuel Remelhe, Olaf Stursberg.

Verification of PLC Programs given as Sequential Function Charts.

Integration of Software Specification Techniques for Applications in Engineering, Priority Program SoftSpez of the German Research Foundation (DFG), Final Report. *Lecture Notes in Computer Science 3147*, Springer 2004, pages 517-540. ISBN 3-540-23135-8

Nanette Bauer, Ralf Huuck, Sven Lohmann, Ben Lukoschus.

Sequential Function Charts: Die Notwendigkeit formaler Analyse.

atp - Automatisierungstechnische Praxis, pages 61-67. Oldenbourg Wissenschaftsverlag, August 2004. ISSN 0178-2320.

Ralf Huuck

Software Verification for Programmable Logic Controllers

Dissertation, Institute of Computer Science and Applied Mathematics, University of Kiel, April 17, 2003.

Ralf Huuck, Ben Lukoschus, Nanette Bauer.

A Model-Checking Approach to Safe SFCs.

CESA 2003: IMACS Multiconference on Computational Engineering in Systems Applications, Lille, France, July 9-11, 2003. ISBN 2-9512309-5-8.

Ralf Huuck

Software Verification for Embedded Systems.

In the Proceedings of MMAR '02: The 8th IEEE International Conference on Methods and Models in Automation and Robotics, Szczecin, Poland, 2-5 September 2002

Ralf Huuck, Ben Lukoschus, Goran Frehse, and Sebastian Engell

Compositional Verification of Continuous-Discrete Systems

Modelling, Analysis and Design of Hybrid Systems, Lecture Notes in Control and Information Sciences 279, pages 225-246. Springer-Verlag, 2002. ISBN 3-540-43812-2

Goran Frehse, Olaf Stursberg, Sebastian Engell, Ralf Huuck, Ben Lukoschus.

Modular Analysis of Discrete Controllers for Distributed Hybrid Systems.

b '02: The XV. IFAC World Congress, Barcelona, Spain, July 21-26, 2002.

Nanette Bauer, Ralf Huuck, Ben Lukoschus

A grenatch Semantics for Hybrid Controllers.

b '02: The XV. IFAC World Congress, Barcelona, Spain, July 21-26, 2002.

Nanette Bauer, Ralf Huuck

A Parameterized Semantics for Sequential Function Charts.

In the proceedings of SFEDL (Semantic Foundations of Engineering Design Languages) 2002, Satellite Event of ETAPS 2002, 6-14.4.2002, pages 69-83.

Nanette Bauer, Ralf Huuck

Towards Automatic Verification of Embedded Control Software

APAQS 2001: IEEE Asian Pacific Conference on Quality Software, Hong Kong, December 10-11, pages 375-383, 2001. ISBN 0-7695-1287-9.

Ralf Huuck, Ben Lukoschus, Yassine Lakhnech.

Verifying Untimed and Timed Aspects of the Experimental Batch Plant.

European Journal of Control, 7(4):400-415, September 2001. Special Issue: Verification of Hybrid Systems - Results of a European Union Esprit Project. Hermes Science Publishing. ISSN 0947-3580.

Goran F. Frehse, Olaf Stursberg, Sebastian Engell, Ralf Huuck, Ben Lukoschus.

Verification of Hybrid Controlled Processing Systems based on Decomposition and Deduction.

ISIC 2001: 2001 IEEE International Symposium on Intelligent Control, Mexico City, Mexico, September 5-7, 2001, pages 150-155. IEEE Press. ISBN 0-7803-6733-2 (CD-ROM: 0-7803-6735-9).

Stefan Kowalewski, Peter Herrmann, Sebastian Engell, Heiko Krumm, Heinz Treseler, Yassine Lakhnech, Ralf Huuck, Ben Lukoschus.

Approaches to the Formal Verification of Hybrid Systems.

at-Automatisierungstechnik, 49(2):66-74, February 2001. Special Issue: Hybrid Systems II: Analysis, Modeling, and Verification. Oldenbourg Verlag. ISSN 0178-2312.

Sébastien Bornot, Ralf Huuck, Yassine Lakhnech, Ben Lukoschus.

Utilizing Static Analysis for Programmable Logic Controllers.

ADPM 2000: The 4th International Conference on Automation of Mixed Processes: Hybrid Dynamic Systems, Dortmund, Germany, September 18-19, 2000, pages 183-187, Aachen, Germany, 2000. Shaker Verlag. ISSN 0945-4659, ISBN 3-8265-7836-8.

Sébastien Bornot, Ralf Huuck, Yassine Lakhnech, Ben Lukoschus.

An Abstract Model for Sequential Function Charts.

Discrete Event Systems: Analysis and Control, Proceedings of WODES 2000: 5th Workshop on Discrete Event Systems, Ghent, Belgium, August 21-23, 2000, pages 255-264, Boston, Dordrecht, London, 2000. Kluwer Academic Publishers. ISBN 0-7923-7897-0.

Sébastien Bornot, Ralf Huuck, Yassine Lakhnech, Ben Lukoschus.

Verification of Sequential Function Charts using SMV.

PDPTA 2000: International Conference on Parallel and Distributed Processing Techniques and Applications, Monte Carlo Resort, Las Vegas, Nevada, USA, June 26-29, 2000, volume V, pages 2987-2993. CSREA Press, June 2000. ISBN 1-892512-51-3.

Sébastien Bornot, Ralf Huuck, Ben Lukoschus.

Statische Analysetechniken für speicherprogrammierbare Steuerungen.

FBT 2000: 10. GI/ITG-Fachgespräch: Formale Beschreibungstechniken für verteilte Systeme, Lübeck, Germany, June 22/23, 2000, pages 175-181, Aachen, Germany, June 2000. Shaker Verlag. ISSN 0945-0807, ISBN 3-8265-7491-5.

Ralf Huuck, Yassine Lakhnech, Ben Lukoschus, Luis Urbina, Sebastian Engell, Stefan Kowalewski, and Jörg Preußig.

Integrating Timed Condition/Event Systems and Timed Automata for the Verification of Hybrid Systems.

Parallel and Distributed Computing Practices, 1(2):45-60, June 1998.

Stefan Kowalewski, Sebastian Engell, Ralf Huuck, Yassine Lakhnech, Ben Lukoschus, and Luis Urbina.

Using Model-Checking for Timed Automata to Parameterize Logic Control Programs. *8th European Symposium on Computer Aided Process Engineering (ESCAPE8)*, Brugge, Belgium, May 1998. Proceedings appear in *Computers and Chemical Engineering*.

Ralf Huuck.

Transforming Timed Condition/Event Systems into Timed Automata: An Approach to Automatic Verification.

Master's Thesis, Christian-Albrechts-Universität zu Kiel, Germany, June 1998.

Ralf Huuck, Yassine Lakhnech, Luis Urbina, Sebastian Engell, Stefan Kowalewski and Jörg Preußig. **Comparing Timed C/E Systems with Timed Automata.**

Proceedings *Int. Workshop on Hybrid and Real-Time Systems (HART'97)*, Grenoble, Frankreich, March 26-28, 1997, *Lecture Notes in Computer Science 1201*, Springer, pp. 81-86

Ralf Huuck, Yassine Lakhnech, Luis Urbina, Sebastian Engell, Stefan Kowalewski and Jörg Preußig.

Combining a Computer Science and a Control Theory Approach to the Verification of Hybrid Systems.

5th Int. Workshop on Parallel and Distributed Real-Time Systems (WPDRTS'97), Geneva, Switzerland, April 1-3, 1997, IEEE Computer Society, ISBN 0-8186-8096-2/97.

Stefan Kowalewski, Jörg Preußig, Sebastian Engell, Ralf Huuck, Yassine Lakhnech, and Ben Lukoschus.

Analyse zeitbewerteter Bedingung/Ereignis-Systeme mittels Echtzeitautomaten-Tools. 5.

Fachtagung Entwurf komplexer Automatisierungssysteme (EKA '97), 1:180-194, Braunschweig, Germany, May 1997.