

Curriculum Vitae

Stefan Ratschan

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1 Personal Information

Full Name: Stefan Matthias Ratschan
Academic Degrees: doc. (~ assoc. prof.), Dr. techn. (~Ph.D.), Dipl.-Ing. (~M.Sc.)
Citizenship: Austrian
Languages: German (native speaker), English (fluent), Czech (fluent)
Bosnian/Croatian/Serbian (intermediate), Spanish (passive)

2 Education

Ph.D. Degree in Computer Science with Distinction (September 1998)

Ph.D. Thesis: "Approximate Constraint Logic Programming",
Research Institute for Symbolic Computation (RISC-Linz),
Johannes Kepler University, Linz, Austria.

Diploma Degree in Computer Science (February 1995)

Diploma Thesis: "RISC-CLP(Δ): A Constraint Logic Programming System with Parametric Domain",
Research Institute for Symbolic Computation (RISC-Linz),
Johannes Kepler University, Linz, Austria.

High School Exam (Matura) with Distinction (June 1989)

Bundesgymnasium Schärding, Austria

3 Employment History

Researcher (July 2006–) and **Department Head** (2013–)

Institute of Computer Science of the Academy of Sciences of the Czech Republic
Prague, Czech Republic

Staff Researcher and Principal Investigator in Transregional Research Center AVACS (November 2004–June 2006)

Max-Planck-Institut für Informatik
Saarbrücken, Germany

Postdoctoral Research Fellow (November 2002–October 2004)

Max-Planck-Institut für Informatik
Saarbrücken, Germany

Marie Curie Postdoctoral Fellow (November 2001–October 2002)

European Union Grant
"Quantified Constraint Solving in Control Engineering"
Universitat de Girona, Spain

PostDoc (November 1999–September 2001)

"Numerical and Symbolic Scientific Computing"
Research Institute for Symbolic Computation (RISC-Linz),
Johannes Kepler University, Linz, Austria.

Social Service (“Zivildienst”) (August 1998–September 1999)
Humanitarian Worker,
World University Service Austria and University of Sarajevo,
Bosnia and Herzegovina.

Research Assistant (September 1994–June 1998)
Research Institute for Symbolic Computation (RISC-Linz),
Johannes Kepler University, Linz, Austria.

Programmer
Development of various types of business software

4 Fundraising and Awards

- Czech Science Foundation Grant GAČR 15-14484S, “Simulation-Based Computation of Robust Invariants of Hybrid Dynamical Systems”, 900 Kč/year, 2015–2018
- Czech Science Foundation Grant GAČR P202/12/J060, “Integrated Verification and Falsification of Hybrid Systems of Industrial Size”, 900 Kč/year, 2012–2014
- Czech Ministry of Education, Youth, and Sports, Grant MŠMT OC10048, “Efficient Handling of Non-linear Numerical Constraints Arising in Automated Reasoning about Rich Models of Computer Systems”, 450K Kč/year, 2010–2012
- Co-proposer and Management Committee member of COST Action IC0901: “Rich-Model Toolkit—An Infrastructure for Reliable Computer Systems”
- “Verification of Hybrid Systems” 750 Kč/year (201/08/J020, Czech Science Foundation), associated project of transregional research center (Interregio-SFB) AVACS (German science Foundation), 2M€/year, 2008–2010
- Individual Marie Curie Postdoctoral Fellowship (European Union), 2001
- Erwin Schrödinger Postdoctoral Fellowship (Austrian Science Foundation, declined), 2001

5 Publications and Talks

- All publications listed below use alphabetic order of authors with the exception of publications marked with †.
- Preprints of most of these publications are available at <http://www.cs.cas.cz/~ratschan/preprints.html>

5.1 Edited Collections and Proceedings

Stefan Ratschan (editor)

Fourth International Conference on Mathematical Aspects of Computer and Information Sciences—MACIS 2011

Internal Conference Proceedings, 271 pages

5.2 Journal Publications

Peter Franek, Stefan Ratschan, and Piotr Zgliczynski

Quasi-decidability of a Fragment of the First-order Theory of Real Numbers

Journal of Automated Reasoning, to appear

Peter Franek and Stefan Ratschan

Effective Topological Degree Computation Based on Interval Arithmetic

Mathematics of Computation

Volume 84, 2015, 1265–1290

Stefan Ratschan and Milan Hladík

Efficient Solution of a Class of Quantified Constraints with Quantifier Prefix Exists-Forall

Mathematics in Computer Science

Volume 8, Issue 3, 2014, 329–340

Stefan Ratschan

Safety Verification of Non-linear Hybrid Systems is Quasi-Decidable

Formal Methods in System Design

Volume 44, Issue 1, 2014, pp. 71-90

Lijun Zhang, Zhikun She, Stefan Ratschan, Holger Hermanns, and Ernst Moritz Hahn

Safety Verification for Probabilistic Hybrid Systems

European Journal of Control

Volume 18, Number 6, 2012, pp. 572–587

Stefan Ratschan and Zhikun She

Providing a Basin of Attraction to a Target Region of Polynomial Systems by Computation of Lyapunov-like Functions

SIAM J. Control and Optimization

Volume 48, Number 7, 2010, pp. 4377–4394

Martin Fränzle, Christian Herde, Tino Teige, Stefan Ratschan, and Tobias Schubert

Efficient Solving of Large Non-linear Arithmetic Constraint Systems with Complex Boolean Structure

Journal on Satisfiability, Boolean Modeling and Computation

Special Issue on SAT/CP Integration

Volume 1, 2007, pp. 209–236

Werner Damm, Guilherme Pinto, and Stefan Ratschan

Guaranteed Termination in the Verification of LTL Properties of Non-linear Robust Discrete Time Hybrid Systems

International Journal of Foundations of Computer Science (IJFCS)

Volume 18, Number 1, 2007, pp. 63–86

Stefan Ratschan and Zhikun She

Safety Verification of Hybrid Systems by Constraint Propagation Based Abstraction Refinement

ACM Transactions on Embedded Computing Systems

Volume 6, Number 1, 2007, pp. 1–23

Stefan Ratschan

Efficient Solving of Quantified Inequality Constraints over the Real Numbers

ACM Transactions on Computational Logic

Volume 7, Number 4, 2006, pp. 723–748

Luc Jaulin, Stefan Ratschan, and Laurent Hardouin

Set Computation for Nonlinear Control†

Reliable Computing

Volume 10, Number 1, 2004, pp. 1–26

Stefan Ratschan

Search Heuristics for Box Decomposition Methods

Journal of Global Optimization

Volume 24, Number 1, 2002, pp. 51–60

Stefan Ratschan

Quantified Constraints Under Perturbation

Journal of Symbolic Computation

Volume 33, Number 4, 2002, pp. 493–505

Stefan Ratschan

Approximate Quantified Constraint Solving by Cylindrical Box Decomposition

Reliable Computing

Volume 8, Number 1, 2002, pp. 21–42

Stefan Ratschan

Convergent Approximate Solving of First-order Constraints by Approximate Quantifiers

ACM Transactions on Computational Logic

Volume 5, Number 2, 2004, pp. 264–281

Stefan Ratschan

Uncertainty Propagation in Heterogeneous Algebras for Approximate Quantified Constraint Solving

Journal of Universal Computer Science,

Volume 6, Number 9, 2000.

5.3 Articles in Refereed Conference Proceedings

Jan Kuřátko and Stefan Ratschan

Combined Global and Local Search for the Falsification of Hybrid Systems

FORMATS 2014: Formal Modelling and Analysis of Timed Systems

Springer LNCS 8711, 146–160, 2014

Stefan Ratschan

An Algorithm for Formal Safety Verification of Complex Heterogeneous Systems

REC 2012: 5th International Conference on Reliable Engineering Computing

M. Vořechovský, V. Sadílek, S. Seitzl, V. Veselý, R. L. Muhanna, and R. L. Musslen (eds),
pp. 457–467

http://rec2012.fce.vutbr.cz/documents/proceedings/REC2012_proceedings.pdf

Tomáš Dzetkulič and Stefan Ratschan

Incremental Computation of Succinct Abstractions For Hybrid Systems

FORMATS 2011: Formal Modeling and Analysis of Timed Systems

U. Fahrenberg and S. Tripakis (Eds.): FORMATS 2011, LNCS 6919, pp. 271–285. Springer,
Heidelberg (2011)

Peter Franek and Stefan Ratschan and Piotr Zgliczynski

Satisfiability of Systems of Equations of Real Analytic Functions is Quasi-decidable

MFCS 2011: 36th International Symposium on Mathematical Foundations of Computer Science
Springer LNCS 6907

Stefan Ratschan

Safety Verification of Non-linear Hybrid Systems is Quasi-Semidecidable

TAMC 2010: 7th Annual Conference on Theory and Applications of Models of Computation

Springer LNCS 6108, pp. 397–408, 2010

Lijun Zhang, Zhikun She, Stefan Ratschan, Holger Hermanns and Ernst Moritz Hahn

Safety Verification for Probabilistic Hybrid Systems

CAV 2010: 22nd International Conference on Computer Aided Verification

Springer LNCS 6174, pp. 196–211, 2010

Tomáš Dzetkulič and Stefan Ratschan

How to Capture Hybrid Systems Evolution Into Slices of Parallel Hyperplanes

ADHS'09: 3rd IFAC Conference on Analysis and Design of Hybrid Systems, 2009

pages 274–279

Stefan Ratschan and Jan-Georg Smaus

Finding Errors of Hybrid Systems by Optimising an Abstraction-Based Quality Estimate

TAP'09: Tests and Proofs, Springer LNCS 5668, pp. 153–168, 2009

Stefan Ratschan and Zhikun She

Recursive and Backward Reasoning in the Verification of Hybrid Systems

Proceedings of the 5th Int. Conf. on Informatics in Control, Automation and Robotics (ICINCO'2008)

INSTICC Press, <http://dx.doi.org/10.5220/0001475500650071>

Henning Burchardt and Stefan Ratschan

Estimating the Region of Attraction of Ordinary Differential Equations by Quantified Constraint Solving

Proceedings of the 3rd WSEAS International Conference on DYNAMICAL SYSTEMS and CONTROL (CONTROL'07),

WSEAS Press, 2007, 241–246

Felix Klaedtke, Stefan Ratschan and Zhikun She

Language-Based Abstraction for Hybrid System Verification

Verification, Model Checking and Abstract Interpretation

Springer LNCS 4349, 2007, 151–166

Stefan Ratschan and Zhikun She

Providing a Basin of Attraction to a Target Region by Computation of Lyapunov-like Functions

Proceedings of IEEE International Conference on Computational Cybernetics

2006

Stefan Ratschan and Zhikun She

Constraints for Continuous Reachability in the Verification of Hybrid Systems

Proceedings of the 8th International Conference on Artificial Intelligence and Symbolic Computation

Springer LNCS 4120, 2006, 196–210

Stefan Ratschan and Jan-Georg Smaus

Verification-Integrated Falsification of Non-Deterministic Hybrid Systems

Proceedings of the 2nd IFAC Conference on Analysis and Design of Hybrid Systems

2006

Werner Damm, Guilherme Pinto and Stefan Ratschan

Guaranteed Termination in the Verification of LTL Properties of Non-linear Robust Discrete Time Hybrid Systems

Proceedings of the Third International Symposium on Automated Technology for Verification and Analysis, 2005

Springer LNCS 3707, 2005, 99–113

Stefan Ratschan and Zhikun She

Safety Verification of Hybrid Systems by Constraint Propagation Based Abstraction Refinement

Proceedings of the Eighth International Workshop on Hybrid Systems: Computation and Control

Springer LNCS 3414, 2005, 573–589

Stefan Ratschan

Solving Existentially Quantified Constraints with One Equality and Arbitrarily Many Inequalities

Proceedings of the Ninth International Conference on Principles and Practice of Constraint Programming,

Springer LNCS 2833, 2003, 615–633

Stefan Ratschan and Josep Vehí

Robust Pole Clustering of Parametric Uncertain Systems Using Interval Methods†

Robust Control Design 2003 — Proceedings of the 4th IFAC Symposium

Patrizio Colaneri (ed.)

Elsevier Science

2004

Stefan Ratschan

Continuous First-Order Constraint Satisfaction with Equality and Disequality Constraints

Proceedings of the Eighth International Conference on Principles and Practice of Constraint Programming,

Springer LNCS 2470, 2002, 680–685

Stefan Ratschan

Continuous First-Order Constraint Satisfaction

Artificial Intelligence, Automated Reasoning, and Symbolic Computation 2002, Springer LNCS 2385, 2002, 181–195

Stefan Ratschan and Luc Jaulin

Solving Composed First-Order Constraints From Discrete-Time Robust Control†

Proc. of the Sixth Annual Workshop of the ERCIM Working Group on Constraints

<http://arXiv.org/html/cs/0110012>

2001

5.4 Invited Contributions and Editorials

Stefan Ratschan and Thomas Sturm

Constraint Solving and Complex Systems—Special Issue Foreword

Mathematics in Computer Science

Volume 6, Number 4, 2012, p. 345

Georgios Fainekos, Eric Goubault, Sylvie Putot, and Stefan Ratschan

Numerical Software Verification—Special Issue Foreword

Mathematics in Computer Science

Volume 5, Number 4, 2011, pp. 357–358

Stefan Ratschan

Symbolic-numeric Problems in the Automatic Analysis and Verification of Cyber-physical Systems

SNC '09: Proceedings of the 2009 Conference on Symbolic Numeric Computation

ACM, 2009, pp. 7–8

Stefan Ratschan

Verification of Hybrid Systems

Newsletter of the European Consortium for Mathematics in Industry, 2006, special issue on result-verifying computations, Andreas Frommer and Bruno Lang (eds.), volume 39, pp. 13–14

Hirokazu Anai and Stefan Ratschan

Computer Algebra and Control System Design

Proc. of the Seventh Asian Symposium on Computer Mathematics (ASCM 2005), pp. 54–57

Sung-il Pae and Hyungju Park (eds.)

Korea Institute for Advanced Study

5.5 Articles in Published Workshop Proceedings

Stefan Ratschan

Solving Undecidable Problems in the Theory of Real Numbers and Hybrid Systems

Algorithmic Algebra and Logic 2005

Proceedings of the Conference in Honor of the 60th Birthday of Volker Weispfenning

A. Dolzmann, A. Seidl, and T. Sturm (eds.)

Books on Demand GmbH, Norderstedt

Stefan Ratschan and Zhikun She

Constraint Based Verification of Hybrid Systems

Proc. of the Seventh Asian Symposium on Computer Mathematics (ASCM 2005), pp. 66–68

Sung-il Pae and Hyungju Park (eds.)

Korea Institute for Advanced Study

5.6 Software

Stefan Ratschan and Zhikun She

HSOLVER

Verification of hybrid systems

<http://hsolver.sourceforge.net>

approximately 430 downloads April 2005-March 2011

Stefan Ratschan

RSOLVER

Solver for quantified real-number constraints

<http://rsolver.sourceforge.net>

approximately 2400 downloads April 2005-November March 2011

Stefan Ratschan with Hoon Hong, Andreas Neubacher, Volker Stahl et. al.

Approximate Quantified Constraint Solving

5.7 Invited Talks and Tutorials

Invited Plenary Talk

Decidability from a Numerical Point of View

Sixth International Conference on Mathematical Aspects of Computer and Information Sciences (MACIS), Berlin, 2015

Panel Session Speaker

The role of robustness in hybrid systems

17th International Conference on Hybrid Systems: Computation and Control (HSCC), Berlin, 2014

Invited visiting researcher, 2 weeks, Beihang University, China, 2010

Non-linear Numerical Constraint Solving

Automatic Verification and Analysis of Complex Systems

1st AVACS Spring School, Universität Oldenburg, March 2010

Symbolic-Numeric Problems in the Automatic Analysis and Verification of Cyber-Physical Systems

Invited Plenary Talk

SNC2009, 3rd International Workshop on Symbolic-Numeric Computation

Kyoto, Japan, 2009

Interval Computation: Why? When? How?

Tutorial (2x90min)

Seminar on numerical analysis and winter school (seminář numerické analýzy a zimní škola), SNA'09, Ostrava, 2009

Guaranteed Termination in the Verification of Non-Linear Robust Hybrid Systems

German Verification Day, Oldenburg, 2005

Quantified Constraints Under Perturbation

Invitational Special Session, Seventh International Conference on Applications of Computer Algebra, Albuquerque, 2001

Various workshop invitations (e.g., "Prague gathering of logicians 2014", numerous Dagstuhl seminars; NII Shonan Meeting; ESI Vienna: "Global Optimization"; ZiF Bielefeld "Mathematical Stability Analysis in Biomechanics and Robotics",), and invitations to seminar talks (e.g., EPFL Switzerland)

5.8 Numerous Talks in Workshops

5.9 Other Publications

Stefan Ratschan

Applications of Quantified Constraint Solving

<http://arxiv.org/abs/1205.5571>

Interview Stefan Ratschan

In "Vědci a vědkyně v pohybu—o akademické mobilitě" (Marta Vohlídalová a Alice Červinková), Sociologický ústav AV ČR, 2012, pp. 116–124

6 Editing, Conference, and other Organizational Activities

- Vice president of supervisory board, Institute Computer Science, Academy of Sciences of the Czech Republic, 2012–2013
- Steering committee chair of conference series "Mathematical Aspects of Computer and Information Sciences" (MACIS), 2012–2013
- Editorial board member of journal "Mathematics in Computer Science" (Birkhäuser Verlag), 2010–
- SNR 2016 (2nd International Workshop on Symbolic and Numerical Methods for Reachability Analysis), CPSWeeks 2016, PC member
- SNR 2015 (1st International Workshop on Symbolic and Numerical Methods for Reachability Analysis, CAV affiliated), PC member

- PESW 2015: The 3rd Prague Embedded Systems Workshop, PC member
- ARCH 2015: 2nd International Workshop on Applied Verification for Continuous and Hybrid Systems, CPSWeek 2015, Seattle
- PESW 2014: The 2nd Prague Embedded Systems Workshop, PC member
- ARCH 2014: 1st International Workshop on Applied verification for Continuous and Hybrid Systems, Cyber Physical Systems Week, Berlin, PC member
- HAS'14: 4th Workshop on Hybrid Autonomous Systems 2014, PC member
- SETTA'14: First International Symposium on Dependable Software Engineering: Theories, Tools and Applications, Nanjing, China, PC member
- SummerSim'14: 2014 Summer Simulation Multi-Conference (SCS/ACM SIGSIM), Monterey, CA, USA, PC member
- HSCC 2014: Hybrid Systems: Computation and Control, Berlin, Germany, PC member
- MACIS 2013: Fifth International Conference on Mathematical Aspects of Computer and Information Sciences, Nanning, China, PC member
- SCSS 2013: 5th International Symposium on Symbolic Computation in Software Science, Hagenberg, Austria, PC member
- ESW 2013: The 1st Embedded Systems Workshop, Temešvar, Czech Republic, PC member
- ICAPS 2013 workshop on Planning in Continuous Domains, PC member
- HSCC 2013: Hybrid Systems: Computation and Control, PC member
- SVARM & VERIFY Workshop 2012, associated with IJCAR 2012, PC member.
- NSV 2012: Fifth International Workshop on Numerical Software Verification, Berkeley, California, USA, PC member
- HSCC 2012: Hybrid Systems: Computation and Control, PC member
- MACIS 2011: "4th International Conference on Mathematical Aspects of Computer and Information Sciences", Beijing, China, program co-chair
- NSV-2011: "Fourth International Workshop on Numerical Software Verification", associated with CAV 2011, co-organizer
- QiCP'10: Third International Workshop on Quantification in Constraint Programming, St. Andrews, Scotland, 2010, PC Member
- SVARM: Workshop on Synthesis, Verification, and Analysis of Rich Models, Edinburgh, 2010, PC Member
- NSV-3: Third International Workshop on Numerical Software Verification, Edinburgh, 2010, PC Member
- FORMATS'10, 8th International Conference on Formal Modelling and Analysis of Timed Systems, PC Member

- QiCP'08: Second International Workshop on Quantification in Constraint Programming, Sydney, Australia, 2008, PC Member
- International Conference on Mathematical Aspects of Computer and Information Sciences, Beijing, China, 2006, Program Committee Member
- 8-th Asian Symposium on Computer Mathematics (ASCM), Seoul, 2005, co-organizer of Session "Computer Algebra and Control System design"
- Workshop on Interval Analysis and Constraint Propagation for Applications, IntCP 2005, Sitges, Spain, Member of Program Committee and Organizing Committee
- Workshop on Quantification in Constraint Programming, Sitges, Spain, 2005, Program Committee Member
- Workshop on Interval Analysis and Constraint Propagation for Applications, IntCP 2003, Kinsale, Ireland, Committee Member
- Assistance, organization of "First International Symposium on Parallel Symbolic Computation", 1994, Linz.
- Design and management of a 50K€/year aid program for the universities of Bosnia and Hercegovina in the sector of computer networking.

7 Refereeing Activities

- Review of project proposal (Vidi grant in the Innovational Research Incentives Scheme) for Netherlands Organisation for Scientific Research (NWO).
- Reviewer for numerous journals

8 Teaching and Communication of Science

Systems Theory

Semester course WS 2012/2013, 2013/14, 2014/15 (2+1 hours, 200-250 students each)
Czech Technical University, Prague

Formal Methods and Specification

Semester course SS 2011, 2012, 2013, 2015 (2+1 hours, appr. 80 students each)
Czech Technical University, Prague

Systems Modeling and Analysis

Semester course WS 2010/2011, 2011/12 (2+1 hours)
Czech Technical University, Prague

Two Talks at Czech Week of Science and Technology

November 2008

Hybrid Systems: Modeling, Simulation, Verification

Semester course WS 2008/2009 (2 hours)
Charles University, Prague

Global Optimization

Semester course WS 2007/2008 (2 hours)
Charles University, Prague

Solving Constraints over the Real Numbers

Semester course 2003/04 (2 hours of lecture and 2 hours of exercises per week)
Universität des Saarlandes, Germany

Solving Quantified Real-Number Constraints

RAAG Summer School on Tools for Real Algebraic Geometry, 2003
Rennes, France

Tutorial on Solving Real First-Order Constraints

Short Postgraduate Course
Universitat de Girona, Spain

Foundations of Computer Geometry

1 year course 1998/1999 (2 hours of lectures and 2 hours in lab per week)
Faculty of Natural Sciences and Mathematics
University of Sarajevo, Bosnia and Hercegovina

9 Supervision

- Jan Kuřátko (Ph.D. student 2012–)
- Tomáš Dzetkulič (Ph.D. student 2007–)
- Zhikun She (Postdoc 2005–2006)

Master: Vojtěch Hovorka (2013), Tomáš Zrůst (2015)
Bachelor: Tomáš Makara (2014), Jiří Fejlek (2015)