Arie Gurfinkel
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Research Interests

Automated reasoning about software systems, especially model-checking, and software engineering methodologies supporting it.

Mathematical logic, automata theory, abstract interpretation, semantics of computation, lattice theory, reasoning with partial/incomplete/inconsistent information, model exploration.

Education

University of Toronto Toronto, ON
Ph.D., Computer Science, Spring 2006 (Expected Completion)
Thesis: *Model-Checking With Many Values*
Supervisor: Prof. M. Chechik

University of Toronto Toronto, ON
M.S., Computer Science, March 2003
Thesis: *Multi-Valued Symbolic Model-Checking: Fairness, Counter-Examples, Running Time*
Supervisor: Prof. M. Chechik

University of Toronto Toronto, ON
B.S., Computer Science, May 2000

W.L. Mackenzie C.I. High School Toronto, ON
June 1996

Honors and Awards

IBM Ph.D. Fellowship	09/2004 – 09/2005
NSERC Postgraduate Scholarship (PGS B)	01/2003 – 01/2005
Ontario Graduate Scholarship	05/2001 – 05/2002
University of Toronto Fellowship	09/2000 – 09/2001

Academic Employment

- **Teaching Assistant** September 2005 – December 2005
  University of Toronto Toronto, ON
  - Teaching assistant for "Compilers and Interpreters" (CSC488/2107, cross-listed) and "Automated Verification" (CSC2108, graduate)
- **Intern** Summer 2005
  IBM CAS Toronto Toronto, ON
  - Dynamic and static analysis of webservices, and integration of software model-checker YASM with Eclipse IDE.
- **Teaching Assistant** January 2005 – April 2005
  University of Toronto Toronto, ON

– As a teaching assistant for "Compilers and Interpreters" (CSC488/2107), I was responsible for redesigning a six-part course project in which the students build a working compiler. My duties also included helping in developing the midterm and the final exam, as well as grading course work.

- **Teaching Assistant** September 2003 – December 2003
  University of Toronto Toronto, ON

  – As a teaching assistant for "Automated Verification" (CSC2108, graduate), I have collaborated with Prof. Chechik to update the course to reflect the state-of-the-art in the field of automated verification, and specifically, model-checking. I was involved in designing the course, assignments, and supplementary lecture materials. I have also prepared and delivered 4 out of 13 three-hour lectures. At the end of the course, I have organized a mini-conference for the presentation of final course projects.

Professional Activities

- **Conference Reviews:** CONCUR, FMICS, FASE, VMCAI, STOC, TCS.
- **Journal Reviews:** ACM Transactions on Embedded Computing Systems, International Journal on Software Tools for Technology Transfer, Theoretical Computer Science, Requirements Engineering Journal.
- **Student Volunteer:** SPIN'01, ISMVL'04
- Member of ACM

Software

- YASM, a software model-checker for C programs.
- VaqUoT, a NuSMV extension for vacuity detection in temporal logic specifications.
- TLQSolver, a query-checker for CTL queries.
- KEGVis, a framework for generating, exploring, and visualizing counter-examples.
- XChek, a symbolic model-checker for multi-valued logic.

Publications

Refereed Journal Papers

1. A. Gurfinkel, M. Chechik, B. Devereux. "Temporal Logic Query Checking: A Tool for Model Exploration", *IEEE Transactions on Software Engineering*, Vol. 29, No. 10, pages. 898-914, October 2003.
2. M. Chechik, B. Devereux, S. Easterbrook, A. Gurfinkel. "Multi-Valued Symbolic Model-Checking", *ACM Transactions on Software Engineering and Methodology*, Vol. 12, No. 4, pages 1-38, October 2003.

Submitted

1. M. Chechik and A. Gurfinkel. "A Framework for Counterexample Generation and Exploration", submitted to *International Journal on Software Tools for Technology Transfer*, September 2005.
2. M. Chechik, A. Gurfinkel, B. Devereux, A. Lai, S. Easterbrook. "Symbolic Data-Structures for Multi-Valued Model-Checking", submitted to *Formal Methods for Software Design*, 49 pages. Last updated September 2004.

Refereed Conference and Workshop Papers

Submitted

1. M. Chechik, M. Gheorghiu, and A. Gurfinkel. "Efficient Debugging of Environment Models", submitted for publication, September 2005.

Published

1. A. Gurfinkel and M. Chechik. "Why Waste a Perfectly Good Abstraction?", in *Proceedings of 12th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS'06)*, Vienna, Austria, March 2006. (Presenter)

2. A. Gurfinkel, O. Wei, and M. Chechik. "Systematic Construction of Abstractions for Model-Checking", in *Proceedings of 7th International Conference on Verification, Model-Checking, and Abstract Interpretation (VMCAI'06)*, volume 3855 of LNCS, pages 381–397, Charleston, SC, January 2006. Extended version available as "Logical Abstract Interpretation", CSRG Tech. Rep. 532, September 2005. (Presenter)

3. A. Gurfinkel and M. Chechik. "How Thorough is Thorough Enough?", in *Proceedings of 13th IFIP WG 10.5 Advanced Research Working Conference on Correct Hardware Design and Verification Methods (CHARME'05)*, volume 3725 of LNCS, pages 65–80, Saarbrücken, Germany, October 2005. (Presenter)

4. O. Wei, A. Gurfinkel and M. Chechik. "Identification and Counter Abstraction for Full Virtual Symmetry", in *Proceedings of 13th IFIP WG 10.5 Advanced Research Working Conference on Correct Hardware Design and Verification Methods (CHARME'05)*, volume 3725 of LNCS, pages 285–300, Saarbrücken, Germany, October 2005.

5. S. Nejati, A. Gurfinkel, and M. Chechik. "Stuttering Abstraction for Model Checking", in *Proceedings of 3rd IEEE International Conference on Software Engineering and Formal Methods (SEFM'05)*, pages 311–320, Koblenz, Germany, September 2005.

6. M. Chechik and A. Gurfinkel. "A Framework for Counterexample Generation and Exploration", in *Proceedings of 8th International Conference on Fundamental Approaches to Software Engineering (FASE'05)*, volume 3442 of LNCS, pages 217–233, Edinburgh, Scotland, April 2005.

7. A. Gurfinkel and M. Chechik. "Extending Extended Vacuity", in *Proceedings of 5th International Conference on Formal Methods in Computer-Aided Design (FMCAD'04)*, volume 3312 of LNCS, pages 306–321, Austin, TX, November 2004. (Presenter)

8. S. Berezin, C. Barrett, I. Shianian, M. Chechik, A. Gurfinkel, and D. DIll. "A Practical Approach to Partial Functions in CVC Lite", in *Proceedings of the CADE-20 Workshop: Pragmatics of Decision Procedures in Automated Reasoning (PDPAR)*, July 2004, 11 pages.

9. A. Gurfinkel and M. Chechik. "How Vacuous is Vacuous?", in *Proceedings of 10th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS'04)*, volume 2988 of LNCS, pages 160–175, Barcelona, Spain, March 2004. (Presenter)

10. A. Gurfinkel, M. Chechik. "Generating Counterexamples for Multi-Valued Model-Checking", in *Proceedings of Formal Methods Europe (FME'03)*, volume 2805 of LNCS, pages 503–521, Pisa, Italy, September 2003. (Presenter)

11. A. Gurfinkel, M. Chechik. "Multi-Valued Model-Checking via Classical Model-Checking", in *Proceedings of 14th International Conference on Concurrency Theory (CONCUR'03)*, volume 2761 of LNCS, pages 266–280, Marseille, France, September 2003. (Presenter)

12. M. Chechik, A. Gurfinkel. "TLQSolver: A Temporal Logic Query Checker", in *Proceedings of 15th International Conference on Computer-Aided Verification (CAV'03)*, volume 2725 of LNCS, pages 210–214, Boulder, CO, July 2003. (Presenter)

13. A. Gurfinkel, M. Chechik. "Proof-like Counter-Examples", in *Proceedings of International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS'03)*, volume 2619 of LNCS, pages 160–175, Warsaw, Poland, April 2003. (Presenter)

14. A. Gurfinkel, B. Devereux, M. Chechik. "Model Exploration with Temporal Logic Query Checking", in *Proceedings of SIGSOFT Conference on Foundations of Software Engineering (FSE'02)*, pages 139–148, Charleston, SC, November 2002.

15. M. Chechik, B. Devereux, A. Gurfinkel, "XChek: A Multi-Valued Model-Checker", in *Proceedings of 14th International Conference on Computer-Aided Verification (CAV'02)*, volume 2404 of LNCS, pages 505–509, Copenhagen, Denmark, July 2002. (Presenter)

16. M. Chechik, B. Devereux, A. Gurfinkel. "Model-Checking Infinite State-Space Systems with Fine-Grained Abstractions Using SPIN", in *Proceedings of the 8th SPIN Workshop on Model-Checking Software Systems (SPIN'01)*, volume 2057 of LNCS, pages 16–36, Toronto, Ontario, May 2001. (Presenter)

Other Refereed Contributions

1. M. Chechik and A. Gurfinkel. "Model-Checking Software Using Precise Abstractions", in *IFIP Working Group on Verified Software: Tools, Techniques, and Experiments (VSTTE'05)*, October 2005, 7 pages.

2. S. Easterbrook, M. Chechik, B. Devereux, A. Gurfinkel, A. Lai, A. Tefliovich, V. Petrovykh, C. Thompson-Welsh. "XChek: A Model-Checker for Multi-Valued Reasoning", in *Proceedings of International Conference on Software Engineering (ICSE'03)*, pages 804–805, Portland, OR, May 2003.

3. S. Nejati and A. Gurfinkel. "Stuttering Refinement of Partial Systems", in *Proceedings of the Eighteenth Annual IEEE Symp. on Logic in Computer Science (LICS'03)*, IEEE Computer Society Press, June 2003. Short Presentation.

Posters

1. A. Gurfinkel, K. Ku, S. Nejati, O. Wei, M. Chechik. "Software Model-Checking: Verifying Real Programs with YASM", CASCON'05, October 2005.

2. A. Gurfinkel, K. Ku, X. Ma, S. Nejati, M. Gheorghiu, M. Chechik. "Software Model-Checking: Solving the Halting Problem", CASCON'04, October 2004.

3. A. Gurfinkel, B. Devereux, K. Shukla, R. Talati, M. Chechik. "Model Exploration with TLQSolver", CASCON'03, October 2003.

4. M. Chechik, B. Devereux, S.M. Easterbrook, A. Gurfinkel, V. Petrovykh. "Automated Reasoning in the Presence of Inconsistencies in Software Requirements", CASCON'01, November 2001.

5. A. Gurfinkel, M. Chechik. "LTL Model-Checking Over Multi-Valued Logics", CITO Review, March 2001.

Theses and Technical Reports

1. A. Gurfinkel, "Model-Checking With Many Values", Ph.D. Thesis, in preparation.

2. M. Gheorghiu, A. Gurfinkel, and M. Chechik. "VaqUoT: A Tool for Vacuity Detection", April 2005.

3. A. Gurfinkel and B. Devereux. "Irrelevance and Vacuity in SAT-Based Model-Checking", May 2004.

4. A. Gurfinkel. "Multi-Valued Symbolic Model-Checking: Fairness, Counter-Examples, Running Time", MS Thesis, University of Toronto, Department of Computer Science, October 2002.

5. A. Gurfinkel, "A Survey of Graph-based Algorithms in Software Model Checking", in "Automated Verification, Fall 2000: A Collection of Reports", Tech. Rep. 425, University of Toronto, March 2001.

6. A. Gurfinkel, E. Nudelman, M. Chechik. "SHADOW: A Framework for Creating Program Analysis Tools", April 2000.

Presentations

Gave presentations at conferences as well as numerous talks at University of Toronto Formal Methods Reading Group.

1. *Why Waste a Perfectly Good Abstraction?*, Microsoft Research Cambridge, March 2006.

2. *Software Model-Checking with* YASM*: A Tutorial*, guest lecture, CSC2108, University of Toronto , November 2005.

3. *Software Model-Checking with* YASM*: A Tutorial*, University of Toronto Model-Checking Day, July 2005.

4. *Software Model-Checking*, guest lecture, CSC488/2107, University of Toronto, April 2005.

5. *An Automata-Theoretic Approach to Branching Time Model-Checking*, University of Toronto CSC2108, November 2003.

6. *A Survey of Graph-based Algorithms in Software Model Checking*, University of Toronto Seminar, March 2001.

Undergraduate Students Supervised

1. Kelvin Ku. *YASM: Yet Another Software Model-Checker*, Summer 2004; CSC494 project course, Fall 2004.

2. Xin (John) Ma. *YASM: Yet Another Software Model-Checker*, Summer 2004.

3. Rohit Talati. *Development of User-Interface for TLQSolver*, Summer 2003.

4. Kapil Shukla. *Testcase Generation using Query-Checking*, Summer 2003.

5. Anya Tefliovich. *Development of XChek GUI*, June-July 2002.

6. Christopher Thompson-Walsh. *Development of Multi-Valued Model-Checker*, Summer 2001; *Development of Temporal Logic Query Checker*, Summer 2002.

7. Viktor Petrovykh. *Development of Multi-Valued Model Checker*, 2001–2002.

8. Ben Wong. *KEGVis: A Web-Based Counter-Example Visualizer for Multi-Valued Model-Checking*, ECE B.Sc. Thesis, 2001.

Work History

- **System Administrator** — February 1997 – August 2000
  MedHunters.com — Toronto, ON

- **Application Developer** — Summer of 1997 – 2000
  Exalt Inc. — Toronto, ON

  – was a member of small Research and Development team

- **Lecturer** — July 1997 – August 2000
  Software Testing Lab — North York, ON

  – taught beginner and intermediate level Java programming courses

Personal Information

Canadian citizen.

References

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