

# THE SPIN MODEL CHECKER

## PRIMER AND REFERENCE MANUAL

Gerard J. Holzmann

### Master SPIN, the breakthrough tool for improving software reliability

SPIN is the world's most popular, and arguably one of the world's most powerful, tools for detecting software defects in concurrent system designs. Tens of thousands of people have used SPIN since it was first produced almost three years ago. The tool has been applied to everything from the verification of complex real-time systems that is used in airplane exchanges, to the validation of critical control software for interplanetary spacecraft.

This is the most comprehensive reference guide to SPIN, written by the principal designer of the tool. It covers the tool's specification language and Promela's foundations, and gives detailed advice on methods for solving the most complex software verification problems.

- Design and verify both abstract and detailed verification models of complex systems software
- Develop a solid understanding of the theory behind logic model checking
- Become an expert user of the SPIN command-line interface, the Spin graphical user interface, and the SpinView editing tool
- Learn the basic theory of image automata, linear temporal logic, depth-first and breadth-first search, weak optimizations, and model execution from source code

The SPIN software was awarded the prestigious Software System Award by the Association for Computing Machinery (ACM), which previously recognized systems such as UNIX, Smalltalk, RISC/P, and the World Wide Web.

### About the Author

DR. GERARD J. HOLZMANN is the principal designer of the SPIN system. Formerly Director of Computing Principles Research at Bell Laboratories in Murray Hill, NJ, he recently joined Xerox's Palo Alto Research Laboratory in Pasadena, CA, to help set up a new Laboratory for Reliable Software. Holzmann's earlier books include *Design and Validation of Computer Hardware* (Prentice Hall), and *The Early History of Data Networks* (IEEE CS Press).

1 Introduction  
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# Spin Model Checker Primer And Reference Manual

**A Gutmann**



## **Spin Model Checker Primer And Reference Manual:**

*The Spin Model Checker* Gerard J. Holzmann, 2004 The SPIN Model Checker is used for both teaching software verification techniques and for validating large scale applications The growing number of users has created a need for a more comprehensive user guide and a standard reference manual that describes the most recent version of the tool This book fills that need SPIN is used in over 40 countries The official SPIN web site spinroot.com receives between 2500 and 3000 hits per day It has been estimated that up to three quarters of the 400 billion spent annually to hire programmers in the United States is ultimately spent on debugging

**Verification, Model Checking, and Abstract Interpretation** Francesco Logozzo, Doron A. Peled, Leonore D. Zuck, 2008-02-26 The book constitutes the refereed proceedings of the 9th International Conference on Verification Model Checking and Abstract Interpretation VMCAI 2007 held in San Francisco USA in January 2008 The 21 revised full papers presented together with 2 invited lectures and 2 invited tutorials were carefully reviewed and selected from a total of over 60 submissions The papers feature current research from the communities of verification program certification model checking debugging techniques abstract interpretation abstract domains static analysis cross fertilization and advancement of hybrid methods

**Handbook of Model Checking** Edmund M. Clarke, Thomas A. Henzinger, Helmut Veith, Roderick Bloem, 2018-05-18 Model checking is a computer assisted method for the analysis of dynamical systems that can be modeled by state transition systems Drawing from research traditions in mathematical logic programming languages hardware design and theoretical computer science model checking is now widely used for the verification of hardware and software in industry The editors and authors of this handbook are among the world's leading researchers in this domain and the 32 contributed chapters present a thorough view of the origin theory and application of model checking In particular the editors classify the advances in this domain and the chapters of the handbook in terms of two recurrent themes that have driven much of the research agenda the algorithmic challenge that is designing model checking algorithms that scale to real life problems and the modeling challenge that is extending the formalism beyond Kripke structures and temporal logic The book will be valuable for researchers and graduate students engaged with the development of formal methods and verification tools

Digital Avionics Handbook Cary Spitzer, Uma Ferrell, Thomas Ferrell, 2017-11-22 A perennial bestseller the Digital Avionics Handbook offers a comprehensive view of avionics Complete with case studies of avionics architectures as well as examples of modern systems flying on current military and civil aircraft this Third Edition includes Ten brand new chapters covering new topics and emerging trends Significant restructuring to deliver a more coherent and cohesive story Updates to all existing chapters to reflect the latest software and technologies Featuring discussions of new data bus and display concepts involving retina scanning speech interaction and synthetic vision the Digital Avionics Handbook Third Edition provides practicing and aspiring electrical aerospace avionics and control systems engineers with a pragmatic look at the present state of the art of avionics

*SOFSEM 2007: Theory and Practice of*

*Computer Science* Jan van Leeuwen, Giuseppe F. Italiano, Wiebe van der Hoek, Christoph Meinel, Harald Sack, František Plášil, 2007-07-13 This book constitutes the refereed proceedings of the 33rd Conference on Current Trends in Theory and Practice of Computer Science SOFSEM 2007 held in Harrachov Czech Republic in January 2007 The 69 revised full papers presented together with 11 invited contributions were carefully reviewed and selected from 283 submissions The papers were organized in four topical tracks

**Specification and Verification of Multi-agent Systems** Mehdi Dastani, Koen V. Hindriks, John-Jules Meyer, 2010-07-20 Specification and Verification of Multi agent Systems presents a coherent treatment of the area of formal specification and verification of agent based systems with a special focus on verification of multi agent programs This edited volume includes contributions from international leading researchers in the area addressing logical formalisms and techniques such as model checking theorem proving and axiomatisations for semi automatic verification of agent based systems Chapters include Using Theorem Proving to Verify Properties of Agent Programs The Refinement of Multi Agent Systems Model Checking Agent Communication Directions for Agent Model Checking Model Checking Logics of Strategic Ability Complexity Correctness of Mult Agent Programs A Hybrid Approach The Norm Implementation Problem in Normative Multi Agent Systems A Verification Logic for GOAL Agents Using the Maude Term Rewriting Language for Agent Development with Formal Foundations The Cognitive Agents Specification Language and Verification Environment A Temporal Trace Language for Formal Modelling and Analysis of Agent Systems Assurance of Agent Systems What Role Should Formal Verification Play Specification and Verification of Multi agent Systems is a comprehensive guide that makes a useful tool for researchers practitioners and students and serves as a reference work summarizing the state of the art in an accessible manner

**Formal Methods for Industrial Critical Systems** Stefania Gnesi, Tiziana Margaria, 2012-11-27 Today formal methods are widely recognized as an essential step in the design process of industrial safety critical systems In its more general definition the term formal methods encompasses all notations having a precise mathematical semantics together with their associated analysis methods that allow description and reasoning about the behavior of a system in a formal manner Growing out of more than a decade of award winning collaborative work within the European Research Consortium for Informatics and Mathematics Formal Methods for Industrial Critical Systems A Survey of Applications presents a number of mainstream formal methods currently used for designing industrial critical systems with a focus on model checking The purpose of the book is threefold to reduce the effort required to learn formal methods which has been a major drawback for their industrial dissemination to help designers to adopt the formal methods which are most appropriate for their systems and to offer a panel of state of the art techniques and tools for analyzing critical systems

**Theoretical Aspects of Computing - ICTAC 2008** John S. Fitzgerald, Anne E. Haxthausen, Husnu Yenigun, 2008-08-25 Research on theoretical aspects of computing has a direct impact on the practice of computer systems development Over many decades fundamental theories have emerged to describe functionality temporal behavior and resource consumption Theories of

application domains are beginning to be exploited for modelling and analyzing intended computing systems before the expensive commitment is made to real programs and hardware. Recent years have seen major improvements in the cost effectiveness of tools supporting the exploitation of theories through proof model checking and testing. Against this encouraging background we are pleased to present papers that show something of the liveliness and diversity of research in theoretical aspects of computing today.

ICTAC 2008, the 5th International Colloquium on Theoretical Aspects of Computing, was held on 13 September 2008 in Istanbul, Turkey, hosted by Bilkent University. The ICTAC series was founded by the International Institute for Software Technology of the United Nations University (UNU-IIST). It brings together practitioners and researchers from academia, industry and government to present results and to exchange ideas and experience addressing challenges in both theoretical aspects of computing and in the exploitation of theory through methods and tools for system development. This series also promotes cooperation in research and education between participants and their institutions from developing and industrial countries in accordance with the mandate of the United Nations University.

The previous ICTAC colloquia were held in Guiyang, China (2004, LNCS 3407), Hanoi, Vietnam (2005, LNCS 3722), Tunis, Tunisia (2006, LNCS 4281) and Macau, SAR, China (2007, LNCS 4711).

Perspectives of System Informatics Andrei Voronkov, Irina Virbitskaite, 2015-04-20. This book contains the thoroughly refereed papers from the 9th International Ershov Informatics Conference (PSI) 2014 held in St. Petersburg, Russia, in June 2014. The 17 revised full papers, 11 revised short papers and 2 system and experimental papers presented in this book were carefully reviewed and selected from 80 submissions. The volume also contains 5 keynote talks which cover a range of hot topics in computer science and informatics. The papers cover various topics related to the foundations of program and system development and analysis, programming methodology and software engineering and information technologies.

Formal Methods for Components and Objects Frank S. de Boer, Marcello M. Bonsangue, Susanne Graf, Willem-Paul de Roever, 2006-09-30. This book presents 19 revised invited keynote lectures and revised tutorial lectures given at the 4th International Symposium on Formal Methods for Components and Objects (FMCO) 2005, Amsterdam, November 2005. The book provides a unique combination of ideas on software engineering and formal methods that reflect the current interest in the application or development of formal methods for large scale software systems such as component based systems and object systems.

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