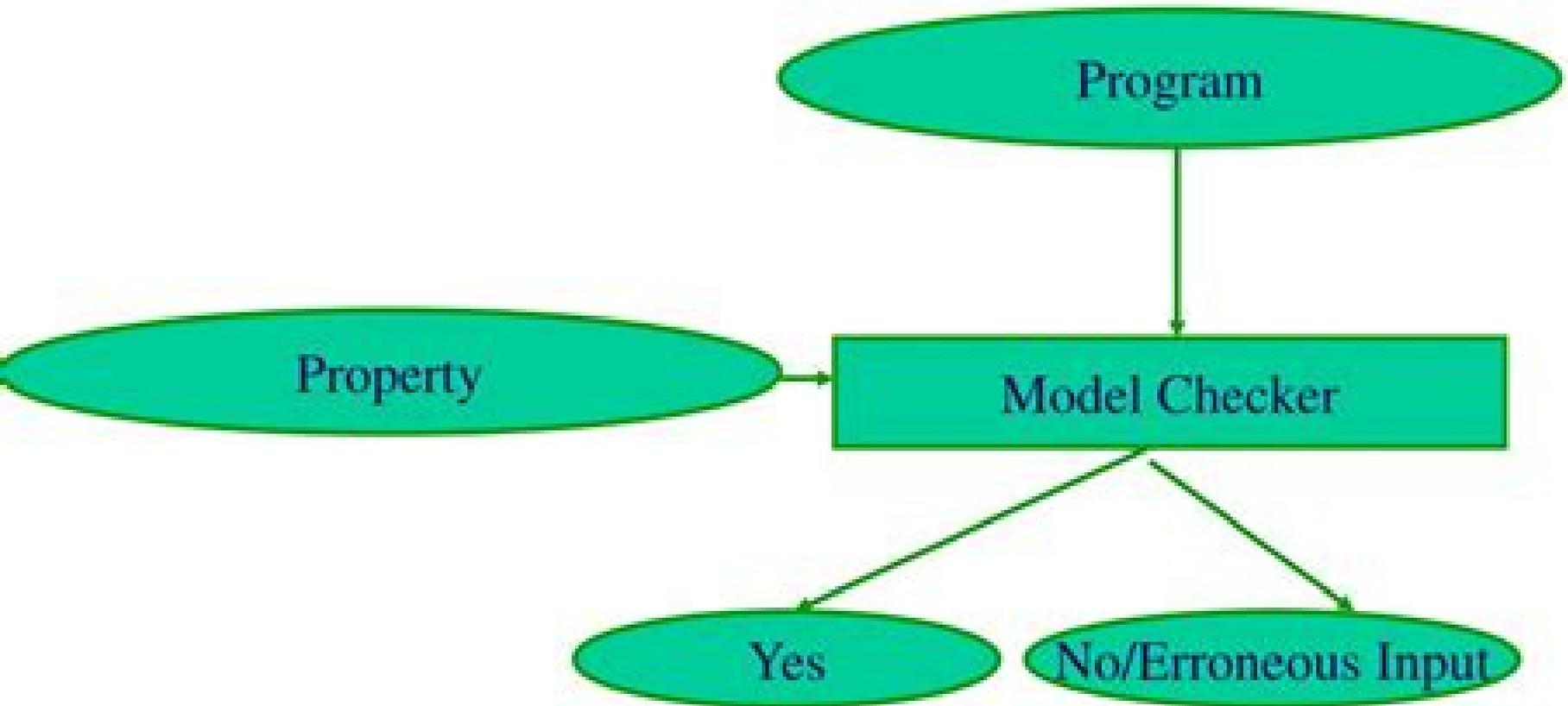


What is software model checking?



Model Checking Software

RS Peters



Model Checking Software:

Systems and Software Verification B. Berard, M. Bidoit, A. Finkel, F. Laroussinie, A. Petit, L. Petrucci, P.

Schnoebelen, 2013-04-17 Model checking is a powerful approach for the formal verification of software. When applicable it automatically provides complete proofs of correctness or explains via counter examples why a system is not correct. This book provides a basic introduction to this new technique. The first part describes in simple terms the theoretical basis of model checking: transition systems as a formal model of systems, temporal logic as a formal language for behavioral properties and model checking algorithms. The second part explains how to write rich and structured temporal logic specifications in practice while the third part surveys some of the major model checkers available.

Model Checking Software Matthew Dwyer, 2003-06-29 This book constitutes the refereed proceedings of the 8th International SPIN Workshop held in Toronto Canada in May 2001. The SPIN model checker is one of the most powerful and popular systems for the analysis and verification of distributed and concurrent systems. The 13 revised full papers presented together with one invited survey paper and three invited industrial experience reports were carefully reviewed and selected from 26 submissions. Besides foundational issues of program analysis and formal verification, the papers focus on tools for model checking and practical applications in a variety of fields.

Model Checking Software Matthew Dwyer, 2001-05-02 This book constitutes the refereed proceedings of the 8th International SPIN Workshop held in Toronto Canada in May 2001. The SPIN model checker is one of the most powerful and popular systems for the analysis and verification of distributed and concurrent systems. The 13 revised full papers presented together with one invited survey paper and three invited industrial experience reports were carefully reviewed and selected from 26 submissions. Besides foundational issues of program analysis and formal verification, the papers focus on tools for model checking and practical applications in a variety of fields.

Model Checking Software Dragan Bosnacki, Stefan Leue, 2002-03-27 The SPIN workshop series brings together researchers and practitioners interested in explicit state model checking technology as it is applied to the verification of software systems. Since 1995 when the SPIN workshop series was instigated, SPIN workshops have been held on an annual basis at Montreal 1995, New Brunswick 1996, Enschede 1997, Paris 1998, Trento 1999, Toulouse 1999, Stanford 2000 and Toronto 2001. While the first SPIN workshop was a stand alone event, later workshops have been organized as more or less closely related events with larger conferences, in particular with CAV 1996, TACAS 1997, FORTE PSTV 1998, FLOC 1999, World Congress on Formal Methods 1999, FMOODS 2000 and ICSE 2001. This year SPIN 2002 was held as a satellite event of ETAPS 2002, the European Joint Conferences on Theory and Practice of Software. The co-location of SPIN workshops with conferences has proven to be very successful and has helped to disseminate SPIN model checking technology to wider audiences. Since 1999 the proceedings of the SPIN workshops have appeared in Springer Verlag's Lecture Notes in Computer Science series. The history of successful SPIN workshops is evidence for the maturing of model checking technology not only in the hardware domain but increasingly also in the

software area While in earlier years algorithms and tool development 1 around the SPIN model checker were the focus of this workshop series the scope has recently widened to include more general approaches to software model checking Current research in this area concentrates not so much on completely verifying system models

but rather on analyzing source code in order to discover software faults *Model Checking Software* Thomas Ball, Sriram K.

Rajamani, 2003-04-28 This book constitutes the refereed proceedings of the 10th International SPIN workshop on Model Checking of Software SPIN 2003 held in Portland OR USA in May 2003 as an ICSE 2003 satellite workshop The 14 revised full papers and 3 revised tool papers presented were carefully reviewed and selected from 30 submissions The book presents state of the art results on the analysis and verification of distributed software systems using the SPIN model checker as one of the most powerful and widely applied systems **Model Checking Software** Dragan Bosnacki, Stefan

Edelkamp, 2007-08-30 This book presents the proceedings of the 14th International SPIN workshop on Model Checking Software held in Berlin Germany Fourteen full papers are presented together with four tool presentation papers and the abstracts of two invited talks The papers are organized into topical sections covering directed model checking partial order reduction program analysis exploration advances modeling and case studies and tool demonstrations **Model Checking**

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, 2002 *Model Checking Software* International SPIN Workshop on Model Checking of Software, 2003 *Model Checking Software* Klaus Havelund, Rupak Majumdar, Jens Palsberg, 2008-08-17 This book constitutes the refereed proceedings of the 15th International SPIN workshop on Model Checking Software SPIN 2008 held in Los Angeles CA USA in August 2008 The 17 revised full papers presented together with 1 tool paper and 4 invited talks were carefully reviewed and selected from 41 submissions The main focus of the workshop series is software systems including models and programs The papers cover theoretical and algorithmic foundations as well as tools for software model checking and foster interactions and exchanges of ideas with related areas in software engineering such as static analysis dynamic analysis and testing *Model Checking*

Software Antti Valmari, 2006-03-29 This book constitutes the refereed proceedings of the 13th International SPIN workshop on Model Checking Software SPIN 2006 held in Vienna Austria in March April 2006 as satellite event of ETAPS 2006 The 16 revised full papers presented together with three tool presentation papers were carefully reviewed and selected from 44 submissions The papers are organized in topical sections Principles of Model Checking Christel Baier, Joost-Pieter

Katoen, 2008-04-25 A comprehensive introduction to the foundations of model checking a fully automated technique for

finding flaws in hardware and software with extensive examples and both practical and theoretical exercises Our growing dependence on increasingly complex computer and software systems necessitates the development of formalisms techniques and tools for assessing functional properties of these systems One such technique that has emerged in the last twenty years is model checking which systematically and automatically checks whether a model of a given system satisfies a desired property such as deadlock freedom invariants and request response properties This automated technique for verification and debugging has developed into a mature and widely used approach with many applications Principles of Model Checking offers a comprehensive introduction to model checking that is not only a text suitable for classroom use but also a valuable reference for researchers and practitioners in the field The book begins with the basic principles for modeling concurrent and communicating systems introduces different classes of properties including safety and liveness presents the notion of fairness and provides automata based algorithms for these properties It introduces the temporal logics LTL and CTL compares them and covers algorithms for verifying these logics discussing real time systems as well as systems subject to random phenomena Separate chapters treat such efficiency improving techniques as abstraction and symbolic manipulation The book includes an extensive set of examples most of which run through several chapters and a complete set of basic results accompanied by detailed proofs Each chapter concludes with a summary bibliographic notes and an extensive list of exercises of both practical and theoretical nature

SPIN Model Checking and Software Verification Klaus

Havelund, John Penix, Willem Visser, 2000-08-21 The SPIN workshop is a forum for researchers interested in the subject of automata based explicit state model checking technologies for the analysis and verification of asynchronous concurrent and distributed systems The SPIN del checker <http://netlib.bell-labs.com/netlib/spin/whatispin.html> developed by Gerard Holzmann is one of the best known systems of this kind and has attracted a large user community This can likely be attributed to its efficient state exploration algorithms The fact that SPIN's modeling language Promela resembles a programming language has probably also contributed to its success Traditionally the SPIN workshops present papers on extensions and uses of SPIN As an experiment this year's workshop was broadened to have a slightly wider focus than previous workshops in that papers on software verification were encouraged Consequently a small collection of papers describe attempts to analyze and verify programs written in conventional programming languages Solutions include translations from source code to Promela as well as specially designed model checkers that accept source code We believe that this is an interesting research direction for the formal methods community and that it will result in a new set of challenges and solutions Of course abstraction becomes the key solution to deal with very large state spaces However we also see potential for integrating model checking with techniques such as static program analysis and testing Papers on these issues have therefore been included in the proceedings

Model Checking Software María del Mar Gallardo, Pedro Merino, 2018-06-15 This book constitutes the refereed proceedings of the 25th International Symposium on Model Checking Software SPIN 2018 held in Malaga Spain in June 2018

The 14 papers presented 1 short paper and 1 demo tool paper were carefully reviewed and selected from 28 submissions. Topics covered include formal verification techniques for automated analysis of software formal analysis for modeling languages such as UML state charts formal specification languages temporal logic design by contract model checking automated theorem proving including SAT and SMT verifying compilers abstraction and symbolic execution techniques and much more.

Model Checking Software Owolabi Legunsen, Grigore Rosu, 2022-08-23 This book constitutes the refereed proceedings of the 28th International Symposium on Model Checking Software SPIN 2022 held virtually in May 2022. The 8 full papers were carefully reviewed and selected from 11 submissions. Topics covered include formal verification techniques for automated analysis of software formal analysis for modeling languages such as UML state charts formal specification languages temporal logic design by contract model checking automated theorem proving including SAT and SMT verifying compilers abstraction and symbolic execution techniques and much more.

Model Checking Software Corina S. Pasareanu, 2009-06-26 This book constitutes the refereed proceedings of the 16th International SPIN workshop on Model Checking Software SPIN 2009 held in Grenoble France in June 2009. The 15 revised full papers presented together with 3 tool papers and 4 invited talks were carefully reviewed and selected from 41 submissions. The papers cover theoretical and algorithmic foundations as well as tools for software model checking by addressing theoretical advances and empirical evaluations related to state space and path exploration techniques as implemented in software verification tools.

Model Checking Software Alastair Donaldson, David Parker, 2012-07-18 This book constitutes the thoroughly refereed proceedings of the 19th International SPIN workshop on Model Checking Software SPIN 2012 held in Oxford UK in July 2012. The 11 revised full papers presented together with 5 tool papers and 4 invited talks were carefully reviewed and selected from 30 submissions. The papers are grouped in topical sections on model checking techniques parallel model checking case studies model checking for concurrency and tool demonstrations.

Model Checking Software Susanne Graf, Laurent Mounier, 2004-02-27 Since 1995 when the SPIN workshop series was instigated SPIN workshops have been held on an annual basis in Montreal 1995 New Brunswick 1996 Enschede 1997 Paris 1998 Trento 1999 Toulouse 1999 Stanford 2000 Toronto 2001 Grenoble 2002 and Portland 2003. All but the first SPIN workshop were organized as satellite events of larger conferences in particular of CAV 1996 TACAS 1997 FORTE PSTV 1998 FLOC 1999 the World Congress on Formal Methods 1999 FMOODS 2000 ICSE 2001 2003 and ETAPS 2002. This year again SPIN was held as a satellite event of ETAPS 2004. The co-location of SPIN workshops with conferences has proven to be very successful and has helped to disseminate SPIN model checking technology to wider audiences. Since 1999 the proceedings of the SPIN workshops have appeared in Springer Verlag's Lecture Notes in Computer Science series. The history of successful SPIN workshops is evidence for the maturing of model checking technology not only in the hardware domain but increasingly also in the software area. While in earlier years algorithms and tool development around the SPIN model checker were the focus of this workshop series for several years now the

scope has been widened to include more general approaches to software model checking techniques and tools as well as applications The SPIN workshop has become a forum for all practitioners and researchers interested in model checking based techniques for the validation and analysis of communication protocols and software systems

Model Checking Software Systems Jeannette Marie Wing, Mandana Vaziri-Farahani, 1995 Abstract Model checking is a proven successful technology for verifying hardware It works however on only finite state machines and most software systems have infinitely many states Our approach to applying model checking to software hinges on identifying appropriate abstractions that exploit the nature of both the system S and the property ϕ to be verified We check ϕ on an abstracted but finite model of S Following this approach we verified three cache coherence protocols used in distributed file systems These protocols have to satisfy this property If a client believes that a cached file is valid then the authorized server believes that the client's copy is valid In our finite model of the system we need only represent the beliefs that a client and a server have about a cached file we can abstract from the caches the files contents and even the files themselves Moreover by successive application of the generalization rule from predicate logic we need only consider a model with at most two clients one server and one file We used McMillan's SMV model checker on our most complicated protocol SMV took less than 1 second to check over 43 600 reachable states

A Case Study in Model Checking Software Systems Carnegie Mellon University. Computer Science Department, Jeannette Marie Wing, Mandana Vaziri-Farahani, 1996 Model checking is a proven successful technology for verifying hardware It works however on only finite state machines and most software systems have infinitely many states Our approach to applying model checking to software hinges on identifying appropriate abstractions that exploit the nature of both the system S and the property ϕ to be verified We check ϕ on an abstracted but finite model of S Following this approach we verified three cache protocols used in distributed file systems These protocols have to satisfy this property If a client believes that a cached file is valid then the authorized server believes that the client's copy is valid In our finite model of the system we need only represent the beliefs that a client and a server have about a cached file we can abstract from the caches the files contents and even the files themselves Moreover by successive application of the generalization rule from predicate logic we need only consider a model with at most two clients one server and one file We used McMillan's SMV model checker on our most complicated protocol SMV took less than 1 second to check over 43 600 reachable states

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