Figure out Values for Testing using Symbolic Execution

Symbolic Execution

Cristian Cadar

Symbolic Execution:

Symbolic Execution and Quantitative Reasoning Corina S. Păsăreanu,2022-05-31 This book reviews recent advances in symbolic execution and its probabilistic variant and discusses how they can be used to ensure the safety and security of software systems Symbolic execution is a systematic program analysis technique which explores multiple program behaviors all at once by collecting and solving symbolic constraints collected from the branching conditions in the program The obtained solutions can be used as test inputs that execute feasible program paths Symbolic execution has found many applications in various domains such as security smartphone applications operating systems databases and more recently deep neural networks uncovering subtle errors and unknown vulnerabilities We review here the technique has also been extended to reason about algorithmic complexity and resource consumption Furthermore symbolic execution has been recently extended with probabilistic reasoning allowing one to reason about quantitative properties of software systems The approach computes the conditions to reach target program events of interest and uses model counting to quantify the fraction of the input domain satisfying these conditions thus computing the probability of event occurrence This probabilistic information can be used for example to compute the reliability of an aircraft controller under different wind conditions modeled probabilistically or to quantify the leakage of sensitive data in a software system using information theory metrics such as Shannon entropy This book is intended for students and software engineers who are interested in advanced techniques for testing and verifying software systems **Testing Techniques in Software Engineering** Paulo Borba,Ana Cavalcanti,Augusto Sampaio,Jim Woodcook,2010-07-30 The Pernambuco School on Software Engineering PSSE 2007 was the second in a series of events devoted to the study of advanced computer science and to the promotion of international scienti c collaboration The main theme in 2007 was testing Testing is nowadays a key activity for assuring software quality The summer school and its proceedings were intended to give a detailed tutorial introduction to the scienti c basis of this activity and its state of the art Theseproceedingsrecordthecontributionsfromtheinvitedlecturers Eachof thechaptersistheresultofathoroughrevisionoftheinitialnotesprovidedtothe participants of the school The revision was inspired by the synergy generated by the opportunity for the lecturers to present and discuss their work among themselves and with the school s attendees The editors have tried to produce a coherent view of the topic by harmonizing these contributions smoothing out di erences in notation and approach and providing links between the lectures We apologize to the authors for any errors introduced by our extensive editing Although the chapters are linked in severalways each one is su ciently se contained to be read in isolation Nevertheless Chap 1 should be read rst by those interested in an introduction to testing Chapter 1 introduces the terminology adopted in this book It also provides an overview of the testing process and of the types functional structural and so on anddimensions unit integration andsoon ofthetestingactivity Themain strategies employed in the central activity of test selection are also discussed Most of the material presented in this introductory

chapter is addressedin more depth in the following chapters **Fundamental Approaches to Software Engineering** Luciano Baresi,2006-03-16 This book constitutes the refereed proceedings of the 9th International Conference on Fundamental Approaches to Software Engineering FASE 2006 held in Vienna Austria in March 2006 as part of ETAPS The 27 revised full papers two tool papers presented together with two invited papers were carefully reviewed and selected from 166 submissions The papers are organized in topical sections **Symbolic Execution for Testing Complex Software** Cristian Cadar,2009 **Advanced Simulation and Test Methodologies for VLSI Design** G. Russell,I.L. Sayers,1989-02-28 **PROCEEDINGS OF THE 23RD CONFERENCE ON FORMAL METHODS IN COMPUTER-AIDED DESIGN – FMCAD 2023** Alexander Nadel ,Kristin Yvonne Rozier,2023-10-13 The Conference on Formal Methods in Computer Aided Design FMCAD is an annual conference on the theory and applications of formal methods in hardware and system in academia and industry for presenting and discussing groundbreaking methods technologies theoretical results and tools for reasoning formally about computing systems FMCAD covers formal aspects of computer aided system testing

Tests and Proofs Martina Seidl,Nikolai Tillmann,2014-07-07 This book constitutes the refereed proceedings of the 8th International Conference on Tests and Proofs TAP 2014 held in York UK in July 2014 as part of the STAF 2014 Federated Conferences The 10 revised full papers and 4 short papers presented together with two tutorial descriptions were carefully reviewed and selected from 27 submissions The papers cover topics in the following four research areas test generation bridging semantic gaps integrated development processes and bounded verification **Symbolic Execution and Quantitative Reasoning** Corina S. Păsăreanu,2020-05-13 This book reviews recent advances in symbolic execution and its probabilistic variant and discusses how they can be used to ensure the safety and security of software systems Symbolic execution is a systematic program analysis technique which explores multiple program behaviors all at once by collecting and solving symbolic constraints collected from the branching conditions in the program The obtained solutions can be used as test inputs that execute feasible program paths Symbolic execution has found many applications in various domains such as security smartphone applications operating systems databases and more recently deep neural networks uncovering subtle errors and unknown vulnerabilities We review here the technique has also been extended to reason about algorithmic complexity and resource consumption Furthermore symbolic execution has been recently extended with probabilistic reasoning allowing one to reason about quantitative properties of software systems The approach computes the conditions to reach target program events of interest and uses model counting to quantify the fraction of the input domain satisfying these conditions thus computing the probability of event occurrence This probabilistic information can be used for example to compute the reliability of an aircraft controller under different wind conditions modeled probabilistically or to quantify the leakage of sensitive data in a software system using information theory metrics such as Shannon entropy This book is intended for students and software engineers who are interested in advanced techniques for testing and verifying software

systems   *Safety of Computer Control Systems 1990 (SAFECOMP'90)* B.K. Daniels,2014-06-28 The market for safe secure and reliable computer systems is expanding continuously and these Proceedings provide an opportunity to review the growth during the last decade and identify skills and technologies required for continued development in the area The papers cover the experiences gained from specifying creating operating and licensing computers in safety security and reliability related applications There are reviews of guidelines and industrial applications with a section covering methods and tools used in designing documenting analysing testing and assessing systems dependent on the SAFECOMP factors   **Software Engineering** Shari Lawrence Pfleeger,Joanne M. Atlee,2006 This introduction to software engineering and practice addresses both procedural and object oriented development Is thoroughly updated to reflect significant changes in software engineering including modeling and agile methods Emphasizes essential role of modeling design in software engineering Applies concepts consistently to two common examples a typical information system and a real time system Combines theory with real practical applications by providing an abundance of case studies and examples from the current literature A useful reference for software engineers   **Tutorial, Microprogramming and Firmware Engineering** Veljko Milutinović,1989   Tutorial, Software Testing & Validation Techniques Edward Miller,1981 Papers and articles discussing several significant advances tin the software testing and validation field   Fault Simulation in Adlib Sable Stanford University. Computer Systems Laboratory,S. Ghosh,W. Vancleemput,1983 This technical report presents work in the area of deductive fault simulation This technique one of the three fault simulation techniques discussed in the literature has been implemented in ADLIB SABLE a hierarchical multi level simulator designed and used at Stanford University Most of the fault models illustrated in this report consider only two fault types single stuck at 0 and single stuck at Z high impedance Gate level fault models have been built for most commonly used gates The ability to model the fault behavior of functional blocks in ADLIB SABLE is also demonstrated The motivation is that for many functional blocks a gate level description may not be available or that the designer wishes to sacrifice detailed analysis for a higher simulation speed Functional fault models are built for many commonly used blocks using a decomposition technique The ratio of functional fault simulation speed to gate level fault simulation speed has been observed to be of the order of 5 for the typical functional block sizes considered The ratio however is not the upper limit and will be larger for larger sized functional blocks It was also proved that the functional fault models are invariant with respect to the internal implementation details A design discipline for sequential circuits is worked out which allows deductive fault simulation Extensions to the simple 0 1 deductive techniques are studied and the fault models built in the extended domain are observed to be useful in modelling gates of some technologies A comparison between deductive and concurrent fault simulation methods is given Performance of deductive fault simulation implemented in ADLIB SABLE shows that for sequential as well as combinational circuits the CPU time increases linearly with increasing number of components simulated an advantage over fault simulators which simulate one fault at a time and display a quadratic behavior

A Systematic Approach to the Development and Validation of Software for Critical Applications Siu-Bun Franklin Ho,1978   *Software Engineering* Merlin Dorfman,Richard H. Thayer,1997 Software Engineering describes the current state of the art practice of software engineering beginning with an overview of current issues and focusing on the engineering of large complex systems The text illustrates the phases of the software development life cycle requirements design implementation testing and maintenance   Proceedings ,2002   IEEE First ICA3PP V. Lakshmi Narasimhan,1995

Formal Methods of Program Verification and Specification Helmut K. Berg,1982   **Totally Verified Systems** Jeffrey J. Joyce,1989 Abstract We describe exploratory efforts to design and verify a compiler for a formally verified microprocessor as one aspect of the eventual goal of building totally verified systems Together with a formal proof of correctness for the microprocessor this yields a precise and rigorously established link between the semantics of the source language and the execution of compiled code by the fabricated microchip we describe in particular 1 how the limitations of real hardware influenced this proof and 2 how the general framework provided by higher order logic was used to formalize the compiler correctness problem for a hierarchially structured language   **Eighth Working Conference on Reverse Engineering** Elizabeth Burd,Peter Aiken,Rainer Koschke,2001 Thirty eight papers for the eighth Working Conference on Reverse Engineering held in Stuttgart in October 2001 The annual conference covers the theory and practice of recovering information from existing software and systems Papers cover topics including pre processing and parsing program slicin

Whispering the Strategies of Language: An Mental Journey through **Symbolic Execution**

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Symbolic Execution Introduction

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