

Refinement Calculus

A Systematic Introduction



Ralph-Johan Back
Joakim von Wright



Springer

Refinement Calculus A Systematic Introduction

Pedro Ribeiro, Augusto Sampaio



Refinement Calculus A Systematic Introduction:

Refinement Calculus Ralph-Johan Back, Joakim Wright, 1998-04-13 Much current research in computer science is concerned with two questions is a program correct And how can we improve a correct program preserving correctness This latter question is known as the refinement of programs and the purpose of this book is to consider these questions in a formal setting In fact correctness turns out to be a special case of refinement and so the focus is on refinement Although a reasonable background knowledge is assumed from mathematics and CS the book is a self contained introduction suitable for graduate students and researchers coming to this subject for the first time There are numerous exercises provided of varying degrees of challenge

Formal Methods for Components and Objects Frank S. de Boer, Marcello M. Bonsangue, Stefan Hallerstede, Michael Leuschel, 2010-11-11 All modern industries rely on large and complex software systems In order to construct such large systems in a systematic manner the focus of the development methodologies has switched in the last two decades from functional to structural issues Formal methods have been applied successfully to the verification of medium sized programs in protocol and hardware design However their application to the development of large systems requires a greater emphasis on specification modeling and validation techniques supporting the concepts of reusability and modifiability and their implementation in new extensions of existing programming languages like Java This state of the art survey presents the outcome of the 8th Symposium on Formal Methods for Components and Objects held in Eindhoven The Netherlands in November 2009 The volume contains 17 revised contributions submitted after the symposium by speakers from each of the following European IST projects the IST FP6 project BIONETS on biologically inspired services evolution for the pervasive age the IST FP7 project COMPAS on compliance driven models languages and architectures for services the IST FP6 project CREDO on modelling and analysis of evolutionary structures for distributed services the IST FP7 DEPLOY on industrial deployment of advanced system engineering methods for high productivity and dependability the IST FP7 project HATS on highly adaptable and trustworthy software using formal methods the IST FP7 project INESS on integrated European railway signalling system the IST FP7 project MOGENTES on model based generation of tests for dependable embedded systems the IST FP6 project PROTEST on property based testing and the IST FP7 project QUASIMODO on quantitative system properties in model driven design of embedded systems

Typed Lambda Calculi and Applications Simona Ronchi Della Rocca, 2007-07-11 This book constitutes the refereed proceedings of the 8th International Conference on Typed Lambda Calculi and Applications TLCA 2007 held in Paris France in June 2007 in conjunction with RTA 2007 the 18th International Conference on Rewriting Techniques and Applications as part of RDP 2007 the 4th International Conference on Rewriting Deduction and Programming The 25 revised full papers presented together with 2 invited talks were carefully reviewed and selected from 52 submissions The papers present original research results that are broadly relevant to the theory and applications of typed calculi and address a wide variety of topics such as proof theory semantics

implementation types and programming Formal Methods and Software Engineering Zhiming Liu, Jifeng He, 2006-10-24 This book constitutes the refereed proceedings of the 8th International Conference on Formal Engineering Methods ICFEM 2006 held in Macao China in November 2006 The 38 revised full papers presented together with three keynote talks were carefully reviewed and selected from 108 submissions The papers address all current issues in formal methods and their applications in software engineering ZB 2002: Formal Specification and Development in Z and B Didier Bert, Jonathan P. Bowen, Martin C. Henson, Ken Robinson, 2003-07-31 This book constitutes the refereed proceedings of the Second International Conference of B and Z Users ZB 2002 held in Grenoble France in January 2002 The 24 papers presented together with three invited contributions were carefully reviewed and selected for inclusion in the book The book documents the recent advances for the Z formal specification notion and for the B method the full scope is covered ranging from foundational and theoretical issues to advanced applications tools and case studies *Engineering Theories of Software Intensive Systems* Manfred Broy, Johannes Gruenbauer, David Harel, Tony Hoare, 2005-11-13 Software engineering has over the years been applied in many different fields ranging from telecommunications to embedded systems in car and aircraft industry as well as in production engineering and computer networks Foundations in software technology lie in models allowing to capture application domains detailed requirements but also to understand the structure and working of software systems like software architectures and programs These models have to be expressed in techniques based on discrete mathematics algebra and logics However according to the very specific needs in applications of software technology formal methods have to serve the needs and the quality of advanced software engineering methods especially taking into account security aspects in Information Technology This book presents mathematical foundations of software engineering and state of the art engineering methods in their theoretical substance in the step towards practical applications to examine software engineering techniques and foundations used for industrial tasks The contributions in this volume emerged from lectures of the 25th International Summer School on Engineering Theories of Software Intensive Systems held at Marktoberdorf Germany from August 3 to August 15 2004 **Formal Methods and Software Engineering** Chris George, Huaikou Miao, 2003-06-30 This book constitutes the refereed proceedings of the 4th International Conference on Formal Engineering methods ICFEM 2002 held in Shanghai China in October 2002 The 43 revised full papers and 16 revised short papers presented together with 5 invited contributions were carefully reviewed and selected from a total of 108 submissions The papers are organized in topical sections on component engineering and software architecture method integration specification techniques and languages tools and environments refinement applications validation and verification UML and semantics **B 2007: Formal Specification and Development in B** Jacques Julliand, Olga Kouchnarenko, 2006-12-12 This book constitutes the refereed proceedings of the 7th International Conference of B Users B 2007 held in Besancon France January 2007 Coverage in this volume includes industrial applications and case studies using B integration of model based

specification methods in the software development lifecycle derivation of hardware software architecture from model based specifications and validating requirements through formal models

Encyclopedia of Software Engineering Three-Volume Set (Print) Phillip A. Laplante, 2010-11-22 Software engineering requires specialized knowledge of a broad spectrum of topics including the construction of software and the platforms applications and environments in which the software operates as well as an understanding of the people who build and use the software Offering an authoritative perspective the two volumes of the Encyclopedia of Software Engineering cover the entire multidisciplinary scope of this important field More than 200 expert contributors and reviewers from industry and academia across 21 countries provide easy to read entries that cover software requirements design construction testing maintenance configuration management quality control and software engineering management tools and methods Editor Phillip A Laplante uses the most universally recognized definition of the areas of relevance to software engineering the Software Engineering Body of Knowledge SWEBOK as a template for organizing the material Also available in an electronic format this encyclopedia supplies software engineering students IT professionals researchers managers and scholars with unrivaled coverage of the topics that encompass this ever changing field Also Available Online This Taylor E mail e reference taylorandfrancis com International Tel 44 0 20 7017 6062 E mail online sales tandf co uk

Integrated Formal Methods Eerke Boiten, John Derrick, Graeme Smith, 2004-03-24 This book constitutes the refereed proceedings of the 4th International Conference on Integrated Formal Methods IFM 2004 held in Canterbury UK in April 2004 The 24 revised full papers presented together with 3 invited papers and one invited tutorial chapter were carefully reviewed and selected from 65 submissions The papers are devoted to automating program analysis state event based verification formalizing graphical notions refinement object orientation hybrid and timed automata integration frameworks verifying interactive systems and testing and assertions

Interconnect-Centric Design for Advanced SOC and NOC Jari Nurmi, H. Tenhunen, J. Isoaho, Axel Jantsch, 2006-03-20 In Interconnect centric Design for Advanced SoC and NoC we have tried to create a comprehensive understanding about on chip interconnect characteristics design methodologies layered views on different abstraction levels and finally about applying the interconnect centric design in system on chip design Traditionally on chip communication design has been done using rather ad hoc and informal approaches that fail to meet some of the challenges posed by next generation SOC designs such as performance and throughput power and energy reliability predictability synchronization and management of concurrency To address these challenges it is critical to take a global view of the communication problem and decompose it along lines that make it more tractable We believe that a layered approach similar to that defined by the communication networks community should also be used for on chip communication design The design issues are handled on physical and circuit layer logic and architecture layer and from system design methodology and tools point of view Formal communication modeling and refinement is used to bridge the communication layers and network centric modeling of multiprocessor on chip networks and socket based design

will serve the development of platforms for SoC and NoC integration Interconnect centric Design for Advanced SoC and NoC is concluded by two application examples interconnect and memory organization in SoCs for advanced set top boxes and TV and a case study in NoC platform design for more generic applications **FM 2009: Formal Methods** Ana

Cavalcanti, Dennis Dams, 2009-10-26 th FM 2009 the 16 International Symposium on Formal Methods marked the 10th anniversary of the First World Congress on Formal Methods that was held in 1999 in Toulouse France We wished to celebrate this by advertising and organizing FM 2009 as the Second World Congress in the FM series aiming to once again bring together the formal methods communities from all over the world The statistics displayed in the table on the next page include the number of countries represented by the Programme Committee members as well as of the authors of submitted and accepted papers Novel this year was a special track on tools and industrial applications Submissions of papers on these topics were especially encouraged but not given any special treatment It was just as hard to get a special track paper accepted as any other paper What we did promote however was a discussion of how originality contribution and soundness should be judged for these papers The following questions were used by our Programme Committee Theoretical Aspects of Computing - ICTAC 2014 Gabriel Ciobanu, Dominique Méry, 2014-09-11 This book constitutes the refereed proceedings of the 11th International Colloquium on Theoretical Aspects of Computing ICTAC 2014 held in Bucharest Romania in September 2014 The 25 revised full papers presented together with three invited talks were carefully reviewed and selected from 74 submissions The papers cover various topics such as automata theory and formal languages principles and semantics of programming languages theories of concurrency mobility and reconfiguration logics and their applications software architectures and their models refinement and verification relationship between software requirements models and code static and dynamic program analysis and verification software specification refinement verification and testing model checking and theorem proving models of object and component systems coordination and feature interaction integration of theories formal methods and tools for engineering computing systems service oriented architectures models and development methods models of concurrency security and mobility theories of distributed grid and cloud computing real time embedded hybrid and cyber physical systems type and category theory in computer science models for e learning and education case studies theories tools and experiments of verified systems domain specific modeling and technology examples frameworks and practical experience challenges and foundations in environmental modeling and monitoring healthcare and disaster management *Formal Aspects of Component Software* Kyungmin Bae, Peter Csaba Ölveczky, 2018-10-06 This book constitutes the refereed proceedings from the 15th International Conference on Formal Aspects of Component Software FACS 2018 held in Pohang South Korea in October 2018 The 14 full papers presented together with an invited abstract and an invited paper were carefully reviewed and selected from 32 submissions FACS 2016 is concerned with how formal methods can be used to make component based and service oriented software development succeed Formal methods have

provided a foundation for component based software by successfully addressing challenging issues such as mathematical models for components composition and adaptation or rigorous approaches to verification deployment testing and certification

A Practical Theory of Reactive Systems R. Kurki-Suonio, 2005-07-20 A man may imagine he understands something but still not understand anything in the way that he ought to Paul of Tarsus 1 Corinthians 8 2 Calling this a practical theory may require some explanation Theory and practice are often thought of as two different worlds governed by different ideal principles and laws David Lorge Parnas for instance who has contributed much to our theoretical understanding of software engineering and also to sound use of theory in the practice of it likes to point out that theoretically is synonymous to not really In applied mathematics the goal is to discover useful connections between these two worlds My thesis is that in software engineering this two world view is inadequate and a more intimate interplay is required between theory and practice That is both theoretical and practical components should be integrated into a practical theory It should be clear from the above that the intended readership of this book is not theoreticians They would probably have difficulties in appreciating a book on theory where the presentation does not proceed in a logical sequence from basic definitions to theorems and mathematical proofs followed by application examples In fact all this would not constitute what I understand by a practical theory in this context

Unifying Theories of Programming Pedro Ribeiro, Augusto Sampaio, 2019-09-23 This volume contains papers presented at UTP 2019 the 7th International Symposium on Unifying Theories of Programming held in Porto Portugal on the 8th of October 2019 This edition of the UTP symposium is in honor of Sir Tony Hoare on the occasion of his 85th birthday The papers contained in this volume were invited and friendly refereed original contributions sought from the UTP community One of the papers is from the distinguished invited speaker Tony Hoare himself Nine other additional papers compose this volume covering several aspects of Unifying Theories of Programming

Embedded Computer Systems: Architectures, Modeling, and Simulation Timo D. Härmäläinen, Andy D. Pimentel, Jarmo Takala, Stamatis Vassiliadis, 2005-07-11 The SAMOS workshop is an international gathering of highly qualified researchers from academia and industry sharing in a 3 day lively discussion on the quiet and spiring northern mountainside of the Mediterranean island of Samos As a tradition the workshop features workshop presentations in the morning while after lunch all kinds of informal discussions and nut cracking gatherings take place The workshop is unique in the sense that not only solved research problems are presented and discussed but also partly unsolved problems and in depth topical reviews can be unleashed in the scientific arena Consequently the workshop provides the participants with an environment where collaboration rather than competition is fostered The earlier workshops SAMOS I IV 2001 2004 were composed only of invited presentations Due to increasing expressions of interest in the workshop the Program Committee of SAMOS V decided to open the workshop for all submissions As a result the SAMOS workshop gained an immediate popularity a total of 114 submitted papers were received for evaluation The papers came from 24 countries and regions Austria 1 Belgium 2 Brazil 5

Canada 4 China 12 Cyprus 2 Czech Republic 1 Finland 15 France 6 Germany 8 Greece 5 Hong Kong 2 India 2 Iran 1 Korea 24 The Netherlands 7 Pakistan 1 Poland 2 Spain 2 Sweden 2 Taiwan 1 Turkey 2 UK 2 and USA 5 We are grateful to all of the authors who submitted papers to the workshop

Unifying Theories of Programming Steve Dunne, 2006-06-27 This book constitutes the thoroughly refereed post proceedings of the First International Symposium on Unifying Theories of Programming UTP 2006 held at Walworth Castle County Durham UK in February 2006 The book presents 14 revised full papers Based on the pioneering work on unifying theories of programming by Tony Hoare and Jifeng He UTP 2006 focused on the most significant results and raised awareness of the benefits of unifying theoretical frameworks

Relational and Algebraic Methods in Computer Science Peter Höfner, Damien Pous, Georg Struth, 2017-05-08 This book constitutes the proceedings of the 16th International Conference on Relational and Algebraic Methods in Computer Science RAMiCS 2017 held in Lyon France in May 2017 The 17 revised full papers and 2 invited papers presented together with 1 invited abstract were carefully selected from 28 submissions Topics covered range from mathematical foundations to applications as conceptual and methodological tools in computer science and beyond

Formal Methods: Foundations and Applications Adenilson Simao, Carroll Morgan, 2011-11-10 This book constitutes the thoroughly refereed post conference proceedings of the 14th Brazilian Symposium on Formal Methods SBMF 2011 held in Sao Paulo Brazil in September 2011 co located with CBSOFT 2011 the second Brazilian Conference on Software Theory and Practice The 13 revised full papers were carefully reviewed and selected from 37 submissions The papers presented cover a broad range of foundational and methodological issues in formal methods for the design and analysis of software and hardware systems as well as applications in various domains

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