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Algebraic Foundations of Systems Specification



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Algebraic Foundations Of Systems Specification

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Algebraic Foundations Of Systems Specification:

Algebraic Foundations of Systems Specification Egidio Astesiano, Hans-Jörg Kreowski, Bernd Krieg-Brückner, 2012-12-06

The aim of software engineering is the provision and investigation of methods for the development of software systems of high quality with correctness as a key issue. A system is called correct if it does what one wants if it meets the requirements. To achieve and to guarantee correct systems the need of formal methods with rigorous semantics and the possibility of verification is widely accepted. Algebraic specification is a software engineering approach of this perspective. When Liskov and Zilles Guttag and the ADJ group with Goguen Thatcher Wagner and Wright introduced the basic ideas of algebraic specification in the mid seventies in the U S A and Canada they initiated a very successful and still flourishing new area. In the late seventies algebraic specification became a major research topic also in many European countries. Originally the algebraic framework was intended for the mathematical foundation of abstract data types and the formal development of first order applicative programs. Meanwhile the range of applications has been extended to the precise specification of complete software systems the uniform definition of syntax and semantics of programming languages and to the stepwise development of correct systems from the requirement definitions to the running programs. The activities in the last 25 years have led to an abundance of concepts methods approaches theories languages and tools which are mathematically founded in universal algebra category theory and logic.

Algebraic Foundations of Systems Specification E. Astesiano, H. J. Kreowski, B. Krieg-Brückner, 1999. The aim of software engineering is the provision and investigation of methods for the development of software systems of high quality with correctness as a key issue. A system is called correct if it does what one wants if it meets the requirements. To achieve and to guarantee correct systems the need of formal methods with rigorous semantics and the possibility of verification is widely accepted. Algebraic specification is a software engineering approach of this perspective. When Liskov and Zilles Guttag and the ADJ group with Goguen Thatcher Wagner and Wright introduced the basic ideas of algebraic specification in the mid seventies in the U S A and Canada they initiated a very successful and still flourishing new area. In the late seventies algebraic specification became a major research topic also in many European countries. Originally the algebraic framework was intended for the mathematical foundation of abstract data types and the formal development of first order applicative programs. Meanwhile the range of applications has been extended to the precise specification of complete software systems the uniform definition of syntax and semantics of programming languages and to the stepwise development of correct systems from the requirement definitions to the running programs. The activities in the last 25 years have led to an abundance of concepts methods approaches theories languages and tools which are mathematically founded in universal algebra category theory and logic.

Foundations of Algebraic Specification and Formal Software Development Donald Sannella, Andrzej Tarlecki, 2012-01-05. This book provides foundations for software specification and formal software development from the perspective of work on algebraic specification concentrating on

developing basic concepts and studying their fundamental properties These foundations are built on a solid mathematical basis using elements of universal algebra category theory and logic and this mathematical toolbox provides a convenient language for precisely formulating the concepts involved in software specification and development Once formally defined these notions become subject to mathematical investigation and this interplay between mathematics and software engineering yields results that are mathematically interesting conceptually revealing and practically useful The theory presented by the authors has its origins in work on algebraic specifications that started in the early 1970s and their treatment is comprehensive This book contains five kinds of material the requisite mathematical foundations traditional algebraic specifications elements of the theory of institutions formal specification and development and proof methods While the book is self contained mathematical maturity and familiarity with the problems of software engineering is required and in the examples that directly relate to programming the authors assume acquaintance with the concepts of functional programming The book will be of value to researchers and advanced graduate students in the areas of programming and theoretical computer science Recent Trends in Algebraic Development Techniques Francesco Parisi-Presicce,1998-03-11 Spine title WADT 97 *Perspectives of System Informatics* Dines Bjørner,Manfred Broy,Alexandre V. Zamulin,2003-06-26 This book constitutes the thoroughly refereed post proceedings of the Third International Andrei Ershov Memorial Conference PSI 99 held in Akademgorodok Novosibirsk Russia in July 1999 The 44 revised papers presented together with five revised full invited papers were carefully reviewed and selected from a total of 73 submissions The papers are organized in sections on algebraic specifications partial evaluation and super compilation specification with states concurrency and parallelism logic and processes languages and software database programming object oriented programming constraint programming model checking and program checking and artificial intelligence **Mechanizing Mathematical Reasoning** Dieter Hutter,2005-02-23 By presenting state of the art results in logical reasoning and formal methods in the context of artificial intelligence and AI applications this book commemorates the 60th birthday of Jörg H Siekmann The 30 revised reviewed papers are written by former and current students and colleagues of Jörg Siekmann also included is an appraisal of the scientific career of Jörg Siekmann entitled A Portrait of a Scientist Logics AI and Politics The papers are organized in four parts on logic and deduction applications of logic formal methods and security and agents and planning Formal Methods for Software Engineering Markus Roggenbach,Antonio Cerone,Bernd-Holger Schlingloff,Gerardo Schneider,Siraj Ahmed Shaikh,2022-06-22 Software programs are formal entities with precise meanings independent of their programmers so the transition from ideas to programs necessarily involves a formalisation at some point The first part of this graduate level introduction to formal methods develops an understanding of what constitutes formal methods and what their place is in Software Engineering It also introduces logics as languages to describe reasoning and the process algebra CSP as a language to represent behaviours The second part offers specification and testing methods for formal development of software based

on the modelling languages CASL and UML The third part takes the reader into the application domains of normative documents human machine interfaces and security Use of notations and formalisms is uniform throughout the book Topics and features Explains foundations and introduces specification verification and testing methods Explores various application domains Presents realistic and practical examples illustrating concepts Brings together contributions from highly experienced educators and researchers Offers modelling and analysis methods for formal development of software Suitable for graduate and undergraduate courses in software engineering this uniquely practical textbook will also be of value to students in informatics as well as to scientists and practical engineers who want to learn about or work more effectively with formal theories and methods Markus Roggenbach is a Professor in the Dept of Computer Science of Swansea University Antonio Cerone is an Associate Professor in the Dept of Computer Science of Nazarbayev University Nur Sultan Bernd Holger Schlingloff is a Professor in the Institut für Informatik of Humboldt Universität zu Berlin Gerardo Schneider is a Professor in the Dept of Computer Science and Engineering of University of Gothenburg Siraj Ahmed Shaikh is a Professor in the Institute for Future Transport and Cities of Coventry University The companion site for the book offers additional resources including further material for selected chapters prepared lab classes a list of errata slides and teaching material and virtual machines with preinstalled tools and resources for hands on experience with examples from the book The URL is <https://sefm-book.github.io>

Models, Algebras and Logic of Engineering Software Manfred Broy, Markus Pizka, 2003 This volume focuses on the education of researchers teachers students and practitioners As usual in engineering a study and application of the relevant branches of mathematics is crucial both in education and practice

Algebraic Methodology and Software Technology Michael Johnson, 1997-12 This book constitutes the refereed proceedings of the 6th International Conference on Algebraic Methodology and Software Engineering AMAST 97 held in Sydney Australia in December 1997 The volume presents 48 revised full papers selected from an unusually high number of submissions One of the outstanding features of AMAST is its mix of serious mathematical development of formal methods in software engineering with practical concerns tools case studies and industrial development The volume addresses all current aspects of formal methods in software engineering and programming methodology with a certain emphasis on algebraic and logical foundations

Recent Trends in Algebraic Development Techniques Jose L. Fiadeiro, 2003-07-31 The European conference situation in the general area of software science has long been considered unsatisfactory A fairly large number of small and medium sized conferences and workshops take place on an irregular basis competing for high quality contributions and for enough attendees to make them financially viable Discussions aiming at a consolidation have been underway since at least 1992 with concrete planning beginning in summer 1994 and culminating in a public meeting at TAPSOFT 95 in Aarhus On the basis of a broad consensus it was decided to establish a single annual federated spring conference in the slot that was then occupied by TAPSOFT and CAAP ESOP CC comprising a number of existing and new conferences and covering a spectrum from theory to

practice ETAPS 98 the rst instance of the European Joint Conferences on Theory and Practice of Software is taking place this year in Lisbon It comprises ve conferences FoSSaCS FASE ESOP CC TACAS four workshops ACoS VISUAL WADT CMCS seven invited lectures and nine tutorials

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