Abstraction and Specification in Program Development

Liskov and Guttag

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Abstraction and Specification in Program Development

Barbara Liskov and John Guttag

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Abstraction And Specification In Program Development

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Abstraction And Specification In Program Development:

Abstraction and Specification in Program Development Barbara Liskov,John Guttag,1986 Abstraction and Specification in Program Development offers professionals in program design and software engineering a methodology that will enable them to construct programs that are reliable and reasonably easy to understand modify and maintain Good programming involves the systematic mastery of complexity and this book provides the first unified treatment of the techniques of abstraction and specification which the authors argue are the linchpin of any effective approach to programming They place particular emphasis on the use of data abstraction to produce highly modular programs The authors focus on the process of decomposing large program projects into independent modules that can be assigned to independent working groups They discuss methods of decomposition the kinds of modules that are most useful in this process and techniques to increase the likelihood that modules produced can in fact be recombined to solve the original programming problem There are many examples of abstractions throughout the text and each chapter ends with pertinent references and exercises Most of the sample implementations in the book are written in CLU one of a growing number of languages able to support data abstraction Sufficient material is included however to allow the reader to work in Pascal as well The material in this book was developed by the authors during a decade of teaching undergraduate graduate and professional level courses Barbara Liskov the developer of CLU is Professor and John Guttag an Associate Professor of Computer Science at MIT Abstraction and Specification in Program Development is included in the MIT Electrical Engineering and Computer Science series

Program Development in Java Barbara Liskov,John Guttag,2000-06-06 Written by a world renowned expert on programming methodology and the winner of the 2008 Turing Award this book shows how to build production quality programs programs that are reliable easy to maintain and quick to modify Its emphasis is on modular program construction how to get the modules right and how to organize a program as a collection of modules The book presents a methodology effective for either an individual programmer who may be writing a small program or a single module in a larger one or a software engineer who may be part of a team developing a complex program comprised of many modules Both audiences will acquire a solid foundation for object oriented program design and component based software development from this methodology Because each module in a program corresponds to an abstraction such as a collection of documents or a routine to search the collection for documents of interest the book first explains the kinds of abstractions most useful to programmers procedures iteration abstractions and most critically data abstractions Indeed the author treats data abstraction as the central paradigm in object oriented program design and implementation The author also shows with numerous examples how to develop informal specifications that define these abstractions specifications that describe what the modules do and then discusses how to implement the modules so that they do what they are supposed to do with acceptable performance Other topics discussed include Encapsulation and the need for an implementation to provide the

behavior defined by the specification Tradeoffs between simplicity and performance Techniques to help readers of code understand and reason about it focusing on such properties as rep invariants and abstraction functions Type hierarchy and its use in defining families of related data abstractions Debugging testing and requirements analysis Program design as a top down iterative process and design patterns The Java programming language is used for the book s examples However the techniques presented are language independent and an introduction to key Java concepts is included for programmers who may not be familiar with the language **Program Development in Java: Abstraction, Specification, and Object-Oriented Design** B. Liskov,Guttag,2000 **Program Verification Via Abstraction Using Incremental Operational Specifications** Cheron Rae Vail,1991 Abstraction and Specification with Modula-2 Claire Willis,D. J. Paddon,1992 This text adopts a modern software engineering approach to teaching a programming language Throughout the book the concept of a software system rather than a program is emphasized and software design is tackled independently from any programming language **Bibliography on Abstract Data Types** B. Kutzler,F. Lichtenberger,2012-12-06 Sponsored by the sterr Fonds zur F rderung der Wissenschaftlichen Forschung project nr P4567 Program Development in Java B. Liskov,John Guttag,2001 Liskov engineering Massachusetts Institute of Technology and Guttag computer science and engineering also at MIT present a component based methodology for software program development The book focuses on modular program construction how to get the modules right and how to organize a program as a collection of modules It explains the key types of abstractions demonstrates how to develop specifications that define these abstractions and illustrates how to implement them using numerous examples An introduction to key Java concepts is included Annotation copyrighted by Book News Inc Portland OR **Modular Specification and Verification of Object-Oriented Programs** Peter Müller,2003-07-31 Software systems play an increasingly important role in modern societies Smart cards for personal identi cation e banking software controlled me cal tools airbags in cars and autopilots for aircraft control are only some examples that illustrate how everyday life depends on the good behavior of software Consequently techniques and methods for the development of hi quality dependable software systems are a central research topic in computer science A fundamental approach to this area is to use formal speci cation and veri cation Speci cation languages allow one to describe the crucial p perties of software systems in an abstract mathematically precise and implementation independent way By formal veri cation one can then prove that an implementation really has the desired speci ed properties Although this formal methods approach has been a research topic for more than 30 years its practical success is still restricted to domains in which devel ment costs are of minor importance Two aspects are crucial to widen the application area of formal methods Formal speci cation techniques have to be smoothly integrated into the software and program development process The techniques have to be applicable to reusable software components This way the quality gain can be exploited for more than one system thereby justifying the higher development costs Starting from these considerations Peter Muller has developed

new te niques for the formal speci cation and veri cation of object oriented so ware The speci cation techniques are declarative and implementati independent They can be used for object oriented design and programming **Methods of Programming** M. Broy,1991 The systematic development of software systems is a central task of computing science A software system is the result of putting together knowledge about the application the requirements and the structures of computing science Under the heading CIP Computer aided Intuition guided Programming a group of researchers led by Prof F L Bauer and Prof K Samelson started work in 1975 in the direction of formal program specification transformational programming and tool supportfor program development The collection of papers in this volume presents examples of a formal approach to programming language concepts and program development based on algebraic specifications and program transformations Examples are also presented of evolutions and modificationsof the original ideas of the CIP project The topics range from descriptionsof the program development process to derivations of algorithms from specifications The volume is dedicated to Prof F L Bauer PUBLISHER S WEBSITE **Implementation of Functional Languages** Ricardo Pena,Thomas Arts,2003-08-03 The International Workshops on the Implementation of Functional Languages IFL havebeenrunningfor14yearsnow Theaimoftheseworkshopsistobring together researchers actively engaged in the implementation and application of functional programming languages to discuss new results and new directions of research A non exhaustive list of topics includes language concepts type che ing compilation techniques abstract interpretation automatic program g eration abstract machine architectures array processing concurrent parallel programming and program execution heap management runtime pro ling and performance measurements debugging and tracing veri cation of functional programs tools and programming techniques The 14th edition IFL 2002 was held in Madrid Spain in September 2002 It attracted47researchersfromthefunctionalprogrammingcommunity belonging to10di erentcountries Duringthethreedaysoftheworkshop 34contributions were presented covering most of the topics mentioned above The workshop was sponsored by several Spanish public institutions the M istry of Science and Technology Universidad Complutense de Madrid and the Tourism O ce Town Hall and Province Council of Segovia a small Roman and medieval city near Madrid We thank our sponsors for their generous contri tions This volume follows the lead of the last six IFL workshops in publishing a high quality subset of the contributions presented at the workshop in Springer s Lecture Notes in Computer Science series All speakers attending the workshop were invited to submit a revised version for publication A total of 25 papers were submitted Each one was reviewed by four PC members and thoroughly discussed by the PC The results of this process are the 15 papers included in this volume *Readings in Artificial Intelligence and Software Engineering* Charles Rich,Richard C. Waters,2014-06-28 Readings in Artificial Intelligence and Software Engineering covers the main techniques and application of artificial intelligence and software engineering The ultimate goal of artificial intelligence applied to software engineering is automatic programming Automatic programming would allow a user to simply say what is wanted

and have a program produced completely automatically This book is organized into 11 parts encompassing 34 chapters that specifically tackle the topics of deductive synthesis program transformations program verification and programming tutors The opening parts provide an introduction to the key ideas to the deductive approach namely the correspondence between theorems and specifications and between constructive proofs and programs These parts also describes automatic theorem provers whose development has be designed for the programming domain The subsequent parts present generalized program transformation systems the problems involved in using natural language input the features of very high level languages and the advantages of the programming by example system Other parts explore the intelligent assistant approach and the significance and relation of programming knowledge in other programming system The concluding parts focus on the features of the domain knowledge system and the artificial intelligence programming Software engineers and designers and computer programmers as well as researchers in the field of artificial intelligence will find this book invaluable

International IEEE Conference on Ada Applications and Environments ,1987 **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 *Proceedings of the National Conference* ,1984 **Information Processing** ,1986

Formal Specification of Software Using Abstract State Machines Charles Robert Wallace,1999 **Logic-based Program Synthesis and Transformation /** ,1999 Proceedings of the ACM SIGSOFT '89 Third Symposium on Software Testing, Analysis, and Verification Richard A. Kemmerer,1989 **ACM '81 Conference Proceedings, Los Angeles, California, November 9-11, 1981** Association for Computing Machinery,1981 **PLEASE, Predicate Logic Based ExecutAble SpEcifications** Robert B. Terwilliger,Roy Harold Campbell,University of Illinois at Urbana-Champaign. Department of Computer Science,1985

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