

Michael J.C. Gordon

**THE
DENOTATIONAL
DESCRIPTION
OF
PROGRAMMING
LANGUAGES**
An Introduction



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The Denotational Description Of Programming Languages

Bozzano G Luisa

The Denotational Description Of Programming Languages:

The Denotational Description of Programming Languages M.J.C. Gordon, 2012-12-06 This book explains how to formally describe programming languages using the techniques of denotational semantics. The presentation is designed primarily for computer science students rather than for say mathematicians. No knowledge of the theory of computation is required but it would help to have some acquaintance with high level programming languages. The selection of material is based on an undergraduate semantics course taught at Edinburgh University for the last few years. Enough descriptive techniques are covered to handle all of ALGOL 50, PASCAL and other similar languages. Denotational semantics combines a powerful and lucid descriptive notation due mainly to Strachey with an elegant and rigorous theory due to Scott. This book provides an introduction to the descriptive techniques without going into the background mathematics at all. In some ways this is very unsatisfactory reliable reasoning about semantics e.g. correctness proofs cannot be done without knowing the underlying model and so learning semantic notation without its model theory could be argued to be pointless. My own feeling is that there is plenty to be gained from acquiring a purely intuitive understanding of semantic concepts together with manipulative competence in the notation. For these equip one with a powerful conceptual framework a framework enabling one to visualize languages and constructs in an elegant and machine independent way. Perhaps a good analogy is with calculus for many practical purposes e.g. engineering calculations an intuitive understanding of how to differentiate and integrate is all that is needed. *The Denotational Description of Programming Languages* Michael J. C. Gordon, 1979

Formal Description of Programming Concepts Erich Neuhold, Manfred Paul, 1991-10-04 In software engineering there is a growing need for formalization as a basis for developing powerful computer assisted methods. This volume contains seven extensive lectures prepared for a series of IFIP seminars on the Formal Description of Programming Concepts. The authors are experts in their fields and have contributed substantially to the state of the art in numerous publications. The lectures cover a wide range in the theoretical foundations of programming and give an up to date account of the semantic models and the related tools which have been developed in order to allow a rigorous discussion of the problems met in the construction of correct programs. In particular methods for the specification and transformation of programs are considered in detail. One lecture is devoted to the formalization of concurrency and distributed systems and reflects their great importance in programming. Further topics are the verification of programs and the use of sophisticated type systems in programming. This compendium on the theoretical foundations of programming is also suitable as a textbook for special seminars on different aspects of this broad subject.

Organization of Programming Languages Bernd Teufel, 2012-12-06 Beside the computers itself programming languages are the most important tools of a computer scientist because they allow the formulation of algorithms in a way that a computer can perform the desired actions. Without the availability of high level languages it would simply be impossible to solve complex problems by using computers. Therefore

high level programming languages form a central topic in Computer Science. It should be a must for every student of Computer Science to take a course on the organization and structure of programming languages since the knowledge about the design of the various programming languages as well as the understanding of certain compilation techniques can support the decision to choose the right language for a particular problem or application. This book is about high level programming languages. It deals with all the major aspects of programming languages including a lot of examples and exercises. Therefore the book does not give an detailed introduction to a certain programming language for this it is referred to the original language reports but it explains the most important features of certain programming languages using those programming languages to exemplify the problems. The book was outlined for a one session course on programming languages. It can be used both as a teacher's reference as well as a student text book.

Understanding Programming Languages Cliff B. Jones, 2020-11-17. This book is about describing the meaning of programming languages. The author teaches the skill of writing semantic descriptions as an efficient way to understand the features of a language. While a compiler or an interpreter offers a form of formal description of a language it is not something that can be used as a basis for reasoning about that language nor can it serve as a definition of a programming language itself since this must allow a range of implementations. By writing a formal semantics of a language a designer can yield a far shorter description and tease out analyse and record design choices. Early in the book the author introduces a simple notation a meta language used to record descriptions of the semantics of languages. In a practical approach he considers dozens of issues that arise in current programming languages and the key techniques that must be mastered in order to write the required formal semantic descriptions. The book concludes with a discussion of the eight key challenges delimiting a language concrete representation delimiting the abstract content of a language recording semantics deterministic languages operational semantics non determinism context dependency modelling sharing modelling concurrency and modelling exits. The content is class tested and suitable for final year undergraduate and postgraduate courses. It is also suitable for any designer who wants to understand languages at a deep level. Most chapters offer projects some of these quite advanced exercises that ask for complete descriptions of languages and the book is supported throughout with pointers to further reading and resources. As a prerequisite the reader should know at least one imperative high level language and have some knowledge of discrete mathematics notation for logic and set theory.

Mathematical Foundations of Computer Science 1996 Wojciech Penczek, Andrzej Szalas, 1996-08-07. This book constitutes the refereed proceedings of the 21st International Symposium on Mathematical Foundations of Computer Science MFCS 96 held in Crakow Poland in September 1996. The volume presents 35 revised full papers selected from a total of 95 submissions together with 8 invited papers and 2 abstracts of invited talks. The papers included cover issues from the whole area of theoretical computer science with a certain emphasis on mathematical and logical foundations. The 10 invited presentations are of particular value.

Mathematical Foundations of Software Engineering Gerard O'Regan, 2023-05-04

This textbook presents an introduction to the mathematical foundations of software engineering. It presents the rich applications of mathematics in areas such as error correcting codes, cryptography, the safety and security critical fields, the banking and insurance fields, as well as traditional engineering applications. Topics and features: Addresses core mathematics for critical thinking and problem solving; Discusses propositional and predicate logic and various proof techniques to demonstrate the correctness of a logical argument; Examines number theory and its applications to cryptography; Considers the underlying mathematics of error correcting codes; Discusses graph theory and its applications to modelling networks; Reviews tools to support software engineering mathematics including automated and interactive theorem provers and model checking; Discusses financial software engineering including simple and compound interest, probability and statistics, and operations research; Discusses software reliability and dependability and explains formal methods used to derive a program from its specification; Discusses calculus, matrices, vectors, complex numbers and quaternions as well as applications to graphics and robotics; Includes key learning topics, summaries and review questions in each chapter together with a useful glossary. This practical and easy to follow textbook reference is ideal for computer science students seeking to learn how mathematics can assist them in building high quality and reliable software on time and on budget. The text also serves as an excellent self study primer for software engineers, quality professionals and software managers.

Formal Models and Semantics Bozzano G Luisa, 2014-06-28 The second part of this Handbook presents a choice of material on the theory of automata and rewriting systems, the foundations of modern programming languages, logics for program specification and verification and some chapters on the theoretic modelling of advanced information processing.

ACM Transactions on Programming Languages and Systems Association for Computing Machinery, 1995

Formal Syntax and Semantics of Programming Languages Kenneth Slonneger, Barry L. Kurtz, 1995 With this book readers with a basic grounding in discreet mathematics will be able to understand the practical applications of these difficult concepts. The book presents the typically difficult subject of formal methods in an informal, easy to follow manner. A laboratory component is integrated throughout the text.

Denotational Semantics Joseph E. Stoy, 1985 First book length exposition of the denotational or mathematical or functional approach to the formal semantics of programming languages in contrast to operational and axiomatic approaches. Treats various kinds of languages beginning with the pure lambda calculus and progressing through languages with states, commands, jumps and assignments. This somewhat discursive account is a valuable compilation of results not otherwise available in a single source.

American Mathematical Monthly Bertrand Meyer, 1990

Introduction to the Theory of Programming Languages Gilles Dowek, Jean-Jacques Lévy, 2010-12-09 The design and implementation of programming languages from Fortran and Cobol to Caml and Java has been one of the key developments in the management of ever more complex computerized systems. Introduction to the Theory of Programming Languages gives the reader the means to discover the tools to think design and

implement these languages. It proposes a unified vision of the different formalisms that permit definition of a programming language small steps operational semantics big steps operational semantics and denotational semantics emphasising that all seek to define a relation between three objects a program an input value and an output value. These formalisms are illustrated by presenting the semantics of some typical features of programming languages functions recursivity assignments records objects showing that the study of programming languages does not consist of studying languages one after another but is organized around the features that are present in these various languages. The study of these features leads to the development of evaluators interpreters and compilers and also type inference algorithms for small languages [A Proposed Software Description Language for Representing Program Logic in XML](#) Khaled Mahmoud, 2013-02-08 Master's Thesis from the year 2012 in the subject Computer Science Applied grade none course Information Technology language English abstract. This thesis proposes a software description language to represent the source code of C Java and VB NET in the Extensible Markup Language. The similarity of semantics between these languages enables representing the source code in a form such that both the source code and logic can be easily shared and reused between these languages. By performing semantic and syntactic comparison between C Java and VB NET the proposed language has been designed to include the similar and identical features and language constructs. For every adopted language construct a corresponding construct in the proposed language has been developed. The validity of the proposed language has been investigated and proved theoretically by conducting a semantic comparison between the three languages and experimentally by developing applications to convert source code from Java into the proposed language and from the proposed language into VB NET. Validation cases have been designed to include various programs such as sorting searching and also to include the most used programming constructs in the three languages. Source code of the validation cases have been converted from Java into the proposed language and from the proposed language into VB NET. Java and VB NET programs of the validation cases have been executed and results compared. The results were identical for all conducted experiments. The proposed language has some major benefits in the conversion between programming languages as an intermediary language. It may also be used in the integration between systems as it enables sharing of programming logic at runtime. Existing integration technologies only enable the sharing of data between various systems. This thesis is not concerned with adapting programming languages libraries and functions. Future work may extend the proposed language to adapt different features such as pointers and multiple inheritance into the proposed language [Formal Description of Programming Concepts--III](#) Martin Wirsing, 1987 The Formal Description of Programming Concepts is the subject of a series of conferences organised by the IFIP Working Group 2.2 under the auspices of the Technical Committee 2 Programming of IFIP. This volume contains the 17 papers which were selected by the program committee. As with the previous working conferences the questions and answers following each presentation of a paper are reported in an ad verbatim style in order to preserve the liveliness and outspokenness of the discussions [Foundations of](#)

Programming Languages Seyed H. Roosta, 2002 This text presents topics relating to the design and implementation of programming languages as fundamental skills that all computer scientists should possess. Rather than provide a feature by feature examination of programming languages the author discusses programming languages organized by concepts.

Computer Hardware Description Languages and Their Applications David Agnew, Luc J. M. Claesen, Raul Camposano, 1993 Hardware description languages HDLs have established themselves as one of the principal means of designing electronic systems. The interest in and usage of HDLs continues to spread rapidly driven by the increasing complexity of systems, the growth of HDL driven synthesis, the research on formal design methods and many other related advances. This research oriented publication aims to make a strong contribution to further developments in the field. The following topics are explored in depth: BDD based system design and analysis, system level formal verification, formal reasoning on hardware languages for protocol specification, VHDL, HDL based design methods, high level synthesis and text graphical HDLs. There are short papers covering advanced design capture and recent work in high level synthesis and formal verification. In addition several invited presentations on key issues discuss and summarize recent advances in real time system design, automatic verification of sequential circuits and languages for protocol specification.

Proceedings, 1993

ACM Computer Science Conference Stan C. Kwasny, John F. Buck, 1993 **VDM '90** Dines Bjørner, Charles Antony Richard Hoare, Hans Langmaack, 1990 VDM stands for Vienna Development Method while Z refers to Zermelo a mathematician whose name is associated with set theory. VDM Europe formed around 1985 by the Commission of the European Communities is a group of industrial and academic software engineers, programmers and scientists interested in model theoretic formal software development methods. The preface compares and contrasts features of VDM and Z. Annotation copyrighted by Book News Inc Portland OR [Software Fault Tolerance](#) Manfred Kersken, 1992-03-25 This volume summarizes the results obtained by the group working on software fault tolerance within the REQUEST Reliability and Quality of European Software Technology project of the ESPRIT programme of the European Communities. It should be read by anyone with a professional interest in safety critical and fault tolerant computing. A generic model is developed for evaluating the reliability of fault tolerant software systems. Emphasis is put on identification of problem areas in the development and assessment of fault tolerant software systems and in the components. Examples of crucial failures are those of diverse versions due to a common cause or failures in the adjudicator which acts on outputs of diverse versions. The causes for common failures of versions are similarities in the solutions of specified problems. Methods were developed to determine similarity among versions by means of well known software engineering methods. Concerning adjudicators the influences of several factors on failure detection capability are discussed and guidelines are given for optimal design. A methodology is developed to determine dissimilarity on the level of diverse specifications. Cost based support is given for deciding whether diversity should be used in a software system or a single program should be enhanced by additional verification effort.

Reviewing **The Denotational Description Of Programming Languages**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing.

Within the pages of "**The Denotational Description Of Programming Languages**," an enthralling opus penned by a very acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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