Architecting Dependable Systems VII

As software systems become increasingly ubiquitous, issues of dependability become ever more crucial. Given that solutions to these issues must be considered from the very beginning of the design process, it is clear that dependability and security have to be addressed at the architectural level. This book, as well as its six predecessors, was born of an effort to bring together the research communities of software architectures, dependability, and security. This state-of-the-art survey contains expanded, peer-reviewed papers based on selected contributions from the Workshop on Architecting Dependable Systems (WADS 2009), held at the International Conference on Dependable Systems and Networks (DSN 2009), as well as a number of invited papers written by renowned experts in the area. The 13 papers are organized in topical sections on: mobile and ubiquitous systems, architecting systems, fault management, and experience and vision.

Fields of interest
Software Engineering; Programming Languages, Compilers, Interpreters; Programming Techniques

Target groups
Research

Type of publication
Contributed volume

Operational Semantics and Verification of Security Protocols

Security protocols are widely used to ensure secure communications over insecure networks, such as the internet or airwaves. These protocols use strong cryptography to prevent intruders from reading or modifying the messages. However, using cryptography is not enough to ensure their correctness. Combined with their typical small size, which suggests that one could easily assess their correctness, this often results in incorrectly designed protocols. The authors present a methodology for formally describing security protocols and their environment. This methodology includes a model for describing protocols, their execution model, and the intruder model. The models are extended with a number of well-defined security properties, which capture the notions of correct protocols, and secrecy of data.

Features
- The methodology has a strong mathematical basis and the model has a strong separation of concerns
- Useful for researchers and graduate students of information security or formal methods and for advanced professionals designing critical security protocols
- Introduces new concepts

Contents

Fields of interest
Data Structures, Cryptology and Information Theory; Computer Systems Organization and Communication Networks; Software Engineering/Programming and Operating Systems

Target groups
Research

Type of publication
Graduate/Advanced undergraduate textbook

Verification and Validation in Systems Engineering

Assessing UML/SysML Design Models

Verification and validation represents an important process used for the quality assessment of engineered systems and their compliance with the requirements established at the beginning of or during the development cycle. Debbabi and his coauthors investigate methodologies and techniques that can be employed for the automatic verification and validation of systems engineering design models expressed in standardized modeling languages. Their presentation includes a bird’s eye view of the most prominent modeling languages for software and systems engineering, namely the Unified Modeling Language (UML) and the more recent Systems Modeling Language (SysML). Moreover, it elaborates on a number of quantitative and qualitative techniques that synergistically combine automatic verification techniques, program analysis, and software engineering quantitative methods applicable to design models described in these modeling languages.

Features
- Broad and comprehensive overview of software verification and validation techniques
- Close integration with the UML standard
- Theoretical presentation complemented by numerous case studies

From the contents

Fields of interest
Software Engineering; System Performance and Evaluation; Management of Computing and Information Systems

Target groups
Research

Type of publication
Monograph

Due November 2010

2011. XII, 324 p. (Lecture Notes in Computer Science / Programming and Software Engineering, Volume 6420) Softcover

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**Handbook of Conceptual Modeling**

**Theory, Practice, and Research Challenges**

Conceptual modeling is about describing the semantics of software applications at a high level of abstraction in terms of structure, behavior, and user interaction. Embley and Thalheim start with a manifesto stating that the dream of developing information systems strictly by conceptual modeling – as expressed in the phrase “the model is the code” – is becoming reality. The subsequent contributions written by leading researchers in the field support the manifesto’s assertions, showing not only how to abstractly model complex information systems but also how to formalize abstract specifications in ways that let developers complete programming tasks within the conceptual model itself. They are grouped into sections on programming with conceptual models, structure modeling, process modeling, user interface modeling, and special challenge areas such as conceptual geometric modeling, information integration, and biological conceptual modeling.

**Features**
- Collects the best conceptual modeling ideas, techniques and practices
- Points researchers to interesting challenges in theory and practice
- Includes applications in novel areas like spatial and bioinformatics modeling and information integration
- May serve as a comprehensive textbook for graduate courses

**Contents**
Section I: Programming with Conceptual Models.
Section II: Structure Modelling.
Section III: Process Modelling.
Section IV: User Interface Modelling.
Section V: Special Challenge Areas.

**Fields of interest**
Software Engineering; Information Systems Applications (incl. Internet)

**Target groups**
Research

**Type of publication**
Handbook

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**Due November 2010**

2010. XIV, 768 p. (Lecture Notes in Computer Science / Programming and Software Engineering, Volume 5765)

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**Due November 2010**


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D. W. Embley, Brigham Young University, Provo, UT, USA; B. Thalheim, Christian-Albrechts-University Kiel, Germany (Eds.)

T. Ishida, Kyoto University, Japan (Ed.)

**Culture and Computing**

**Computing and Communication for Crosscultural Interaction**

In the light of upcoming global issues, concerning population, energy, the environment, and food, information and communication technologies are required to overcome difficulties in communication among cultures. In this context, the First International Conference on Culture and Computing, which was held in Kyoto, Japan, in February 2010, was conceived as a collection of symposia, panels, workshops, exhibitions, and guided tours intended to share issues, activities, and research results regarding culture and computing. This volume includes invited and selected papers dealing with state-of-the-art topics in culturally situated agents, intercultural collaboration and support systems, culture and computing for art and heritage, as well as culture and computing within regional communities.

**Features**
- High-quality selected papers
- Covers state-of-the-art research
- Uniquely high-profile

**From the contents**

**Fields of interest**
Information Systems Applications (incl. Internet); Information Storage and Retrieval; User Interfaces and Human Computer Interaction
Analyzing Evolutionary Algorithms
The Computer Science Perspective

Evolutionary algorithms is a class of randomized heuristics inspired by natural evolution. They are applied in many different contexts, in particular in optimization, and analysis of such algorithms has seen tremendous advances in recent years. In this book the author provides an introduction to the methods used to analyze evolutionary algorithms and other randomized search heuristics. He starts with an algorithmic and modular perspective and gives guidelines for the design of evolutionary algorithms. He then places the approach in the broader research context with a chapter on theoretical perspectives. By adopting a complexity-theoretical perspective, he derives general limitations for black-box optimization, yielding lower bounds on the performance of evolutionary algorithms, and then develops general methods for deriving upper and lower bounds step by step. This main part is followed by a chapter covering practical applications of these methods.

Features
- The results presented are derived in detail
- Is a useful reference for both graduate students and researchers
- Each chapter ends with detailed comments and pointers to further reading

Contents

Fields of interest
Theory of Computation; Computational Intelligence; Optimization

Target groups
Research

Type of publication
Graduate/Advanced undergraduate textbook

Due April 2011
- approx. € 54,95 | £49.99
- approx. € (D) 58,80 | € (A) 60,45 | sFr 79,00
ISBN 978-3-642-17363-9

Working with Preferences
Less Is More

Preferences are useful in many real-life problems, guiding human decision making from early childhood up to complex professional and organizational decisions. In artificial intelligence specifically, preferences is a relatively new topic of relevance to nonmonotonic reasoning, multigrait systems, constraint satisfaction, decision making, social choice theory and decision-theoretic planning. The first part of the book deals with preference representation, with specific chapters dedicated to representation languages, nonmonotonic logics of preferences, conditional preference networks, positive and negative preferences, and the study of preferences in cognitive psychology. The second part of the book deals with reasoning with preferences, and includes chapters dedicated to preference-based argumentation, preferences database queries, and rank-ordering outcomes and intervals. The author concludes by examining forthcoming research perspectives.

Features
- The book offers a thorough examination of preferences from an artificial intelligence perspective
- The author examines discusses future research perspectives
- A multidisciplinary topic, the book will be of interest to computer scientists, economists, operations researchers, mathematicians, logicians and philosophers

Contents
Preferences Modeling.- Preferences Representation Languages.- Making Hidden Priorities Explicit.- What Psychology Has to Say About Preferences.- Preferences in Argumentation Theory.- Preferences in Database Queries.- Preferences Aggregation, Conclusion and Perspectives.- Bibliography.

Fields of interest
Artificial Intelligence (incl. Robotics); Operations Research/Decision Theory; Logic

Target groups
Research

Type of publication
Monograph

Due March 2011
- approx. € 79,95 | £72.00
- approx. € (D) 85,55 | € (A) 87,95 | sFr 115,00
ISBN 978-3-642-17372-7
Real-Time Systems
Design Principles for Distributed Embedded Applications

Real-Time Systems: Design Principles for Distributed Embedded Applications is written as a standard textbook for a high-level undergraduate or graduate course on real-time embedded systems or cyber-physical systems. Its practical approach to solving real-time problems also makes it an excellent choice for researchers and practitioners. Compared to the first edition, new developments in complexity management, energy and power management, dependability, security, and the internet of things, are addressed. The book focuses on hard real-time systems, which are computing systems that must meet their temporal specification in all anticipated load and fault scenarios.

Features
- Revised and updated version of the best-selling 1997 first edition from key researcher in the field
- New developments addressed, such as energy and power management, dependability, security, internet functions, scheduling
- A standard text in real-time embedded systems or cyber-physical systems
- Useful as a reference for students, researchers and practitioners alike

Contents

Fields of interest
Special Purpose and Application-Based Systems; Circuits and Systems; System Performance and Evaluation

Target groups
Research

Type of publication
Graduate/Advanced undergraduate textbook

Moving Targets

This book charts the take-up of IT in Britain, as seen through the eyes of one company. It examines how the dawn of the digital computer age in Britain took place for different applications, from early government-sponsored work on secret defence projects, to the growth of the market for Elliott computers for civil applications. Features: charts the establishment of Elliott’s Borehamwood Research Laboratories, and the roles played by John Coales and Leon Bagrit; examines early Elliott digital computers designed for classified military applications and for GCHQ; describes the analogue computers developed by Elliott-Automation; reviews the development of the first commercial Elliot computers and the growth of applications in industrial automation; includes a history of airborne computers by a former director of Elliott Flight Automation; discusses the computer architectures and systems software for Elliott computers; investigates the mergers, takeovers and eventual closure of the Borehamwood laboratories.

Features
- Charts the gradual take-up of information technology in Britain, as seen through the eyes of one innovative company
- Examines how the dawn of the digital computer age in Britain took place at various times for different applications
- Includes a history of airborne computers up to 1988, written by a former director of Elliott Flight Automation

From the contents

Fields of interest
History of Computing

Target groups
Research

Type of publication
Monograph
Musical Performance
A Comprehensive Approach: Theory, Analytical Tools, and Case Studies

This book is a first sketch of what the overall field of performance could look like as a modern scientific field but not its stylistically differentiated practice, pedagogy, and history. Musical performance is the most complex field of music. It comprises the study of a composition's expression in terms of analysis, emotion, and gesture, and then its transformation into embodied reality, turning formulaic facts into dramatic movements of human cognition. Combining these components in a creative way is a sophisticated mix of knowledge and mastery, which more resembles the cooking of a delicate recipe than a rational procedure. This book is the first one aiming at such comprehensive coverage of the topic, and it does so also as a university text book.

Features
- First book that gives full account on the state of the art of empirical and philosophical performance theory, including software and case studies
- Is a textbook for music students and researchers as well with rich illustrations and sound examples
- Has been written by one of the leading experts in the field

From the contents

Fields of interest
Media Design; Algebraic Topology

Target groups
Research

Type of publication
Monograph

Available

2011. 278 p. (Computational Music Science) Hardcover
- € 79,95 | £72.00
ISBN 978-3-642-11837-1

From Active Data Management to Event-Based Systems and More
Papers in Honor of Alejandro Buchmann on the Occasion of His 60th Birthday

Data management has evolved over the years from being strictly associated with database systems, through active databases, to become a topic that has grown beyond the scope of a single field encompassing a large range of subjects, such as distributed systems, event-driven systems, and peer-to-peer and streaming systems. The present collection of works, which sheds light on various facets of data management, is dedicated to Prof. Alejandro Buchmann on the occasion of his 60th birthday. His scientific path looks back on more than thirty years of successful academic life and high-impact research. With this book we celebrate Prof. Buchmann’s vision and achievements.

Features
- Unique visibility
- Fast-track conference proceedings
- State-of-the-art research

From the contents

Fields of interest
Computer Communication Networks; Information Systems Applications (incl.Internet); Software Engineering

Target groups
Research

Type of publication
Monograph

Due November 2010

- € 54,00 | £48.99
ISBN 978-3-642-17725-3

Foundations of Algebraic Specification and Formal Software Development

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.

Features
- The theory presented by the authors has its origins in work on algebraic specifications that started in the early 1970s, and the author’s treatment is comprehensive
- Covers the requisite mathematical foundations, traditional algebraic specifications, elements of the theory of institutions, formal specification and development, and proof theory
- Will be of use to researchers and advanced graduate students in the areas of programming and theoretical computer science

Fields of interest
Logics and Meanings of Programs; Software Engineering/Programming and Operating Systems; Mathematical Logic and Foundations

Target groups
Research

Type of publication
Monograph

Due March 2011

- approx. € 99,95 | £90.00
ISBN 978-3-642-17335-6

G. Mazzola, Minneapolis, MN, USA
K. Sachs, I. Petrov, P. Guerrero, Technische Universität Darmstadt, Germany (Eds.)
D. Sannella, The University of Edinburgh, UK; A. Tarlecki, University of Warsaw and Polish Academy of Sciences, Warsaw, Poland
Knowledge in Formation
A Computational Theory of Interpretation

Humans have an extraordinary capability to combine different types of information in a single meaningful interpretation. The quickness with which interpretation processes evolve suggests the existence of a uniform procedure for all domains. In this book the authors suggest that such a process can be found. They concentrate on the introduction of a theory of interpretation, and they define a model that enables a meaningful representation of knowledge, based on a dynamic view of information and a cognitive model of human information processing. The book consists of three parts. The first part focuses on the properties of signs and sign interpretation; in the second part the authors introduce a model that complies with the conditions for sign processing set by the first part; and in the third part they examine applications of their model in the domain of logic, natural language, reasoning and mathematics.

Features
▶ Book introduces many original ideas  
▶ Significant contribution to the field ▶ The first attempt to establish a rigorous Peircean approach to knowledge representation

Contents

Fields of interest
Artificial Intelligence (incl. Robotics); Logic

Target groups
Research

Type of publication
Monograph

Self-organizing Software
From Natural to Artificial Adaptation

Self-organization, self-regulation, self-repair and self-maintenance are promising conceptual approaches for dealing with complex distributed interactive software and information-handling systems. Self-organizing applications dynamically change their functionality and structure without direct user intervention, responding to changes in requirements and the environment. This is the first book to offer an integrated view of self-organization technologies applied to distributed systems, focusing in particular on multiagent systems. The editors developed this integrated book with three aims: to explain self-organization concepts and principles, using clear definitions and a strong theoretical background; to examine how self-organizing behavior can be modeled, analyzed and systematically engineered into agent behavior; and to assess the types of problems that can be solved using self-organizing multiagent systems.

Features
▶ This is the first book to provide a comprehensive view of self-organized software ▶ Will be suitable for use as a graduate textbook, with chapter summaries and exercises ▶ Is supported by an accompanying website that includes teaching slides, exercise solutions and research project outlines

Contents

Fields of interest
Computing Methodologies; Computational Intelligence

Target groups
Research

Type of publication
Professional book

Taming the Complexity of Evolutionary Dynamics
From Microscopic Models to Schema Theory and Beyond

The study of complex adaptive systems is among the key modern tasks in science. Such systems show radically different behaviours at different scales and in different environments, and mathematical modelling of such emergent behaviour is very difficult, even at the conceptual level. We require a new methodology to study and understand complex, emergent macroscopic phenomena. Coarse graining, a technique that originated in statistical physics, involves taking a system with many microscopic degrees of freedom and finding an appropriate subset of collective variables that offer a compact, computationally feasible description of the system, in terms of which the dynamics looks “natural”. The authors explain the basics of natural and artificial evolutionary dynamics, and offer detailed treatments of the related models of search spaces, population spaces, state spaces, crossover, mutation and selection.

Features
▶ Details the most significant, comprehensive theory of artificial evolutionary systems to emerge in the last 10 years ▶ Will be key reading for theoreticians in computer science, artificial intelligence, engineering, biology and physics ▶ Authors are among the top theoreticians in the field of evolutionary computation

Contents

Fields of interest
Theory of Computation; Statistical Physics, Dynamical Systems and Complexity; Complexity

Target groups
Research

Type of publication
Graduate/Advanced undergraduate textbook
Counterterrorism and Open Source Intelligence

Since the 9/11 terrorist attacks in the United States, serious concerns were raised on domestic and international security issues. Consequently, there has been considerable interest recently in technological strategies and resources to counter acts of terrorism. In this context, this book provides a state-of-the-art survey of the most recent advances in the field of counterterrorism and open source intelligence, demonstrating how various existing as well as novel tools and techniques can be applied in combating covert terrorist networks. A particular focus will be on future challenges of open source intelligence and perspectives on how to effectively operate in order to prevent terrorist activities.

Features
- Presents state-of-the-art research and practice concerning intelligence work
- Detailed description of novel tools and techniques for counterterrorism open source intelligence
- Provides perspectives on the use of open source intelligence in the future

Field of interest
Systems and Data Security

Target groups
Research

Type of publication
Contributed volume

Due March 2011

2011. 400 p. 100 illus. (Lecture Notes in Social Networks, Volume 2) Softcover
- approx. € 99.95 | £90.00
- approx. * € (D) 106.95 | € (A) 109.95 | sFr 143.50
ISBN 978-3-7091-0387-6