

## Type Inheritance And Relational Theory Subtypes Supertypes And Substitutability

Proceedings of the 28th Annual International Conference on Very Large Data Bases held in Hong Kong, China on August 20-23, 2002. Organized by the VLDB Endowment, VLDB is the premier international conference on database technology.

Databases, Types, and the Relational Model: The Third Manifesto is a proposal for the future direction of data and database management systems (DBMSs). It provide a precise, formal definition of an abstract model of data, to be considered as a foundation for the design of a DBMS and a database language.

Fifty years of relational. It's hard to believe the relational model has been around now for over half a century! But it has—it was born on August 19th, 1969, when Codd's first database paper was published. And Chris Date has been involved with it for almost the whole of that time, working closely with Codd for many years and publishing the very first, and definitive, book on the subject in 1975. In this book's title essay, Chris offers his own unique perspective (two chapters) on those fifty years. No database professional can afford to miss this one of a kind history. But there's more to this book than just a little personal history. Another unique feature is an extensive and in depth discussion (nine chapters) of a variety of frequently asked questions on relational matters, covering such topics as mathematics and the relational model; relational algebra; predicates; relation valued attributes; keys and normalization; missing information; and the SQL language. Another part of the book offers detailed responses to critics (four chapters). Finally, the book also contains the text of several recent interviews with Chris Date, covering such matters as RM/V2, XML, NoSQL, The Third Manifesto, and how SQL came to dominate the database landscape.

Some things seem so obvious that they don't need to be spelled out in detail. Or do they? In computing, at least (and probably in any discipline where accuracy and precision are important), it can be quite dangerous just to assume that some given concept is "obvious," and indeed universally understood. Serious mistakes can happen that way! The first part of this book discusses features of the database field—equality, assignment, naming—where just such an assumption seems to have been made, and it describes some of the unfortunate mistakes that have occurred as a consequence. It also explains how and why the features in question aren't quite as obvious as they might seem, and it offers some advice on how to work around the problems caused by assumptions to the contrary. Other parts of the book also deal with database issues where devoting some preliminary effort to spelling out exactly what the issues in question entailed could have led to much better interfaces and much more carefully designed languages. The issues discussed include redundancy and indeterminacy; persistence, encapsulation, and decapsulation; the ACID properties of transactions; and types vs. units of measure. Finally, the book also contains a detailed deconstruction of, and response to, various recent pronouncements from the database literature, all of them having to do with relational technology. Once again, the opinions expressed in those pronouncements might seem "obvious" to some people (to the

writers at least, presumably), but the fact remains that they're misleading at best, and in most cases just flat out wrong.

C. J. Date is one of the founding fathers of the relational database field. Many of today's seasoned database professionals "grew up" on Date's writings. Those same professionals, along with other serious database students and practitioners, form the core audience for Date's ongoing writing efforts. *Date on Database: Writings 2000-2006* is a compilation of Date's most significant articles and papers over the past seven years. It gives readers a one-stop place in which to find Date's latest thinking on relational technology. Many papers are not easily found outside this book.

The growing demand for systems of ever-increasing complexity and precision has stimulated the need for higher level concepts, tools, and techniques in every area of Computer Science. Some of these areas, in particular Artificial Intelligence, Databases, and Programming Languages, are attempting to meet this demand by defining a new, more abstract level of system description. We call this new level conceptual in recognition of its basic conceptual nature. In Artificial Intelligence, the problem of designing an expert system is seen primarily as a problem of building a knowledge base that represents knowledge about an enterprise. Consequently, Knowledge Representation is viewed as a central issue in Artificial Intelligence research. Database design methodologies developed during the last five years are almost unanimous in offering semantic data models in terms of which the designer directly and naturally models an enterprise before proceeding to a detailed logical and physical database design. In Programming Languages, different forms of abstraction which allow implementation independent specifications of data, functions, and control have been a major research theme for a decade. To emphasize the common goals of these three research efforts, we call this new activity conceptual modelling.

Databases are based on logic - right? Everybody knows that. Or do they? Chris Date's most recent book explores the myriad ways in which logic affects the database world.

This book is a revised, upgraded, and hugely improved version of an earlier one called *Logic and Databases*. Although it's effectively a brand new book, therefore, the following remarks from that earlier book are still relevant here. First, logic and databases are inextricably intertwined. The relational model itself is essentially just elementary logic, tailored to database needs. Now, if you're a database professional, this won't be news to you—but you still might not realize just how much everything we do in the database world is (or should be!) affected by logic. Logic is fundamental, and everywhere. As a database professional, therefore, you owe it to yourself to understand the basics of formal logic, and you ought to be able to explain (and perhaps defend) the connections between formal logic and database technology. And that's what this book is about. What it does is show, through a series of partly independent, partly interrelated essays, just how various crucial aspects of database technology—some of them very familiar, others maybe less so—are solidly grounded in formal logic. Overall, the goal is to help you realize the importance of logic in everything you do, and also, I hope, to help you see that logic can be fun.

Views are virtual tables. That means they should be updatable, just as "real" or base tables are. In fact, view updatability isn't just desirable, it's crucial, for practical reasons as well as theoretical ones. But view updating has always been a

controversial topic. Ever since the relational model first appeared, there has been widespread skepticism as to whether (in general) view updating is even possible. In stark contrast to this conventional wisdom, this book shows how views, just like base tables, can always be updated (so long as the updates don't violate any integrity constraints). More generally, it shows how updating always ought to work, regardless of whether the target is a base table or a view. The proposed scheme is 100% consistent with the relational model, but rather different from the way updating works in SQL products today. This book can: Help database products improve in the future Help with a "roll your own" implementation, absent such product improvements Make you aware of the crucial role of predicates and constraints Show you how relational products are really supposed to behave Anyone with a professional interest in the relational model, relational technology, or database systems in general can benefit from this book.

There is an established interest in integrating databases and programming languages. This book on Data Types and Persistence evolved from the proceedings of a workshop held at the Appin in August 1985. The purpose of the Appin workshop was to focus on these two aspects: persistence and data types, and to bring together people from various disciplines who have thought about these problems. Particular topics of interest include the design of type systems appropriate for database work, the representation of persistent objects such as data types and modules, and the provision of orthogonal persistence and certain aspects of transactions and concurrency. The programme was broken into three sessions: morning, late afternoon and evening to allow the participants to take advantage of two beautiful days in the Scottish Highlands. The financial assistance of the Science and Engineering Research Council, the National Science Foundation and International Computers Ltd. is gratefully acknowledged. We would also like to thank Isabel Graham, Anne Donnelly and Estelle Taylor for their help in organising the workshop. Finally our thanks to Pete Bailey, Ray Carick and Dave Munro for the immense task they undertook in typesetting the book. The convergence of programming languages and databases to a coherent and consistent whole requires ideas from, and adjustment in, both intellectual camps. The first group of chapters in this book present ideas and adjustments coming from the programming language research community. This community frequently discusses types and uses them as a framework for other discussions.

This book constitutes the refereed proceedings of the 32nd Conference on Current Trends in Theory and Practice of Computer Science, SOFSEM 2006, held in Merin, Czech Republic in January 2006. The 45 revised full papers, including the best Student Research Forum paper, presented together with 10 invited contributions were carefully reviewed and selected from 157 submissions. The papers were organized in four topical tracks on computer science foundations, wireless, mobile, ad hoc and sensor networks, database technologies, and semantic Web technologies.

Expert MySQL is the leading reference for learning, understanding, and extending the MySQL server. It unlocks the full promise of open source by showing how to modify the code, create your own storage engine, build your own authentication plugins, and even add your own functions and commands to the SQL language. No other book provides the level of detail or the extensive examples of the inner workings of MySQL that have taken engineers years to master. Expert MySQL is a must have book for all systems integrators, engineers, and software developers working with the MySQL server code. Expert MySQL is also a wealth of information on key aspects of MySQL internals. You'll learn about internal query representation, how the optimizer creates execution plans, and how to exert control over those plans for optimal performance in your environment. You'll even learn to build your own query optimizer, giving insight that can help you understand and resolve tough performance problems. High-availability and replication are also covered, making Expert MySQL a must-have book for anyone doing high-end work involving MySQL. Shows how to customize MySQL and its storage and authentication engines Provides in-depth knowledge of internals for use in query tuning and performance troubleshooting Covers high-end features such as high-availability and replication

This book constitutes the refereed proceedings of the 24th Seminar on Current Trends in Theory and Practice of Informatics, SOFSEM'97, held in Milovy, Czech Republic, in November 1997. SOFSEM is special in being a mix of a winter school, an international conference, and an advanced workshop meeting the demand for ongoing education in the area of computer science. The volume presents 22 invited contributions by leading experts together with 24 revised contributed papers selected from 63 submissions. The invited presentations are organized in topical sections on foundations, distributed and parallel computing, software engineering and methodology, and databases and information systems.

The Database and Expert Systems Applications - DEXA - conferences are dedicated to providing an international forum for the presentation of applications in the database and expert systems field, for the exchange of ideas and experiences, and for defining requirements for the future systems in these fields. After the very promising DEXA 90 in Vienna, Austria, we hope to have successfully established with this year's DEXA 91 a stage where scientists from diverse fields interested in application-oriented research can present and discuss their work. This year there was a total of more than 250 submitted papers from 28 different countries, in all continents. Only 98 of the papers could be accepted. The collection of papers in these proceedings offers a cross-section of the issues facing the area of databases and expert systems, i.e., topics of basic research interest on one hand and questions occurring when developing applications on the other. Major credit for the success of the conference goes to all of our colleagues who submitted papers for consideration and to those who have organized and chaired the panel sessions. Many persons contributed numerous hours to organize this

conference. The names of most of them will appear on the following pages. In particular we wish to thank the Organization Committee Chairmen Johann Gordesch, A Min Tjoa, and Roland Wagner, who also helped establishing the program. Special thanks also go to Gabriella Wagner and Anke Ruckert. Dimitris Karagiannis General Conference Chairman Contents Conference Committee.

The International Encyclopedia of Communication Theory and Philosophy is the definitive single-source reference work on the subject, with state-of-the-art and in-depth scholarly reflection on key issues from leading international experts. It is available both online and in print. A state-of-the-art and in-depth scholarly reflection on the key issues raised by communication, covering the history, systematics, and practical potential of communication theory Articles by leading experts offer an unprecedented level of accuracy and balance Provides comprehensive, clear entries which are both cross-national and cross-disciplinary in nature The Encyclopedia presents a truly international perspective with authors and positions representing not just Europe and North America, but also Latin America and Asia Published both online and in print Part of The Wiley Blackwell-ICA International Encyclopedias of Communication series, published in conjunction with the International Communication Association

Vol. 2 coed. by Carol G. Rosen ; Vol. 3 ed. by Paul M. Postal and Brian D. Joseph.

In Ten Lectures on Event Structure in a Network Theory of Language, Nikolas Gisborne offers an account of verb meaning from the perspective of a model that treats language structure as part of the wider cognitive network.

No matter what DBMS you are using—Oracle, DB2, SQL Server, MySQL, PostgreSQL—misunderstandings can always arise over the precise meanings of terms, misunderstandings that can have a serious effect on the success of your database projects. For example, here are some common database terms: attribute, BCNF, consistency, denormalization, predicate, repeating group, join dependency. Do you know what they all mean? Are you sure? The New Relational Database Dictionary defines all of these terms and many, many more. Carefully reviewed for clarity, accuracy, and completeness, this book is an authoritative and comprehensive resource for database professionals, with over 1700 entries (many with examples) dealing with issues and concepts arising from the relational model of data. DBAs, database designers, DBMS implementers, application developers, and database professors and students can find the information they need on a daily basis, information that isn't readily available anywhere else.

Understanding SQL's underlying theory is the best way to guarantee that your SQL code is correct and your database schema is robust and maintainable. On the other hand, if you're not well versed in the theory, you can fall into several traps. In SQL and Relational Theory, author C.J. Date demonstrates how you can apply relational theory directly to your use of SQL. With numerous examples and clear explanations of the reasoning behind them, you'll learn how to deal with common SQL dilemmas, such as: Should database access granted be through views instead of base tables? Nulls in your database are causing you to get wrong answers. Why? What can you do about it? Could you write an SQL query to find employees who have never been in the same department for more than six months at a time? SQL supports "quantified comparisons," but they're better avoided. Why? How do you avoid them? Constraints are crucially important, but most SQL products don't

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support them properly. What can you do to resolve this situation? Database theory and practice have evolved since Edgar Codd originally defined the relational model back in 1969. Independent of any SQL products, SQL and Relational Theory draws on decades of research to present the most up-to-date treatment of the material available anywhere. Anyone with a modest to advanced background in SQL will benefit from the many insights in this book.

SQL is full of difficulties and traps for the unwary. You can avoid them if you understand relational theory, but only if you know how to put the theory into practice. In this insightful book, author C.J. Date explains relational theory in depth, and demonstrates through numerous examples and exercises how you can apply it directly to your use of SQL. This second edition includes new material on recursive queries, “missing information” without nulls, new update operators, and topics such as aggregate operators, grouping and ungrouping, and view updating. If you have a modest-to-advanced background in SQL, you’ll learn how to deal with a host of common SQL dilemmas. Why is proper column naming so important? Nulls in your database are causing you to get wrong answers. Why? What can you do about it? Is it possible to write an SQL query to find employees who have never been in the same department for more than six months at a time? SQL supports “quantified comparisons,” but they’re better avoided. Why? How do you avoid them? Constraints are crucially important, but most SQL products don’t support them properly. What can you do to resolve this situation? Database theory and practice have evolved since the relational model was developed more than 40 years ago. SQL and Relational Theory draws on decades of research to present the most up-to-date treatment of SQL available. C.J. Date has a stature that is unique within the database industry. A prolific writer well known for the bestselling textbook *An Introduction to Database Systems* (Addison-Wesley), he has an exceptionally clear style when writing about complex principles and theory.

Type inheritance is that phenomenon according to which we can say, for example, that every square is also a rectangle, and so properties that apply to rectangles in general apply to squares in particular. In other words, squares are a subtype of rectangles, and rectangles are a supertype of squares. Recognizing and acting upon such subtype / supertype relationships provides numerous benefits: Certainly it can help in data modeling, and it can also provide for code reuse in applications. For these reasons, many languages, including the standard database language SQL, have long supported such relationships. However, there doesn’t seem to be any consensus in the community at large on a formal, rigorous, and abstract model of inheritance. This book proposes such a model, one that enjoys several advantages over other approaches, not the least of which it is that it’s fully compatible with the well known relational model of data. Topics the model covers include: Both single and multiple inheritance Scalar, tuple, and relation inheritance Type lattices and union and intersection types Polymorphism and substitutability Compile time and run time binding All of these topics are described in detail in the book, with numerous illustrative examples, exercises, and answers. The book also discusses several alternative approaches. In particular, it includes a detailed discussion and analysis of inheritance as supported in the SQL standard.

Psychology is of interest to academics from many fields, as well as to the thousands of academic and clinical psychologists and general public who can’t help but be interested in learning more about why humans think and behave as they do. This award-winning twelve-volume reference covers every aspect of the ever-fascinating discipline of psychology and represents the most current knowledge in the field. This ten-year revision now covers discoveries based in neuroscience, clinical psychology’s new interest in evidence-based practice and mindfulness, and new findings in social, developmental, and forensic psychology.

What makes this book different from others on database design? Many resources on design practice do little to explain the underlying theory,

and books on design theory are aimed primarily at theoreticians. In this book, renowned expert Chris Date bridges the gap by introducing design theory in ways practitioners can understand—drawing on lessons learned over four decades of experience to demonstrate why proper database design is so critical in the first place. Every chapter includes a set of exercises that show how to apply the theoretical ideas in practice, provide additional information, or ask you to prove some simple theoretical result. If you're a database professional familiar with the relational model, and have more than a passing interest in database design, this book is for you. Questions this book answers include: Why is Heath's Theorem so important? What is The Principle of Orthogonal Design? What makes some JDs reducible and others irreducible? Why does dependency preservation matter? Should data redundancy always be avoided? Can it be? Databases often stay in production for decades, and careful design is critical for avoiding subtle errors and processing problems over time. If they're badly designed, the negative impacts can be incredibly widespread. This gentle introduction shows you how to use important theoretical results to create good database designs.

This book constitutes the proceedings of the 41st International Conference on Current Trends in Theory and Practice of Computer Science held in Pec pod Sněžkou, Czech Republic, during January 24-29, 2015. The book features 8 invited talks and 42 regular papers which were carefully reviewed and selected from 101 submissions. The papers are organized in topical sections named: foundations of computer science; software and Web engineering; data, information, and knowledge engineering; and cryptography, security, and verification. This book sheds light on the principles behind the relational model, which is fundamental to all database-backed applications--and, consequently, most of the work that goes on in the computing world today. Database in Depth: The Relational Model for Practitioners goes beyond the hype and gets to the heart of how relational databases actually work. Ideal for experienced database developers and designers, this concise guide gives you a clear view of the technology--a view that's not influenced by any vendor or product. Featuring an extensive set of exercises, it will help you: understand why and how the relational model is still directly relevant to modern database technology (and will remain so for the foreseeable future) see why and how the SQL standard is seriously deficient use the best current theoretical knowledge in the design of their databases and database applications make informed decisions in their daily database professional activities Database in Depth will appeal not only to database developers and designers, but also to a diverse field of professionals and academics, including database administrators (DBAs), information modelers, database consultants, and more. Virtually everyone who deals with relational databases should have at least a passing understanding of the fundamentals of working with relational models. Author C.J. Date has been involved with the relational model from its earliest days. An exceptionally clear-thinking writer, Date lays out principle and theory in a manner that is easily understood. Few others can speak as authoritatively the topic of relational databases as Date can. Chris Date, one of the founders of the relational model, has updated and expanded his relational database dictionary to include more than 900 terms.

This book is based on the premise that knowledge of Information Technology (IT) is essential today for people in every walk of life and all types of profession. It is designed to impart a unified body of knowledge and practice in IT to its readers. Readers can apply this knowledge in innovative ways for various strategic advantages such as increasing productivity, improving quality of

products and services, problem solving, decision making, and improving their own and others living standards. The textbook takes a practical approach to introduce the various components of IT to its readers. While doing so, it demonstrates how IT is being used in modern enterprises by various departments to carry out their activities with greater ease, speed, and accuracy than before. It also introduces several new business models and practices made possible due to IT that enterprises are now using for better profitability. In the process, the book provides to its readers a sound foundation of various components and aspects of IT. It also introduces to its readers several latest concepts and technologies in IT such as Wearable computers, Green computing, Cloud computing, Speech recognition and voice response systems, 4G and 5G networks, Big data analytics, Data science, Web 3.0, IPv6, 3D printing, Enterprise 2.0 organization, etc.

A note from the authors: Dear Reader: "Database is boring." That sentiment is heard all too widely these days. But it's so wrong! The database field is full of important problems still to be solved and interesting issues still to be examined - and some of those problems and issues are explored in this book. Between us, we have nearly 80 years experience in this field, and we're still actively researching, exploring, and learning, as well as helping others do the same. The present book is the latest in a series devoted to these goals; using "The Third Manifesto" (a detailed proposal for the future of database technology) as a foundation, it reports on some of our most recent investigations in this field. Among many other things, it includes the most recent version of "The Third Manifesto" itself; specifications for a conforming language called Tutorial D; and a detailed proposal for a model of type inheritance. Other significant features include: - Extending the foreign key concept - Simplifying queries using image relations - Closer looks at logic and relational algebra - Suggested approaches to "missing information" - Responses to certain "Manifesto" criticisms - Clarifying aspects of normalization The tone of the book overall is naturally somewhat serious, but there are moments of light relief as well. We hope you enjoy it. C.J. Date and Hugh Darwen

E. F. Codd's relational model of data has been described as one of the three greatest inventions of all time (the other two being agriculture and the scientific method), and his receipt of the 1981 ACM Turing Award, the top award in computer science, for inventing it was thoroughly deserved. The papers in which Codd first described his model were staggering in their originality; they had, and continue to have, a huge impact on just about every aspect of the way we do business in the world today. And yet few people, even in the professional database community, are truly familiar with those papers. This book—a thorough overhaul and rewrite of an earlier book by the same name—is an attempt to remedy this sorry state of affairs. In it, well known author C. J. Date provides a detailed examination of all of Codd's major database publications, explaining the nature of his contribution in depth, and in particular highlighting not only the many things he got right but also some of the things he got wrong. Database theory and practice have evolved considerably since Codd first defined his relational model, back in 1969. This book draws on decades of experience to present the most up to date treatment of the material possible. Anyone with a professional interest in databases can benefit from the insights it contains. The book is product independent.

This book considers transformations within the context of computing science and information science, as they are essential in

changing organizations. It not only considers transformations of structured models, rather, the transformation of instances (i.e. the actual contents of those structures) is addressed as well.

A hands-on beginner's guide to designing relational databases and managing data using Microsoft Access Relational databases represent one of the most enduring and pervasive forms of information technology. Yet most texts covering relational database design assume an extensive, sophisticated computer science background. There are texts on relational database software tools like Microsoft Access that assume less background, but they focus primarily on details of the user interface, with inadequate coverage of the underlying design issues of how to structure databases. Growing out of Professor Jonathan Eckstein's twenty years' experience teaching courses on management information systems (MIS) at Rutgers Business School, this book fills this gap in the literature by providing a rigorous introduction to relational databases for readers without prior computer science or programming experience. *Relational Database Design for Business, with Microsoft Access* helps readers to quickly develop a thorough, practical understanding of relational database design. It takes a step-by-step, real-world approach, using application examples from business and finance every step the way. As a result, readers learn to think concretely about database design and how to address issues that commonly arise when developing and manipulating relational databases. By the time they finish the final chapter, students will have the knowledge and skills needed to build relational databases with dozens of tables. They will also be able to build complete Microsoft Access applications around such databases. This text: Takes a hands-on approach using numerous real-world examples drawn from the worlds of business, finance, and more Gets readers up and running, fast, with the skills they need to use and develop relational databases with Microsoft Access Moves swiftly from conceptual fundamentals to advanced design techniques Leads readers step-by-step through data management and design, relational database theory, multiple tables and the possible relationships between them, Microsoft Access features such as forms and navigation, formulating queries in SQL, and normalization *Introductory Relational Database Design for Business, with Microsoft Access* is the definitive guide for undergraduate and graduate students in business, finance, and data analysis without prior experience in database design. While Microsoft Access is its primary "hands-on" learning vehicle, most of the skills in this text are transferrable to other relational database software such as MySQL.

The papers in this volume were presented at the International Conference on Database Theory, held in Berlin, Germany, October 14-16, 1992. This conference initiated the merger of two series of conferences on theoretical aspects of databases that were formed in parallel by different scientific communities in Europe. The first series was known as the International Conference on Database Theory and the second as the Symposium on Mathematical Fundamentals of Database Systems. In the future, ICDT will be organized every two years, alternating with the more practically oriented series of conferences on Extending Database Technology (EDBT). The volume contains 3 invited lectures and 26 contributed papers selected from a total of 107 submissions. The papers are organized into sections on constraints and decomposition, query languages, updates and active databases, concurrency control and recovery, knowledge bases, datalog complexity and optimization, object orientation, information capacity

and security, and data structures and algorithms. Two of the invited papers survey research into theoretical database issues done in Eastern Europe during the past decade.

This book is a comprehensive presentation of entity-relationship (ER) modeling with regard to an integrated development and modeling of database applications. It comprehensively surveys the achievements of research in this field and deals with the ER model and its extensions. In addition, the book presents techniques for the translation of the ER model into classical database models and languages, such as relational, hierarchical, and network models and languages, as well as into object-oriented models.

Provides definitions, many with examples, for over six hundred terms covering relational databases.

All of today's mainstream database products support the SQL language, and relational theory is what SQL is supposed to be based on. But are those products truly relational? Sadly, the answer is no. This book shows you what a real relational product would be like, and how and why it would be so much better than what's currently available. With this unique book, you will: Learn how to see database systems as programming systems Get a careful, precise, and detailed definition of the relational model Explore a detailed analysis of SQL from a relational point of view There are literally hundreds of books on relational theory or the SQL language or both. But this one is different. First, nobody is more qualified than Chris Date to write such a book. He and Ted Codd, inventor of the relational model, were colleagues for many years, and Chris's involvement with the technology goes back to the time of Codd's first papers in 1969 and 1970. Second, most books try to use SQL as a vehicle for teaching relational theory, but this book deliberately takes the opposite approach. Its primary aim is to teach relational theory as such. Then it uses that theory as a vehicle for teaching SQL, showing in particular how that theory can help with the practical problem of using SQL correctly and productively. Any computer professional who wants to understand what relational systems are all about can benefit from this book. No prior knowledge of databases is assumed.

This volume contains the proceedings of the Second International Conference on Advances in Information Systems (ADVIS) held in Izmir, Turkey, 23–25 October 2002. This conference was dedicated to the memory of Prof. Esen Ozkarahan. He was a great researcher who made an essential contribution to the development of information systems. Prof. Ozkarahan was one of the pioneers of database machine research and database systems in Turkey. This conference was organized by the Computer Engineering department of Dokuz Eylul University in Izmir. This department was established in 1994 by Prof. Ozkarahan and he worked there for the last 7 years of his life. The main goal of the conference was to bring together researchers from all around the world working in different areas of information systems, to share new ideas and present their latest results. This time we received 94 submissions from 27 countries. The program committee selected 40 papers for presentation at the conference. During the conference a workshop was organized on the topic "New Information Technologies in Education". The invited and accepted contributions cover a large variety of topics: general aspects of information systems, databases and data warehouses, information retrieval, multiagent systems and technologies, distributed and parallel computing, evolutionary algorithms and system programming, and new information technologies in education. The success of the conference was dependent upon the hard work of a large number of people. We gratefully acknowledge the members of the Program Committee who helped to coordinate the process of refereeing all submitted papers.

-- Places object databases into perspective and shows how they fit into the relational continuum. -- Includes important new relational algebra and database programming ideas, and a complete new model for database subtyping and inheritance. -- Includes a detailed review of

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SQL:1999 (SQL3) and the proposals of the Object Data Management Group (ODMG). Foundation for Future Database Systems: The Third Manifesto offers a comprehensive, insightful proposal for the future of object/relational database management systems. Date and Darwen present a precise, formal definition of an abstract model of data that can be used as a blueprint for designing both databases and database languages -- and as a rock-solid foundation for integrating relational and object technologies. This new Second Edition has been revised extensively, with major extensions to its inheritance model; new language proposals, and improved discussions of many key concepts. The book goes beyond formal specifications, with a detailed discussion of the rationale for each proposal. It will be essential reading for everyone with a serious interest in database technology.

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