Deductive and Object-Oriented Databases

W. Kim
J.-M. Nicolas
S. Nishio
Editors

NORTH-HOLLAND

Deductive and Object-Oriented Databases

Proceedings of the First International Conference on
Deductive and Object-Oriented Databases (DOOD89)
Kyoto Research Park, Kyoto, Japan, 4–6 December, 1989

Edited by

Won KIM
MCC
Austin, Texas
U.S.A.

Jean-Marie NICOLAS
ECRC
Munich
Federal Republic of Germany

Shojiro NISHIO
Department of Information and Computer Sciences
Osaka University
Toyonaka, Osaka
Japan

江苏工业学院图书馆
藏书章

1990

NORTH-HOLLAND
AMSTERDAM • NEW YORK • OXFORD • TOKYO

ELSEVIER SCIENCE PUBLISHERS B.V.
Sara Burgerhartstraat 25
P.O. Box 211, 1000 AE Amsterdam, The Netherlands

Distributors for the United States and Canada:

ELSEVIER SCIENCE PUBLISHING COMPANY INC.
655 Avenue of the Americas
New York, N.Y. 10010, U.S.A.

ISBN: 0 444 88433 5

© ELSEVIER SCIENCE PUBLISHERS B.V., 1990

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the publisher, Elsevier Science Publishers B.V./ Physical Sciences and Engineering Division, P.O. Box 103, 1000 AC Amsterdam, The Netherlands.

Special regulations for readers in the U.S.A. - This publication has been registered with the Copyright Clearance Center Inc. (CCC), Salem, Massachusetts. Information can be obtained from the CCC about conditions under which photocopies of parts of this publication may be made in the U.S.A. All other copyright questions, including photocopying outside of the U.S.A., should be referred to the copyright owner, Elsevier Science Publishers B.V., unless otherwise specified.

No responsibility is assumed by the publisher for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein.

Pp. 165–184, 349–368, 453–472: copyright not transferred.

Printed in The Netherlands

GENERAL CHAIRPERSON'S MESSAGE

It was my great pleasure to welcome participants to *the First International Conference on Deductive and Object-Oriented Databases* (DOOD89) in Kyoto. The idea of organizing this conference began in Kyoto in February 1988. It was motivated by the importance and need to provide a common forum for technical discussions between researchers working with deductive databases and object-oriented databases, and also the need to integrate these very advanced databases in order to accelerate research in investigating next generation intelligent database systems.

Thanks to the hearty cooperation of numerous people, the preparation of the conference progressed admirably under the sponsorship of IPSJ and ASTEM RI/Kyoto, with the cooperation of ACM SIGMOD, IEEE CS and many other organizations as well as with the collaboration of some important next generation computer projects around the world, such as ECRC, ICOT, INRIA, and MCC. I do not know how to express my sincere thanks to them for putting our plan into practice and keeping it at the centre of public attention.

We have now arrived at a very important stage in investigating the topics of the conference by reviewing studies made in the past. As one of the most active researchers in pursuit of this theme, we invited Dr. K. Fuchi to present a keynote address. We were very fortunate that Dr. Fuchi accepted our invitation and gave us the attractive address entitled *Towards a New Step of Logic Paradigm.*

Three invited papers by Dr. C. Zaniolo, Dr. F. Bancilhon et al., and Professor C. Beeri were presented along with the 27 very high quality papers selected from the total number of submitted papers. I feel that these papers form a strong technical basis for the topics of the conference, and their full text together with the abstract of the keynote address are included in this volume. The panel session chaired by Dr. M.L. Brodie complemented the contributed paper sessions and provided an opportunity for exchanging views on *Next Generation Database Management Systems.*

On behalf of the DOOD89 participants, I would like to thank all those who gave their talents and time to assure the success of the conference meeting. In particular, I would like to express my deep appreciation to Dr. W. Kim, Dr. J.-M. Nicolas, and Professor S. Nishio, the Program Co-Chairpersons. Without their initiative and dedicated service in all phases of the conference, DOOD89 would not have existed. I would like to express my sincere thanks to Professor J. Minker, the Steering Committee Chairperson, and the members of the Committee for providing us with the opportunity of holding the conference in Kyoto. The majority of the credit for the high quality of the program is due to the many authors who submitted papers, to our colleagues on the Program Committee who spent many hours reviewing the papers, and the external reviewers who willingly shared their expertise on specific papers. We extend our heartfelt thanks to all of them. Particular thanks must go to Professor A. Makinouchi, the Executive Committee Chairperson, and the members of the Committee who handled all other affairs besides the technical program. Finally sincere thanks and appreciation are also extended to the members of the Organizing Committee for making the conference actually happen and to our industrial supporters for their financial assistance.

Yutaka Ohno
General Chairperson

PROGRAM COMMITTEE CHAIRPERSONS' MESSAGE

Deductive databases and object-oriented databases have been at the forefront of research into next generation intelligent database systems. Object-oriented programming and design methodologies hold great promise for reducing the complexity of very large software systems in such domains as computer-aided design and manufacturing, integrated office information systems, and artificial intelligence. Object-oriented database systems will enhance the programmer/user productivity of such systems. Research into deductive databases is aimed at discovering efficient schemes to uniformly represent assertions and deductive rules, and to respond to highly expressive queries against the knowledge base of assertions and rules. This area of research strongly interacts with Logic Programming which has developed in parallel, sharing Logic as a common basis. Recently, research has been aimed at integrating object-oriented paradigms and rule-based deduction to provide a single powerful framework for intelligent database systems.

The primary objective of the conference meeting was to provide a forum for technical discussions among researchers working with deductive databases and object-oriented databases, in the hope of accelerating progress in these areas of research and also to promote research into the integration of the technical output of these areas of research.

The technical program of the conference consisted of 30 technical papers and one technical panel session. The technical papers represent the 27 papers which were accepted by the three program committees from 82 submitted articles, and three invited papers.

We would like to thank all the people who made the conference possible, including all the members of the program committees, the external reviewers, and the database professionals who submitted technical papers to the conference. We are especially grateful to our industrial supporters for providing financial assistance. Finally, we owe special thanks to Ms. Ikuko Miyazaki of the SCI Corporation for the numerous days she spent in preparing this volume.

Won Kim, Jean-Marie Nicolas, and Shojiro Nishio
Co-Chairs, Program Committee

此为试读,需要完整PDF请访问: www.ertongbook.com

DOOD89

Sponsored by:

Information Processing Society of Japan (IPSJ)
Advanced Software Technology & Mechatronics Research Institute of Kyoto (ASTEM RI/Kyoto)

Supported by:

European Computer-Industry Research Centre (ECRC)
Institute for New Generation Computer Technology (ICOT)
Institut National de Recherche en Informatique et en Automatique (INRIA)
Microelectronics and Computer Technology Corporation (MCC)

In cooperation with:

Japan Society for Artificial Intelligence (JSAI)
Japan Society for Software Science and Technology (JS^3T)
The Association for Computing Machinery, Inc. (ACM)
The Institute of Electrical and Electronics Engineers, Inc. (IEEE)
The Institute of Electronics, Information and Communication Engineers (IEICE)
The Institute of Management Sciences (TIMS), Japan Chapter

General Chairperson

Yutaka OHNO (ASTEM RI/Kyoto)

Steering Committee Chairperson

Jack MINKER (University of Maryland)

Program Committee Chairpersons

American
Won KIM (MCC)

European
Jean-Marie NICOLAS (ECRC)

Far East
Shojiro NISHIO (Osaka University)

Executive Committee Chairperson

Akifumi MAKINOUCHI (Kyushu University)

Organizing Committee Vice-Chairperson

Yahiko KAMBAYASHI (Kyushu University)

Executive Committee Vice-Chairperson

Koichi FURUKAWA (ICOT)

Local Arrangement and Finance Chairperson

Kiyoshi AGUSA (Nagoya University)

Registration Coordinator

Katsumi TANAKA (Kobe University)

Tutorials and Exhibition Coordinator

Akira KAMEI (ASTEM RI/Kyoto)

Publicity Coordinator

Kouichi HARUNO (Toyo Information Systems Co., Ltd.)

Sponsoring Coordinator

Yutaka MATSUSHITA (Keio University)

Steering Committee Members

Serge ABITEBOUL (INRIA)
Eric G. MANNING (University of Victoria)
Yoshifumi MASUNAGA (University of Library and Information Science)
Jean-Marie NICOLAS (ECRC)
Shojiro NISHIO (Osaka University)

Organizing Committee Members

Hiroshi ARISAWA (Yokohama National University)
Koichi FURUKAWA (ICOT)
Yunosuke HAGA (Oki Electric Industry Co., Ltd.)
Akihiro HASHIMOTO (Osaka University)
Tatsuro ICHIHARA (Omron Tateishi Electronics Co.)
Toru KAWADA (Sharp Corporation)
Tsutomu KAWADA (Toshiba Corporation)
Masaru KITSUREGAWA (University of Tokyo)
Ikuo KONDO (Sumitomo Electric Industries, Ltd.)
Hideko KUNII (Ricoh Co., Ltd.)
Akifumi MAKINOUCHI (Kyushu University)
Yutaka MATSUSHITA (Keio University)
Kazuaki MAYUMI (Matsushita Electric Industrial Co., Ltd.)
Kunio MURAKAMI (Nippon Telegraph and Telephone Corporation)
Yukiko NISHIOKA (Digital Computer Limited)
Norio OKINO (Kyoto University)
Kinji ONO (Kokusai Denshin Denwa Co., Ltd.)
Hirotaka SAKAI (Chuo University)
Iwao SAKURAGI (Kyoto Research Park Corporation)
Masaru SUDO (Osaka University)
Norihisa SUZUKI (IBM Japan, Ltd.)
Shunsuke UEMURA (Tokyo University of Agriculture and Technology)
Masahiro YAMAMOTO (NEC Corporation)
Shigeru YONEDA (Hitachi, Ltd.)

Executive Committee Members

Takayuki KIMURA (Kyoto Research Park Corporation)
Nobuyoshi MIYAZAKI (Oki Electric Industry Co., Ltd.)
Taira MURAKAMI (Toyo Information Systems Co., Ltd.)
Kazumasa YOKOTA (ICOT)
Masatoshi YOSHIKAWA (Kyoto Sangyo University)

DOOD89 Secretariat

Ikuko MIYAZAKI (SCI Corp.)
Yuko YOSHIMURA (SCI Corp.)
Mutsumi F. WONDRA (SCI Corp.)

External Referees

H. Aït-Kaci
J. Andreoli
J. Annevelink
C. Arapis
F. Bachmann
P. Bader
I. Balbin
H. Balsters
J.A. Blakeley
F. Bry
E. Casais
J. Chen
R.L. Cooper
R.A. de By
B. Defude
X. Du
T. Ekberg
S. Ford
M. Forster
S. Gibbs
K.J. Greene
T. Haerder
H. Haniuda
D.J. Harper
P. Hingston
K. Hori
M.A.W. Houtsma
G. Hulin
R. Hull
R. Hums
M. Ichikawa
I.C. Jung
P. Kandzia
G. Kappel
K. Kato
W. Kent
M.L. Kersten
D. Konstantas
Y. Kornatzky
A.M. Kotz
W. Kowarschick
V.S. Lakshmanan
W. Lamersdorf
A. Lefebvre
K. Lehnert
X. Li
Y. Liu
P. Lyngbaek
R. Manthey
S. Masuyama
F. Matthes
T. Miyachi
Y. Morita
K. Moriya
M. Murata
R. Nakano
R. Nasr
C. Numaoka
H. Ozawa
R. Pareschi
E. Perez
P. Philbrow
T. Risch
D. Roelants
C. Sakama
B. Schiefer
M. Scholl
H. Schütz
H. Seki
S. Shimojo
I. Shioya
A. Takasu
L. Tanca
J. Thom
C. Thompson
K. Ueda
J. Uhl
M. Umano
E.T.A. van Kuijk
M. Wallace
S. Wang
J. Werner
R. Wilkinson

Program Committee Members

American

Hong-Tai Chou
(Object Sciences Co.)

Umeshwar Dayal
(DEC)

Dan Fishman
(HP)

Yannis Ioannidis
(U. of Wisconsin)

Roger King
(U. of Colorado)

Frederick Lochovsky
(U. of Toronto)

John Mylopoulos
(U. of Toronto)

D. Stott Parker, Jr.
(UCLA)

Yehoshua Sagiv
(Hebrew U.)

Oded Shmueli
(Technion)

Satish Thatte
(TI)

Allen Van Gelder
(UC Santa Cruz)

Moshe Y. Vardi
(IBM Almaden)

Carlo Zaniolo
(MCC)

Stanley Zdonik
(Brown U.)

European

Serge Abiteboul
(INRIA)

Michel Adiba
(U. of Grenoble)

Peter M. Apers
(U. of Twente)

Malcolm Atkinson
(U. of Glasgow)

François Bancilhon
(Altair)

Rudolf Bayer
(TUM)

Catriel Beeri
(Hebrew U.)

Stefano Ceri
(U. of Modena)

Robert Demolombe
(ONERA-CERT)

Klaus R. Dittrich
(U. of Zurich)

Johann C. Freytag
(ECRC)

Georges Gardarin
(INRIA)

Alain Pirotte
(Philips)

Joachim W. Schmidt
(U. of Frankfurt)

Dionysios Tsichritzis
(U. of Geneva)

Laurent Vieille
(ECRC)

Far East

Hirofumi Katsuno
(NTT)

Yoshifumi Masunaga
(U. of LIS)

Takao Miura
(Sanno College)

Nobuyoshi Miyazaki
(Oki)

Setsuo Ohsuga
(U. of Tokyo)

Insup Paik
(NCA, Korea)

Shixuan Sa
(People's U. of China)

Ron Sacks-Davis
(RMIT, Melbourne)

Katsumi Tanaka
(Kobe U.)

Yuzuru Tanaka
(Hokkaido U.)

Mario Tokoro
(Keio U.)

Yoshihisa Udagawa
(Mitsubishi)

Kazumasa Yokota
(ICOT)

Masatoshi Yoshikawa
(Kyoto Sangyo U.)

此为试读,需要完整PDF请访问: www.ertongbook.com

CONTENTS

KEYNOTE ADDRESS

Towards a New Step of Logic Paradigm
K. Fuchi 3

A STATUS UPDATE ON DEDUCTIVE DATABASES

Object Identity and Inheritance in Deductive Databases: An Evolutionary Approach (*Invited Paper*)
C. Zaniolo 7

Query Evaluation in Recursive Databases: Bottom-up and Top-down Reconciled
F. Bry 25

DEDUCTIVE QUERY EVALUATION

On Termination of Datalog Programs (*Extended Abstract*)
A. Brodsky and Y. Sagiv 47

The Level-Cycle Merging Method
J. Han and L.J. Henschen 65

Distribution of Selections: The Missing Link between Strategies for Relational Databases and Deductive Databases
N. Miyazaki 83

Combining Deduction by Certainty with the Power of Magic
H. Schmidt, N. Steger, U. Güntzer, W. Kiessling, R. Azone, and R. Bayer 103

On Deductive Query Evaluation in the DedGin* System
A. Lefebvre and L. Vieille 123

Detecting and Eliminating Redundant Derivations in Logic Knowledge Bases
A.R. Helm 145

OODB THEORY

A Theory of Functional Dependencies for Object-Oriented Data Models
G.E. Weddell 165

Object Identity, Equality and Relational Concept
Y. Masunaga 185

A Formal System for Producing Demons from Rules in an Object-Oriented Database
Y. Caseau 203

OODB FEATURES

The Object-Oriented Database System Manifesto (*Invited Paper*)
M. Atkinson, F. Bancilhon, D. DeWitt, K. Dittrich, D. Maier, and S. Zdonik 223

Meta Operations for Type Management in Object-Oriented Databases: A Lazy Mechanism for Schema Evolution
L. Tan and T. Katayama 241

A Tool Kit System for the Synthesis and the Management of Active Media Objects
Y. Tanaka 259

OODB QUERIES

Object-Oriented Queries: Equivalence and Optimization
G.M. Shaw and S.B. Zdonik 281

On Natural Joins in Object-Oriented Databases
K. Tanaka and T.-S. Chang 297

Reloop, an Algebra Based Query Language for an Object-Oriented Database System
S. Cluet, C. Delobel, C. Lécluse, and P. Richard 313

PANEL DISCUSSION

Next Generation Database Management Systems Technology
M.L. Brodie, F. Bancilhon, C. Harris, M. Kifer, Y. Masunaga, E.D. Sacerdoti, and K. Tanaka 335

DATALOG EXTENSION

Integration of Functions Defined with Rewriting Rules in Datalog
S. Grumbach 349

Possible Model Semantics for Disjunctive Databases
C. Sakama 369

The Well Founded Semantics for Disjunctive Logic Programs
K.A. Ross 385

INTEGRATING OBJECTS AND RULES

Formal Models for Object Oriented Databases (*Invited Paper*)
C. Beeri 405

HILOG: A High-Order Logic Programming Language for Non-1NF Deductive Databases
Q. Chen and W.W. Chu 431

Towards a Dedutive Object-Oriented Database Language
S. Abiteboul 453

Semantics and Evaluation of Rules over Complex Objects
A. Heuer and P. Sander 473

Inference Rules in Object Oriented Programming Systems
L. Wong 493

Features of the TEDM Object Model
D. Maier, J. Zhu, and H. Ohkawa 511

Software Process Modeling as a Strategy for KBMS Implementation
M. Jarke, M. Jeusfeld, and T. Rose 531

QUERY TRANSFORMATION

Query Optimization in Database Programming Languages
P. Valduriez and S. Danforth 553

Integrating Complex Objects and Recursion
H. Schöning 573

OOLP: A Translation Approach to Object-Oriented Logic Programming
M. Dalal and D. Gangopadhyay 593

Author Index 607

KEYNOTE ADDRESS

Deductive and Object-Oriented Databases
W. Kim, J.-M. Nicolas, and S. Nishio (Editors)
© Elsevier Science Publishers B.V. (North-Holland), 1990

KEYNOTE ADDRESS

Towards a New Step of Logic Paradigm

Kazuhiro FUCHI
ICOT, Japan

ABSTRACT

One of the motivations of the FGCS Project was to integrate two areas: programming and database. It was inspired by the appearance of relational data model and logic programming, and also by the research on deductive databases as one of the earliest attempts to combine the two areas. We thought the logic-based approach was the best way to integration.

Another motivation was to fuse ideas from logic programming, functional programming and object-oriented programming. These three are essentially variations of logic programming in a broader sense. So they should naturally be unified on a common basis.

The directionality was simple and clear. However, research done in the last 10 years all over the world have shown that there are plenty of research problems on the way. Meanwhile, there has been a tendency of divergence in research activities. However, I strongly feel that the time is coming again to be conscious of grandunification based on materials enriched by the process of divergence and convergence.

For example, in the field of logic programming there have been trials of extending terms, as well as trials of constraint paradigms. There have some points of contact with the object-oriented approach. The same trials have been done from the viewpoint of database extension. One of the activities toward integration based on a variety of ideas is the research on deductive and object-oriented databases.

A number of ideas have been conceived in the last 10 years, and a lot will come from now on. There seems no definite consensus about the concrete scheme of integration at this moment. However, we will find a way to integration by clarifying the relationships between a variety of ideas. Experience in knowledge processing and natural language processing as well as in realistic applications of some scale will accelerate this movement.

To realize this idea, it is critically important for researchers of related fields to have consciousness to pursue unity in variety, instead of seeking only differentiation.

此为试读,需要完整PDF请访问: www.ertongbook.com