Contents

Foreword V

1. Management of Data: State-of-the-Art and Emerging Trends 1
Jacek Błażewicz, Tadeusz Morzy
1 Introduction 2
2 Survey of the Volume 12

2. Database Systems: from File Systems to Modern Database Systems 18
Zbyszko Królikowski, Tadeusz Morzy
1 Introduction – Database Concepts 19
2 Database System Generations 21
3 Network Database Systems 22
4 Hierarchical Database Systems 25
5 Relational Database Systems 29
6 Object-Oriented Database Systems 33
7 Federated, Mediated Database Systems and Data Warehouses 38
8 Conclusions 47

3. Data Modeling 49
Jeffrey Parsons
1 Introduction 50
2 Early Concerns in Data Management 50
3 Abstraction in Data Modeling 52
4 Semantic Data Models 56
5 Models of Reality and Perception 62
6 Toward Cognition-Based Data Management 66
7 A Cognitive Approach to Data Modeling 70
8 Research Directions 72

4. Object-Oriented Database Systems 78
Alfons Kemper, Guido Moerkotte
1 Introduction and Motivation 80
2 Object-Oriented Data Modeling 85
3 The Query Language OQL 106
4 Physical Object Management 117
5 Architecture of Client-Server-Systems 135
6 Indexing 139
7 Dealing with Set-Valued Attributes 160
8 Query Optimization 164
9 Conclusion 186

5. High Performance Parallel Database Management Systems 194
Shahram Ghandeharizadeh, Shan Gao, Chris Gahagan, Russ Krauss
1 Introduction ... 195
2 Partitioning Strategies ... 196
3 Join Using Inter-Operator Parallelism ... 201
4 ORE: a Framework for Data Migration ... 203
5 Conclusions and Future Research Directions ... 216

6. Advanced Database Systems ... 221
Gottfried Vossen
1 Introduction ... 222
2 Preliminaries ... 227
3 Data Models and Modeling for Complex Objects ... 234
4 Advanced Query Languages ... 249
5 Advanced Database Server Capabilities ... 262
6 Conclusions and Outlook ... 274

7. Parallel and Distributed Multimedia Database Systems ... 284
Odej Kao
1 Introduction ... 286
2 Media Fundamentals ... 288
3 MPEG as an Example of Media Compression ... 292
4 Organisation and Retrieval of Multimedia Data ... 298
5 Data Models for Multimedia Data ... 304
6 Multimedia Retrieval Sequence using Images as an Example ... 308
7 Requirements for Multimedia Applications ... 318
8 Parallel and Distributed Processing of Multimedia Data ... 321
9 Parallel and Distributed Techniques for Multimedia Databases ... 337
10 Case study: CAIRO – Cluster Architecture for Image Retrieval and Organisation ... 348
11 Conclusions ... 359

8. Workflow Technology: the Support for Collaboration ... 365
Dimitrios Georgakopoulos, Andrzej Cichocki, Marek Rusinkiewicz
1 Introduction ... 367
2 Application Scenario and Collaboration Requirements ... 368
3 Commercial Technologies Addressing Collaboration Requirements ... 371
4 Evaluation of Current Workflow Management Technology ... 372
5 Research Problems, Related Work, and Directions ... 381
6 Summary ... 383

9. Data Warehouses ... 387
Ulrich Dorndorf, Erwin Pesch
1 Introduction ... 389
2 Basics ... 389
3 The Database of a Data Warehouse ... 394

4 The Data Warehouse Concept 404
5 Data Analysis of a Data Warehouse 411
6 Building a Data Warehouse 418
7 Future Research Directions 422
8 Conclusions 423

10. Mobile Computing 431
Omran Bukhres, Evaggelia Pitoura, Arkady Zaslavsky
1 Introduction 433
2 Mobile Computing Infrastructure 437
3 Mobile Computing Software Architectures and Models 444
4 Disconnected Operation 454
5 Weak Connectivity 462
6 Data Delivery by Broadcast 468
7 Mobile Computing Resources and Pointers 476
8 Conclusions 479

11. Data Mining 487
Tadeusz Morzy, Maciej Zakrzewicz
1 Introduction 488
2 Mining Associations 490
3 Classification and Prediction 517
4 Clustering 540
5 Conclusions 558

Index 567

List of Contributors 576