# Table of Contents

A Qualitative System Identification Method
Shinji Abe 1

Real-Time Self-Explanatory Simulation
Franz Amador, Adam Finkelstein, and Daniel S. Weld 11

Estimating Order from the Causal Ordering
Jonathan Amsterdam 20

Designing Transitions in Multi-Region Devices
Prasanta Bose and Shankar A. Rajamoney 26

Fuzzy Causal Simulation in Process Engineering
Kouamana Bousson and Louise Trave-Massuyes 35

Automated Modelling of Visco-Elastic Materials
A.C. Capelo, L. Ironi, and S. Tentoni 45

Behavior Abstraction for Tractable Simulation
Daniel J. Clancy and Benjamin Kuipers 57

Numeric Reasoning with Relative Orders of Magnitude
Philippe Dague 65

Focused Real-time Systems Monitoring Based on Multiple Anomoly Models
Richard J. Doyle, Steve A. Chien, Usama M. Fayyad and E. Jay Wyatt 75

Intelligent Model Selection for Hillclimbing Search in Computer-Aided Design
Thomas Ellman, John Keane and Mark Schwabacher 83

Generating Explanations of Device Behavior Using Compositional Modeling and Causal Ordering
Patrice O. Gautier and Thomas R. Gruber 89

A Qualitative System Theory: Introducing Global View into Qualitative Reasoning
Yoshiteru Ishida 98

Automated Model Selection for Simulation
Yumi Iwasaki and Alon Y. Levy 108

Deriving Monotonic Function Envelopes from Observations
Herbert Kay and Lyle H. Ungar 117

Reasoning about Models across Multiple Ontologies
Takashi Kiriyama and Tetsuo Tomiyama 124

A Qualitative Method to Construct Phase Portraits
Wood W. Lee and Benjamin J. Kuipers 132

Approximation Operators in Distributed Modeling
Sui-Ringo Ling and Louis Steinberg 138

Application Oriented Qualitative Reasoning
Robert Milne and Louise Trave-Massuyes 145

Order of Magnitude Reasoning using Logarithms
P. Pandurang Nayak 157

Innovative Design as Systematic Search
Dorothy Neville and Daniel S. Weld 167

Generating Quasi-symbolic Representation of Three-Dimensional Flow
Toyoaki Nishida 173

Representing and Reasoning about Physical Systems from a Functional Viewpoint
Mahmoud Pegah, Jon Sticklen, William Bond and James K. McDowell 183

Automatic Enhancement of Model Parsimony
Cis Schut and Bert Bredeweg 194

Using Qualitative, Numerical and Heuristic Knowledge to support Innovative Design
Nikitas M. Sgouros 204

Understanding Linkages
Howard E. Shrobe 212

On Temporal Abstraction in Qualitative Physics - A Preliminary Report
Peter Struss 219

Kinematic Synthesis with Configuration Spaces
Devika Subramanian and Cheuk-San (Edward) Wang 228

Qualitative Structural Analysis Using Diagrammatic Reasoning
Shirley Tessler, Yumi Iwasaki and Kincho Law 240

Qualitative design with envisionment
Bernard Yannou 250

Spatial Reasoning for Intelligent Control of Numerical Simulators
Ke-Thia Yao and Andrew Gelsey 260

Model Simplification by Asymptotic Order of Magnitude Reasoning
Kenneth Man-kam Yip 266

Qualitative Asymptotic Analysis of Complex Functions
Kenneth Man-kam Yip 273

Author Index 282