

Contents

Preface vii

Authors ix

- 1 GIS, Spatial Analysis, and Modeling Overview 1
Michael F. Goodchild
- 2 Moving toward a GIS Platform for Spatial Analysis and Modeling 19
David J. Maguire
- 3 Approaches to Modeling in GIS: Spatial Representation and Temporal Dynamics 41
Michael Batty

TOOLS AND TECHNIQUES: INTRODUCTION BY DAVID J. MAGUIRE 63

- 4 Assessing the Uncertainty Resulting from Geoprocessing Operations 67
Konstantin Krivoruchko and Carol A. Gotway Crawford
- 5 Spatial Statistical Modeling in a GIS Environment 93
Luc Anselin
- 6 Linking General-Purpose Dynamic Simulation Models with GIS 113
Ian Miller, Stefan Knopf, and Rick Kossik
- 7 Dynamic, Geospatial Landscape Modeling and Simulation 131
Thomas Maxwell and Alexey Voinov

SOCIOECONOMIC APPLICATIONS: INTRODUCTION BY MICHAEL BATTY 147

- 8 Urban Growth Using Cellular Automata Models 151
Michael Batty and Yichun Xie
- 9 A Data Model to Represent Plans and Regulations in Urban Simulation Models 173
Lewis D. Hopkins, Nikhil Kaza, and Varkki G. Pallathucheril
- 10 Urban Land-Use Transportation Models 203
Michael Wegener
- 11 Retail and Service Location Planning 221
Mark Birkin

- 12 Simulating Spatially Explicit Networks for Dispersion of Infectious Diseases 245
Ling Bian and David Liebner
- 13 The Use of GIS in Transport Modeling 265
Thomas Israelsen and Rasmus Dyhr Frederiksen
- 14 The Integration of Case-Based Reasoning and GIS in a Planning Support System 289
Anthony G. O. Yeh
- ENVIRONMENTAL APPLICATIONS: INTRODUCTION BY MICHAEL F. GOODCHILD 315
- 15 Hydrologic Modeling 319
David R. Maidment, Oscar Robayo, and Venkatesh Merwade
- 16 Environmental Modeling with PCRaster 333
Peter A. Burrough, Derek Karssenber, and Willem van Deursen
- 17 Transition Potential Modeling for Land-Cover Change 357
J. Ronald Eastman, Megan E. Van Fossen, and Luis A. Solórzano
- 18 Modeling the Interaction between Humans and Animals in Multiple-Use Forests: A Case Study of *Panthera tigris* 387
Sean Ahearn and J. L. David Smith
- 19 Integration of Geographic Information Systems and Agent-Based Models of Land Use: Prospects and Challenges 403
Dawn C. Parker
- 20 Generating Prescribed Patterns in Landscape Models 423
Junn-Der (Geoffrey) Duh and Daniel G. Brown
- Conclusion*
- 21 GIS, Spatial Analysis, and Modeling: Current Status and Future Prospects 445
David J. Maguire, Michael Batty, and Michael F. Goodchild
- Acronyms* 457
- Index* 461