

Contents

| | | |
|----------|--|----|
| 1 | Map Generalisation: Fundamental to the Modelling and Understanding of Geographic Space. | 1 |
| | William Mackaness, Dirk Burghardt and Cécile Duchêne | |
| 1.1 | Map Generalisation: Why So Complex? | 1 |
| 1.2 | The Map as a System of Relationships. | 3 |
| 1.3 | The Importance of Data Enrichment | 6 |
| 1.4 | Alternate Paradigms to Map Generalisation | 8 |
| 1.5 | Structure and Content of this Book | 10 |
| | References | 14 |
| 2 | Map Specifications and User Requirements. | 17 |
| | Sandrine Balley, Blanca Baella, Sidonie Christophe, Maria Pla, Nicolas Regnauld and Jantien Stoter | |
| 2.1 | Introduction | 18 |
| 2.2 | Key Concepts: Needs, Requirements and Specifications. | 19 |
| 2.3 | Inferring Map Specifications from User Requirements | 25 |
| 2.4 | Collecting User Requirements | 29 |
| 2.5 | Case Study I: Specifying Generic and Specific Map Specifications—A EuroSDR Case Study | 31 |
| 2.6 | Case Study II: A Map Specifications Model for On-Demand Mapping at Ordnance Survey | 38 |
| 2.7 | Case Study III: COLorLEGend—Design of Personalised and Original Maps | 43 |
| 2.8 | Conclusions | 48 |
| | References | 49 |
| 3 | Modelling Geographic Relationships in Automated Environments | 53 |
| | Guillaume Touya, Bénédicte Bucher, Gilles Falquet, Kusay Jaara and Stefan Steiniger | |
| 3.1 | Introduction | 54 |
| 3.2 | Spatial Relations Classification | 55 |
| 3.3 | An Ontology of Spatial Relations | 58 |
| 3.4 | Spatial Relations Ontology to Support Automatic Processes | 62 |

3.5 Case Study I: Spatial Relations for Urban 3D Models 64

3.6 Case Study II: Relations for the Extraction of Groups
of Objects. 69

3.7 Case Study III: Data Migration of User Data 74

3.8 Conclusions 79

References 80

4 Data Structures for Continuous Generalisation:

tGAP and SSC. 83

Peter van Oosterom, Martijn Meijers, Jantien Stoter and Radan Šuba

4.1 Introduction 83

4.2 Principles of the Generalised Area Partitioning Structure 84

4.3 Space Scale Cube for Vario-Scale 89

4.4 Case Study I: Dutch Large Scale Basic Topographic Data
in Constraint tGAP 97

4.5 Case Study II: German Land Cover Data
in Constraint tGAP 104

4.6 Case Study III: Corine and ATKIS Data in the Space
Scale Cube 107

4.7 Conclusions 112

References 114

**5 Integrating and Generalising Volunteered Geographic
Information** 119

Monika Sester, Jamal Jokar Arsanjani, Ralf Klammer,
Dirk Burghardt and Jan-Henrik Haurert

5.1 Introduction 120

5.2 The Potential and Characteristics of User-Generated
Content 121

5.3 Aspects of Data Integration. 124

5.4 The Visualisation and Generalisation of VGI 128

5.5 Case Study I: VGI Platforms and Data Generalisation 131

5.6 Case Study II: Generalisation within the OpenStreetMap
Project Compared to the Generalisation of Authoritative
Data. 139

5.7 Case Study III: Matching GPS Trajectories with Incomplete
User-Generated Road Data 145

5.8 Conclusions 150

References 151

6 Generalisation Operators 157

Lawrence V. Stanislowski, Barbara P. Battenfield, Pia Bereuter,
Sandro Savino and Cynthia A. Brewer

6.1 Introduction 158

| | | |
|----------|--|------------|
| 6.2 | Generalisation Operators: Chronology of Typologies | 159 |
| 6.3 | Operators in Commercial Software | 163 |
| 6.4 | Recent Advances in Operator Development | 166 |
| 6.5 | Case Study I: Generalisation of Road Networks | 169 |
| 6.6 | Case Study II: River Network Pruning by Enrichment and Density Analysis | 175 |
| 6.7 | Case Study III: Algorithms for On-the-Fly Generalisation of Point Data Using Quadrees | 181 |
| 6.8 | Conclusions | 189 |
| | References | 190 |
| 7 | Process Modelling, Web Services and Geoprocessing. | 197 |
| | Nicolas Regnaud, Guillaume Touya, Nicholas Gould and Theodor Foerster | |
| 7.1 | Introduction and State of the Art | 198 |
| 7.2 | Deciding on the Components of the Generalisation Process . . . | 200 |
| 7.3 | Formalising the Procedural Knowledge | 203 |
| 7.4 | Chaining Processes | 204 |
| 7.5 | Future Opportunities | 206 |
| 7.6 | Case Study I: Collaborative Generalisation | 207 |
| 7.7 | Case Study II: An Ontological Approach to On-Demand Mapping and Generalisation | 212 |
| 7.8 | Case Study III: Live Geoinformation with Standardised Geoprocessing Services | 217 |
| 7.9 | Conclusions | 221 |
| | References | 222 |
| 8 | Terrain Generalisation. | 227 |
| | Eric Guilbert, Julien Gaffuri and Bernhard Jenny | |
| 8.1 | Introduction | 228 |
| 8.2 | Issues in Terrain Generalisation. | 229 |
| 8.3 | Object-Oriented Classification of Landforms. | 232 |
| 8.4 | Generalisation Methods | 236 |
| 8.5 | Case Study I: Hypsometric Colouring | 242 |
| 8.6 | Case Study II: Isobathic Line Generalisation. | 245 |
| 8.7 | Case Study III: Preserving Relations with Other Objects During Generalisation | 251 |
| 8.8 | Conclusions | 255 |
| | References | 256 |
| 9 | Evaluation in Generalisation | 259 |
| | Jantien Stoter, Xiang Zhang, Hanna Stigmar and Lars Harrie | |
| 9.1 | Introduction | 260 |
| 9.2 | The Purposes of Evaluation | 260 |

- 9.3 Visual and Quantitative Evaluation on Map Generalisation. 263
- 9.4 Frameworks of Automated Evaluation 266
- 9.5 Components of Automated Evaluation 267
- 9.6 Map Readability Formulas 273
- 9.7 Case Study I: Automated Evaluation of Generalised Building Patterns 276
- 9.8 Case Study II: Map Readability Formulas 283
- 9.9 Case Study III: The EuroSDR Project 287
- 9.10 Conclusions and Further Research 291
- References 291

- 10 Generalisation in the Context of Schematised Maps 299**
- William Mackaness and Andreas Reimer
- 10.1 The Nature of Schematised Maps 299
- 10.2 A Definition of Schematisation 301
- 10.3 A Classification of Schematised Maps 302
- 10.4 Methods of Schematisation Production 304
- 10.5 Schematisation Metaphors in Interactive Environments 306
- 10.6 Case Study I: Schematisation of Transportation Networks 307
- 10.7 Case Study II: Chorematic Diagrams 314
- 10.8 Case Study III: Schematised Maps for Multi Modal Travel 319
- 10.9 Conclusions and Challenges 325
- References 325

- 11 Generalisation in Practice Within National Mapping Agencies. 329**
- Cécile Duchêne, Blanca Baella, Cynthia A. Brewer, Dirk Burghardt, Barbara P. Buttenfield, Julien Gaffuri, Dominik Käuferle, François Lecordix, Emmanuel Maugeais, Ron Nijhuis, Maria Pla, Marc Post, Nicolas Regnaud, Lawrence V. Stanislawski, Jantien Stoter, Katalin Tóth, Sabine Urbanke, Vincent van Altena and Antje Wiedemann
- 11.1 Introduction 331
- 11.2 Deriving Products Through Generalisation at the Institut CartogrÀfic de Catalunya 333
- 11.3 The New Base Map Project: A Semi-Automated Production Line for Topographic Maps at IGN-France 339
- 11.4 Producing Digital Cartographic Models at Swisstopo 346
- 11.5 Automatic Map Derivation at Ordnance Survey GB 351
- 11.6 Generalisation Methods Used for the USGS National Map and National Atlas 355
- 11.7 Generalisation in Production at Kadaster NL 362
- 11.8 AdV-Project “ATKIS: Generalisation” Map Production of DTK50 and DTK100 at LGL in Baden-Württemberg. 369

- 11.9 Multi-Scale Data in Spatial Data Infrastructures: Developments
in INSPIRE at the JRC 373
- 11.10 Synthesis: Recent Achievements and Future Challenges
Regarding Generalisation in NMAs 378
- References 387

- 12 Conclusion: Major Achievements and Research Challenges
in Generalisation 393**
- Dirk Burghardt, Cécile Duchêne and William Mackaness
- 12.1 Major Achievements 393
- 12.2 Future Challenges 398
- 12.3 In Conclusion 402
- References 403

- Index 405**



<http://www.springer.com/978-3-319-00202-6>

Abstracting Geographic Information in a Data Rich
World

Methodologies and Applications of Map Generalisation

Burghardt, D.; Duchene, C.; Mackaness, W. (Eds.)

2014, XV, 407 p. 180 illus., 128 illus. in color.,

Hardcover

ISBN: 978-3-319-00202-6