

Table of contents

| | |
|---|-----------|
| 1 Map-based mobile services | 1 |
| Liqu Meng and Tumasch REICHENBACHER | 1 |
| 1.1 Background | 1 |
| 1.2 Mobile maps and their predecessors | 2 |
| 1.3 Affordances of maps | 5 |
| 1.4 Research challenges of designing map-based mobile services | 6 |
| 1.5 About the book | 8 |
| 1.6 References | 8 |
| | |
| 2 Portrayal and Generalisation of Point Maps for Mobile Information Services | 11 |
| Alistair EDWARDES, Dirk BURGHARDT, Robert WEIBEL | 11 |
| 2.1 Introduction | 11 |
| 2.2 Context of research | 12 |
| 2.3 Maps as a representational medium | 13 |
| 2.4 Map types and multiple views | 14 |
| 2.5 Symbolisation and spatial relations | 16 |
| 2.5.1 Space distortion from symbolisation in data conflation | 17 |
| 2.5.2 Abstractions of spatial relations | 19 |
| 2.6 Geographic space | 21 |
| 2.7 Generalisation | 22 |
| 2.7.1 Generalisation operators for point maps | 22 |
| 2.8 Conclusions | 27 |
| Acknowledgements | 28 |
| References | 28 |
| | |
| 3 Activity and Context - A Conceptual Framework for Mobile Geoservices | 31 |
| Doris DRANSCH | 31 |
| 3.1 Mobile Geoservices | 31 |
| 3.2 Concepts of activity and context | 32 |
| 3.2.1 Activity | 33 |
| 3.2.2 Activity and Mobile Geoservices | 36 |
| 3.2.3 Context | 39 |
| 3.2.4 Context and Mobile Geoservices | 40 |
| 3.3 Conclusion | 41 |
| References | 41 |
| | |
| 4 Effectiveness and efficiency of tourism maps in the World Wide Web and their potential for mobile map services | 45 |
| Frank DICKMANN | 45 |
| 4.1 Introduction | 45 |
| 4.2 Web maps and tourism | 46 |

| | | |
|----------|--|-----------|
| 4.3 | Empirical analysis..... | 47 |
| 4.4 | First results..... | 49 |
| 4.4.1 | Comprehension of overall topographic structures..... | 50 |
| 4.4.2 | Assimilation of complex spatial information..... | 51 |
| 4.4.3 | Assimilation of detailed geographic information..... | 52 |
| 4.5 | Conclusion..... | 53 |
| | References..... | 54 |
| 5 | The Cognitive Reality of Schematic Maps | 57 |
| | Alexander KLIPPEL, Kai-Florian RICHTER, Thomas BARKOWSKY, Christian FREKSA..... | 57 |
| 5.1 | Introduction..... | 57 |
| 5.2 | Schematisation and Generalisation..... | 58 |
| 5.3 | Maintaining Qualitative Information..... | 62 |
| 5.4 | Aspects of Human Spatial Cognition..... | 65 |
| 5.4.1 | Wayfinding Choremes..... | 65 |
| 5.4.2 | Focus maps..... | 67 |
| 5.4.3 | Chorematic focus maps..... | 68 |
| 5.4.4 | Multimodality..... | 68 |
| 5.5 | Applications..... | 70 |
| 5.6 | Conclusions..... | 70 |
| | References..... | 71 |
| 6 | Adaptive Visualisation of Landmarks using an MRDB..... | 75 |
| | Birgit ELIAS, Mark HAMPE, Monika SESTER..... | 75 |
| 6.1 | Introduction..... | 75 |
| 6.2 | Mobile Navigation..... | 76 |
| 6.2.1 | Context-dependent mobile navigation..... | 76 |
| 6.2.2 | Focus on moving mode..... | 76 |
| 6.3 | Route-dependent generation of landmarks..... | 79 |
| 6.3.1 | Existing databases for landmark detection..... | 80 |
| 6.3.2 | Extraction procedure of potential landmarks..... | 80 |
| 6.3.3 | Generation of route-specific landmarks..... | 81 |
| 6.4 | Scale-dependent visualisation of landmarks..... | 82 |
| 6.4.1 | Generating multiple resolutions for the MRDB..... | 82 |
| 6.4.2 | Adaptive visualisation of landmark objects by re-generalisation..... | 83 |
| 6.4.3 | Emphasizing important objects..... | 83 |
| 6.4.4 | Using MRDB for emphasizing important objects..... | 85 |
| 6.5 | Summary and Outlook..... | 86 |
| | Acknowledgement..... | 87 |
| | References..... | 87 |
| 7 | Ego centres of mobile users and egocentric map design | 89 |
| | Liqu MENG..... | 89 |
| 7.1 | Introduction..... | 89 |
| 7.1.1 | Usability of the egocentric mobile map..... | 92 |

| | |
|---|------------|
| 7.1.2 Necessity of designing egocentric mobile maps | 92 |
| 7.2 Detecting the ego centre of a mobile map user | 94 |
| 7.2.3 <i>Acquisition of scenarios</i> | 96 |
| 7.3 Designing egocentric map..... | 98 |
| 7.4 Concluding remarks | 105 |
| 7.5 Acknowledgement | 105 |
| 7.6 References..... | 105 |
| | |
| 8 Adaptation to Context – A Way to Improve the Usability of Mobile Maps | 109 |
| L. Tiina SARJAKOSKI, Annu-Maaria NIVALA..... | 109 |
| 8.1 Introduction..... | 109 |
| 8.2 Preliminary User Requirements Based on Field Testing | 111 |
| 8.2.1 Aim of the field study and test method | 112 |
| 8.2.2 Test users, material and equipment | 112 |
| 8.2.3 Pre-defined tasks | 113 |
| 8.2.4 Results..... | 114 |
| 8.3 Categorisation of Contexts in Mobile Map Applications..... | 116 |
| 8.3.1 Definitions of context..... | 116 |
| 8.3.2 Contexts relevant for mobile map usage situation | 117 |
| 8.3.3 Summary of context categorisation..... | 119 |
| 8.4. Implementation of the GUI and Adaptive Maps | 120 |
| 8.4.1 Personalisation of the service..... | 120 |
| 8.4.2 Adaptive seasonal maps | 121 |
| 8.5. Further Development of Context-Aware Adaptive Maps | 124 |
| References..... | 124 |
| | |
| 9 Focalizing Measures of Salience for Wayfinding..... | 127 |
| Stephan WINTER ¹ , Martin RAUBAL ² , Clemens NOTHEGGER ³ | 127 |
| 9.1 Introduction..... | 127 |
| 9.2 The Measure of Salience..... | 128 |
| 9.3 Focalizing in Route Piloting..... | 130 |
| 9.3.1 Mode of travelling..... | 131 |
| 9.3.2 Role of the traveller..... | 131 |
| 9.3.3 Environment of the traveller | 131 |
| 9.3.4 Spatial and cognitive abilities of the traveller | 132 |
| 9.4 Focalizing by Weighting the Measures of Salience | 132 |
| 9.4.1 Specifications by the provider..... | 133 |
| 9.4.2 Specifications by the user..... | 133 |
| 9.4.3 Learning from behaviour..... | 134 |
| 9.5 Test of Weighted Salience | 134 |
| 9.6 Results..... | 136 |
| 9.7 Conclusions and Outlook | 139 |
| Acknowledgements..... | 140 |
| References..... | 140 |

| | |
|---|------------|
| 10 Adaptive egocentric maps for mobile users | 143 |
| Tumasch REICHENBACHER | 143 |
| 10.1 Introduction..... | 143 |
| 10.2 Geoservices for everyday activities | 144 |
| 10.3 Context-adaptation in geoservices | 148 |
| 10.3.1 Context model for mobile geovisualisation services..... | 148 |
| 10.3.2 Adapting geovisualisation to mobile usage context parameters | |
| | 150 |
| 10.3.3 The process of map adaptation..... | 152 |
| 10.4 Egocentric maps..... | 155 |
| 10.5 Adapting to mobile user activities | 156 |
| 10.6 Conclusions..... | 160 |
| References..... | 160 |
| | |
| 11 Cartographic Location Based Services..... | 163 |
| Georg GARTNER, Susanne UHLIRZ..... | 163 |
| 11.1 Introduction..... | 163 |
| 11.2 Elements of Cartographic LBS | 163 |
| 11.2.1 Positioning | 164 |
| 11.2.2 Modelling and Presentation of Information | 164 |
| 11.2.3 Users and Adaptation..... | 166 |
| 11.3 Research questions in the context of cartographic LBS..... | 166 |
| 11.3.1 Integrative Positioning | 166 |
| 11.3.2 Route Information Systems..... | 167 |
| 11.3.3 Information Presentation and Visualisation | 167 |
| 11.4 Selected contributions to concepting cartographic LBS | 168 |
| 11.4.1 Active Landmarks | 168 |
| 11.4.2 Presenting routes by various presentation forms..... | 171 |
| 11.4.3 Cartographic support for wayfinding | 172 |
| 11.5 Summary | 173 |
| References..... | 174 |
| | |
| 12 XML in Service Architectures for Mobile Cartographic Applications ... | 177 |
| Lassi LEHTO, Tapani SARJAKOSKI..... | 177 |
| 12.1 Introduction..... | 177 |
| 12.2 XML Basics | 178 |
| 12.2.1 General..... | 178 |
| 12.2.2 XML Schema..... | 180 |
| 12.2.3 XLink | 181 |
| 12.2.4 XSLT | 181 |
| 12.3 XML in Spatial Data Processing..... | 182 |
| 12.3.1 Data encoding, GML | 182 |
| 12.3.2 Map visualisation, SVG | 182 |
| 12.3.3 Spatial data modelling and validation, XML Schema..... | 183 |
| 12.3.4 Spatial relationships, XLinks | 183 |
| 12.3.5 Spatial data transformations, XSLT | 183 |

| | | |
|-----------|--|------------|
| 12.4 | Architecture for Mobile Map Services..... | 185 |
| 12.4.1 | Architecture layers..... | 185 |
| 12.4.2 | Standardised interfaces..... | 187 |
| 12.4.3 | Use of XML in the architecture..... | 188 |
| 12.5 | Service Architecture in the GiMoDig project..... | 189 |
| 12.5.1 | General..... | 189 |
| 12.5.2 | Query processing..... | 191 |
| 12.5.3 | Response processing..... | 191 |
| 12.6 | Other related studies..... | 193 |
| 12.7 | Discussion and conclusion..... | 193 |
| | References..... | 194 |
| 13 | A Survey of Map-based Mobile Guides..... | 197 |
| | Jörg BAUS ¹ , Keith CHEVERST ² , Christian KRAY ² | 197 |
| 13.1 | Introduction..... | 197 |
| 13.2 | Mobile Guide Systems: A Representative Survey..... | 199 |
| 13.3 | COMPARISON/ANALYSIS..... | 206 |
| 13.3.1 | Positioning..... | 207 |
| 13.3.2 | Situational factors..... | 207 |
| 13.3.3 | Adaptation capabilities..... | 208 |
| 13.3.4 | Interface and user interaction..... | 209 |
| 13.3.5 | Use of maps..... | 210 |
| 13.3.6 | Architecture..... | 211 |
| 13.3.7 | Future directions..... | 212 |
| 13.4 | Conclusion..... | 213 |
| | Acknowledgements..... | 213 |
| | References..... | 213 |
| 14 | Position Determination of Reference Points in Surveying..... | 217 |
| | Leonhard DIETZE, Klaus BÖHM..... | 217 |
| 14.1 | Introduction and state of the art..... | 217 |
| 14.1.1 | Locating reference points without technical support..... | 217 |
| 14.1.2 | Current approaches using Location-based Services (LBS)..... | 218 |
| 14.2 | Requirements for the 'Mobile Reference Point Localisation' support service..... | 219 |
| 14.3 | The MRPL service concept..... | 220 |
| 14.3.1 | The structured vector format..... | 220 |
| 14.3.2 | Integration of the user position with GPS..... | 221 |
| 14.3.3 | Technical background of position determination using GPS..... | 222 |
| 14.4 | Realisation..... | 222 |
| 14.4.1 | Architecture..... | 222 |
| 14.5 | The MRPL prototype..... | 226 |
| 14.6 | Evaluation of the MPRL prototype..... | 227 |
| 14.6.1 | Test scenario..... | 227 |
| 14.6.2 | Results..... | 228 |
| 14.6.3 | Evaluation..... | 229 |

| | |
|---|------------|
| 14.7 Summary and outlook..... | 230 |
| Acknowledgements..... | 230 |
| References..... | 230 |
| 15 Dynamic 3D Maps for Mobile Tourism Applications | 233 |
| Arne SCHILLING ¹ , Volker COORS ² , Katri LAAKSO ³ | 233 |
| 15.1 Feasibility and Advantages of 3D Maps | 233 |
| 15.2 The TellMaris Project | 234 |
| 15.3 Integration in a Distributed Environment | 236 |
| 15.4 Development of the iPAQ Prototype | 237 |
| 15.4.1 Presentation Strategies | 238 |
| 15.4.2 Connecting Tourist Data and GIS Data | 239 |
| 15.4.3 Spatial Database for 3D Geodata | 240 |
| 15.4.4 Technical Results | 242 |
| 15.5 Prototype Evaluation..... | 242 |
| 15.5.1 Settings and objectives..... | 242 |
| 15.5.2 Results..... | 243 |
| References..... | 244 |
| 16 Designing electronic maps: an ethnographic approach | 247 |
| Barry BROWN ¹ , Eric LAURIER ² | 247 |
| 16.1 Introduction..... | 247 |
| 16.2 Motivation..... | 248 |
| 16.3 Methods | 249 |
| 16.4 Using Maps | 250 |
| 16.4.1 Maps as collaborative artifacts..... | 250 |
| 16.4.2 Using a map <i>in situ</i> | 251 |
| 16.4.3 Getting from a to b..... | 253 |
| 16.4.4 Maps for pre-visiting an planing | 254 |
| 16.5 Designing map technologies | 256 |
| 16.5.1 Collaborative map use..... | 256 |
| 16.5.2 Combining electronic maps and guidebooks | 257 |
| 16.5.3 Supporting pre visiting an planning | 258 |
| 16.6 Conclusion | 261 |
| Acknowledgements..... | 261 |
| References..... | 262 |
| INDEX..... | 265 |