

Andrew U. Frank Irene Campari (Eds.)

Spatial Information Theory

A Theoretical Basis for GIS

European Conference, COSIT'93

Marciana Marina, Elba Island, Italy

September 19-22, 1993

Proceedings

Technische Hochschule Darmstadt FACHBEREICH INFORMATIK B I B L I O T H E K Inventar-Nr.: <u>20852</u> Sachgebiete: Standort:
--

Springer-Verlag

Berlin Heidelberg New York

London Paris Tokyo

Hong Kong Barcelona

Budapest

Table of Contents

I. Spatial Cognition

A Cognitive Model for the Process of Multimodal, Incremental Route Descriptions	1
<i>Wolfgang Maaß (Universität des Saarlandes, Saarbrücken, Germany)</i>	
Cognitive Maps, Cognitive Collages, and Spatial Mental Models	14
<i>Barbara Tversky (Stanford University, USA)</i>	

II. Spatial Reasoning

A Logical Framework for Reasoning about Space	25
<i>Laure Vieu (INRA, Castanet-Tolosan, France)</i>	
Maintaining Qualitative Spatial Knowledge	36
<i>Daniel Hernández (Technische Universität München, Germany)</i>	
Qualitative Triangulation for Spatial Reasoning	54
<i>Gérard F. Ligozat (LIMSI, Université Paris XI, France)</i>	
Enhancing Qualitative Spatial Reasoning - Combining Orientation and Distance	69
<i>Kai Zimmermann (Universität Hamburg, Germany)</i>	

III. Cartography

Map Semantics	77
<i>Ian Pratt (University of Manchester, UK)</i>	
Development of a Cartographic Language	92
<i>J. Raul Ramirez (Ohio State University, USA)</i>	

IV. Query Languages

Spatial Queries and Data Models	113
<i>Leila De Floriani, Paola Marzano (Università di Genova, Italy), Enrico Puppo (IMA-CNR Genova, Italy)</i>	
Topological Querying of Multiple Map Layers	139
<i>Sylvia de Hoop (Wageningen Agricultural University, The Netherlands), Peter van Oosterom (TNO Physics and Electronics Laboratory, The Hague, The Netherlands), Martien Molenaar (Wageningen Agricultural University, The Netherlands)</i>	

V. Temporal Reasoning

- Towards a Conceptual Data Model for the Analysis of Spatio-Temporal Processes: The Example of the Search for Optimal Grazing Strategies 158
Jean-Paul Cheylan (GDR Cassini, GIP Reclus, Montpellier, France), Sylvie Lardon (GDR Cassini and INRA-SAD, Auzeville, France)
- The Cognitive Structure of Space: An Analysis of Temporal Sequences 177
Stephen C. Hirtle, Thea Ghiselli-Crippa, Michael B. Spring (University of Pittsburgh, USA)
- Hierarchies of Space and Time 190
Peter A. Whigham (CSIRO Division of Water Resources, Canberra, Australia)

VI. Data Models for Spatial and Temporal Data

- The Voronoi Model and Cultural Space: Applications to the Social Sciences and Humanities 202
Geoffrey Edwards (Université Laval, Sainte-Foy, Canada)
- Interaction with GIS Attribute Data Based on Categorical Coverage 215
Gary S. Volta, Max J. Egenhofer (University of Maine, Orono, USA)
- The Semantics of Relations in 2D Space Using Representative Points: Spatial Indexes 234
Dimitris Papadias, Timos Sellis (National Technical University of Athens, Greece)
- Computing Visibility Maps on a Digital Terrain Model 248
Leila De Floriani, Paola Magillo (Università di Genova, Italy)

VII. Cultural Differences in Spatial Cognition

- Toward a Theoretical Framework for Geographic Entity Types 270
David M. Mark (State University of New York at Buffalo, USA)
- Land, Space and Spatial Planning in Three Time Regions 284
Albert Z. Guttenberg (University of Illinois, Urbana, USA)
- Geographic and Manipulable Space in Two Tamil Linguistic Systems 294
Eric Pederson (Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands)

VIII. Scales in Geographic Space

- Scale and Multiple Psychologies of Space 312
Daniel R. Montello (University of California, Santa Barbara, USA)

GIS and Modeling Prerequisites 322
Arthur Getis (State University of California, San Diego, USA)

A Map Editing Kernel Implementation: Application to Multiple
 Scale Display 341
*Philippe Rigaux (Cedric/CNAM, Paris, France), Michel Scholl (INRIA,
 Le Chesnay, France), Agnès Voisard (Universität München, Germany)*

IX. User-Interface

Metaphors Create Theories for Users 366
Werner Kuhn (Technische Universität Wien, Vienna, Austria)

Using a Landscape Metaphor to Represent a Corpus of Documents 377
Matthew Chalmers (Xerox Parc, Cambridge, UK)

From Interface to Interplace: The Spatial Environment as a Medium
 for Interaction 391
*Thomas Erickson (Advanced Technology Group, Apple Computer Inc.,
 Cupertino, USA)*

A Keystroke Level Analysis of Manual Map Digitizing 406
Peter Haunold, Werner Kuhn (Technische Universität Wien, Vienna, Austria)

X. Spatial Analysis

Critical Issues in the Evaluation of Spatial Autocorrelation 421
Yue-Hong Chou (University of California, Riverside, USA)

A Directional Path Distance Model for Raster Distance Mapping 434
*Cixiang Zhan, Sudhakar Menon, Peng Gao (Environmental Systems
 Research Institute, Redlands, USA)*

XI. Spatial Reasoning

Symbolic Spatial Reasoning in Object Shapes for Qualitative Reasoning 444
Erland Jungert (FOA, Sweden)

Reasoning About Spatial Structure in Landscapes with Geographic
 Information Systems 463
Claude W. Saunders (Argonne National Laboratory, Argonne, USA)

XII. Posters 478