Book Review

Advances in Spatio-Temporal Analysis

Xinming Tang, Yaolin Liu, Jixian Zhang, and Wolfgang Kainz (eds.)

Taylor & Francis Group: London UK. 2008. xi and 239 pp., diagrams

ISBN: 978-0-415-40630-7

Hardcover. $69.00

Reviewed by
May Yuan. Professor, College of Atmospheric and Geographic Sciences, University of Oklahoma, Norman, Oklahoma

This book contributes to Volume 5 of the *ISPRS Book Series in Photogrammetry, Remote Sensing and Spatial Information Sciences* (Book Series Editor: Paul Aplin) with a collection of 21 peer-reviewed papers selected from the joint workshop of ISPRS WGII/1, 2, 7, WG VII/6, and STM'05, that took place August 27-29, 2005, in Beijing, China. Collectively, the joint workshop addressed four themes: spatial modeling, spatio-temporal modeling, spatio-temporal analysis, and spatial reasoning and data mining, which constitute the four sections in this book. The introductory paper (Chapter 1) provides a short review of the section themes and introductions to papers included in each section. The book is intended for advanced graduate students or professionals who are engaged or interested in temporal GIS research.

The editors consider spatio-temporal modeling as an extension of spatial modeling and therefore devote the first section to key research issues in spatial modeling, including topology and qualitative reasoning, spatial tessellation, spatial uncertainty, and fuzzy regions. All five papers in the first section are heavily theory-centric and offer formal models to represent the underlying abstract concepts. Papers in the second section on spatio-temporal modeling, however, are more application-oriented in that the proposed spatio-temporal representation schemes or data models are rooted in specific application domains. Pollution diffusion forecasting demonstrates the "Analytical Dynamic Continuous Field" approach to capturing field intensity and its change. The Chinese Historical GIS project contributes to the design and implementation of a unified spatio-temporal data model. Land parcel change shows a proposed indexing scheme that captures snapshot increments. Urban structures and changes elucidate the application of "Space Syntax Theory" to capture temporal topological relationships in convex spaces. The development of China's National Fundamental Geospatial Information Dynamic Database implements a proposed spatio-temporal data model based on version differences. Finally, car movements in a street network support a proposed algebra for moving objects.

The section on spatio-temporal analysis is heavily based on applications. Each paper describes analytical methods developed for specific projects, including agro-environmental impact analysis in the North China Plain, epidemic transmission analysis of Severe Acute Respiratory Syndrome (SARS), visual exploration of time-series of remotely sensed images, land-cover change in the National Carbon Accounting System in Fuijian Province, China, and groundwater volume analysis.

These proposed methods are mainly point- or pixel-based to examine movement or change. One exception is the visual exploration of temporality in remotely sensed images, which examines region-based movement by identifying objects in images and tracking these objects to detect events.

The final section on spatial reasoning and data mining mixes both methodology- and application-based papers. The first paper in the section gives an overview of spatial data mining and knowledge discovery with case studies in landslide monitoring based on remote sensing data. The papers that follow discuss genetic neural network and applications in police case analysis, Markov chain modeling and fuzzy clustering to predict the demand for cultivated land, and clustering analysis for China's National Fundamental GIS to refine database content. Nevertheless, the section consists of one theoretical paper on qualitative spatial reasoning that discusses spatial topology based on Internal Cardinal Directions (ICD) relations to examine containmentship.

The majority of the authors are from, or associated with, the Institute of Remote Sensing in the Chinese Academy of Sciences, China's State Key Laboratory for Remote Sensing, the Key Laboratory for Geoinformatics of the State Bureau of Surveying and Mapping, or the National Laboratory for Information Engineering in Surveying, Mapping, and Remote Sensing. Consequently, many papers grow out of Chinese State-sponsored projects, and provide an overview of related research by leading Chinese scholars. Most papers are about 10 pages or shorter with clear focused topics within the respective theme. These focused papers allow a wide coverage of topical areas included in the modest 320-page book, a notable strength of the book. Readers can scan through these topical areas to grasp the thesis in each with conciseness. Readers will also appreciate the formal models presented in most papers that offer algorismic procedures for programming and implementation of theoretical concepts. While emphases on applications vary from section to section, all papers, to some degree, relate theoretical developments to applications that help greatly anchor abstract concepts.

The brevity, perhaps, is also the book's weakness. Most proposed methods or conceptual models are left without rigorous validation. Demonstrations on one application help make the connections between theories and applications, but assessment should go beyond one application. Several papers have fewer than 10 references cited,

so these papers may not be properly contextualized themselves in the respective literature. Another area of weakness is imbalance of space and time in the book. Two of the four sections address only spatial issues: section one on spatial modeling and section four on spatial data mining. With the book title: *Advances in Spatio-Temporal Analysis*, readers could be disappointed at the fact that one-half of the included papers only deal with spatial issues. While the first paper attempts to make connections among papers in a section, papers appear isolated, and transitions from one paper to the next can be much improved. Nevertheless, each paper contains interesting ideas on its own, and readers may be able to make connections from their unique perspectives. Since the joint workshop was held in 2005, the timeliness of the papers suffers from the delayed publication of the book in 2008.

Overall, the book can be useful as references for graduate seminars and advanced GIS research. Researchers who are interested in China's GIS scholarship can obtain a good sense for their projects and approaches. The book complements several publications in temporal GIS since 2000, including *Temporal GIS: Advanced Functions for Field-based Applications* by G. Christakos *et al.* (2002), *Mining Spatio-temporal Information Systems* by Ladner *et al.* (2002), *GeoDynamics* by Atkinson et al. (2004), *Dynamic and Mobile GIS: Investigating Changes in Space and Time* by Drummond *et al.* (eds.) (2006), *Computation and Visualization for Understanding Dynamics in Geographic Domains: A Research Agenda* by Yuan and Stewart Hornsby (2007), and *Understanding Dynamics of Geographic Domains* by Stewart Hornsby and Yuan (eds.) (2008). Compared to these publications, the book fills the void of strong emphases on formalization and logic models.

It's all about... *career your future society...*

ASPRS would like to welcome the following new members!

Alaska
Isaiah Ditmer*

At Large
Alex Neil Catchpaugh
Tran Thi Thu Chung
Wang Feng*
Katrin Franke
Colin Reugebrink
Bahram Salehi*
Zeshan Shahzad

Central New York
Jared C. Skinner*

Central US
Khameis Mohamed Abdouli
Michal Jama*

Columbia River
Col-Lea Lane*

East Great Lakes
Boris Skopljak*
JingJing Wang*

Florida
Georgina Kaye Blumel
Dan J. Bubser
Isabelle F. Castillo*
Raymond Miller
Jennifer Novac
Joshua Michael Novac

Mid-South
Craig Andrew Hancock
Aram Parrish Lief*
Dan Morath*
Lihong Su
Jessica Lee Watkins*

North Atlantic
Sunil Bhaskaran
Bruce E. Lewis

Nothern California
Donna Lynn Knifong

New England
Shawn Michael Baldwin
Michael Alan Lindgren*

Potomac
Beth Canada
Ann Marie Carbonell
Sumit Chakravarty*
Robert Hirsch*
Do-Hyung Kim*
Lee Meeks
Mary Elizabeth Megison
John D. Marshall
Daisy J. Mueller
Andrew Robison
Guy Serbin
Kunwar K. Singh*
Jessica Walker*

Puget Sound
Karen L. Hodges

Rocky Mountain
Andrew Bruce Archer
William Henry Brenton, Jr.*
Craig Michael Gallagher*
Evan Foster Mandell*
Reihaneh Peiman*

Saint Louis
Glenn O. Humphress

Southwest US
Scott Goodden*
Ryan M. Kelly
Douglas Lance Lorah*
Cesar A. Puente*

Western Great Lakes
Larry Callant

denotes student membership

working together to advance the practice of geospatial technology

For more information on ASPRS membership, visit http://www.asprs.org/membership/

Is your contact information current?

Contact us at members@asprs.org or log on to https://eserv.asprs.org

to update your information.

We value your membership.