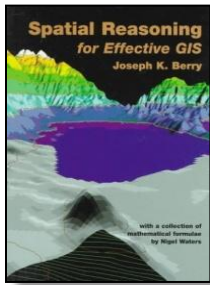


Spatial Reasoning for Effective GIS

by Joseph K. Berry (1995, John Wiley Publishers)



...available for purchase online from Wiley.com and Amazon.com (about \$95)

<[click here](#)> for printer-friendly version (.pdf); posted online line at www.innovativegis.com/basis/Books/spatial.htm

Most desktop mapping and GIS applications have focused on mapping and spatial data management for viewing and geo-query of mapped data. Map analysis and GIS modeling involve entirely new spatial reasoning concepts and procedures that are not reflected in our paper map legacy. This book discusses the new breed of map analysis tools and how they can be used to better characterize and communicate spatial relationships. Spatial Reasoning and its companion book, [Beyond Mapping: Concepts, Algorithms and Issues in GIS](#) (Berry, 1993), are based on Joe Berry's popular "Beyond Mapping" columns in GIS

World magazine. The books are written for GIS professionals, as well as novices, in a witty style that entertains as well as informs.

Spatial Reasoning explores the basic concepts of map analysis and discusses the fundamental elements of GIS that make it different from traditional map structure, content, processing and use. The book encourages the reader to extend the historic role of maps telling us "Where is what?" to "So what?" It is an invitation to consider the expanded capabilities of GIS and relate them to current operations thereby fostering an appreciation of GIS as an effective analytical tool in solving many complex spatial issues. GIS is a new technology, and as such it presents new opportunities as well as new pitfalls. This book engages the reader through incisive and relaxed discussion that investigates why GIS technology is "as different from as it is similar" to traditional map processing.

The book also contains an extensive resource appendix and a glossary of GIS terms written by Bruce L. Kessler, originally published in the Journal of Forestry.

The **MapCalc** software by BASIS provides hands-on exercises supporting the topics in this book. Professional and Developer versions of the software are in development. The Educational version, [MapCalc Learner](#) and support materials are available for free download from www.innovativegis.com, see "Software" item.



— **MapCalc Learner** with MapCalc and Surfer* tutorial systems, exercises/databases, and application examples; constrained 100 x 100 analysis frame; licensed for educational use. Free download.

— **Instructor Materials** containing lecture PowerPoint's, additional exercises and exam questions/answers; multiple seat license for single computer lab; educational use only; two CD set; US\$45.00 plus shipping and handling.

***Surfer** is a popular surface modeling and 3D display package by Golden Software, Inc. It is bundled with the educational version of MapCalc and provides complementary exercises. For more information on Surfer, link to <http://www.goldensoftware.com/frames/surferframe.htm>

Spatial Reasoning for Effective GIS

This is a collection of Joe Berry's popular "Beyond mapping" columns published in GeoWorld from 1993 to 1996. In this compilation, Berry explores the development of geographic information systems (GIS) technology from maps that simply answered the question, "Where is it?" to systems that help us answer the question "Why is it?" *Spatial Reasoning* further develops understanding of mapped data, data analysis procedures and the uses of maps. This second book in the series keeps a reader moving beyond basic mapping. The material presented in [Spatial Reasoning](#) is cross-referenced to the companion GIS Concepts Digital Slide Shows (gCON) and Tutorial Map Analysis Package (tMAP) software. The gCON system is designed for self-learning map analysis concepts through slide sets demonstrating GIS procedures and applications. The tMAP software program is designed for self-learning map analysis concepts through "hands-on" experience.

Note: The original gCON Digital Slides Shows have been replaced by the online [MapCalc Description and Examples](#) document and the tMAP software has been replaced by the [MapCalc Learner](#) software (free download at www.innovativegis.com, under "Software").

- **Introduction** — Is the GIS technology cart in front of the horse? Data mining, predictive modeling and dynamic simulation are new applications of GIS used to uncover spatial relationships and sensitivities among

mapped data. This section discusses the revolutionary procedures identifying the driving forces, trends and forecasts of the a spatial paradigm.

- **Topic 1 Understanding GIS** — As GIS moves from graphical inventories to spatial reasoning, new procedures must be developed to communicate the logic that supports GIS models. An end user must interact with a model—a spatial spreadsheet—that can present alternative perspectives. This section describes the interactive use of a map pedigree linking GIS commands to a flowchart of model logic.
- **Topic 2 From Field Samples to Mapped Data** — In the simplest sense, statistics are merely a collection of numbers. Traditional statistical analysis characterize the "typical response" in a data set, whereas spatial statistics seek to map the data's distribution in geographic space. This section compares the two approaches and investigates various techniques of spatial interpolation.
- **Topic 3 Implementing GIS** — GIS technology begins with a through understanding of its intended applications and operating environment. This section presents an applications-driven procedure for assessing GIS information needs within an organization and establishes a hierarchy of questions it can address.
- **Topic 4 Toward and Honest GIS** — By their nature, maps are abstractions of real conditions. They approximate the positioning of tangible or conceptual features on our landscape with varying degrees of certainty. This section introduces the concept of using a "shadow map" of certainty to track error propagation in GIS models.
- **Topic 5 A Framework for GIS Modeling** — The use of GIS to model complex spatial relationships is increasing rapidly. Our understanding of the types and approaches of models, however, is based on decades of nonspatial modeling experience. This section presents a classification framework for GIS models and a flowcharting methodology.
- **Topic 6 Alternative Data Structures** — At the heart of GIS is data. How data are structured, in large part, determines a system's performance, capabilities and breadth of applications. This section describes alternative approaches to vector and raster data structures.
- **Topic 7 Organizing the Map Analysis Toolbox** — What GIS can do depends on the depth of the spatial information available to the computer, tempered by the depth of understanding of the analytical operations by those who use it. This section discusses spatial topology and its extension to the classification of analytical GIS operations.
- **Topic 8 The Anatomy of a GIS Model** — Although GIS models address a wide diversity of applications, the basic structure of most models are quite similar. This section compares several GIS models to illustrate different modeling approaches and varying levels of results they generate.
- **Topic 9 Putting GIS in the Hands of People** — The Global Positioning System (GPS) focuses on real-time positioning in space while remote sensing (RS) technology focuses on monitoring and classifying the landscape. This section covers the underlying principles of these related fields and their integration into a GIS/GPS/RS field unit.
- **Topic 10 A Futuristic GIS** — Spatial Analysis is more than mapping and spatial database management. It involves deriving new information to express relationships based on the relative positions of map features. This section establishes a framework for spatial analysis and demonstrates several of its important aspects.
- **Epilog** — GIS technology is thought of as hardware and software. However, the "humanware" component often determines the usefulness of the system. This section discusses the human factor in GIS and the linkages and distinctions among data, information, knowledge and wisdom.
- **Appendices** — Appendices are included that describe the companion software for self-learning GIS concepts and applications, a listing of GIS resources, and a collection of mathematical formulae used in GIS by Nigel Waters.

The *Spatial Reasoning for Effective GIS* book can be purchased online from Wiley.com and Amazon.com.



For more information about the *Spatial Reasoning* book and supporting materials, contact:

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