Beyond Mapping I — Beyond Mapping
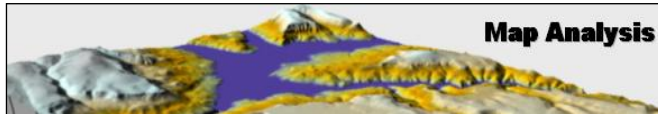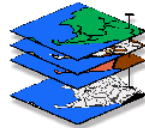
Compilation of Beyond Mapping columns appearing in
GIS World magazine March 1989 to September 1993

Map Analysis

written by   Joseph K. Berry

posted by BASIS Press

Chronological and additional listings
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Beyond Mapping: *Concepts, Algorithms and Issues in GIS*

Description and Annotated Table of Contents

Beyond Mapping: Concepts, Algorithms and Issues in GIS *is a collection of Joe Berry's popular "Beyond Mapping" columns published in GIS World from 1989 to 1993.*

In this compilation, Berry explores the concepts of geographic information systems (GIS) technology and discusses the issues involved as GIS moves from the researcher to the general user. This emerging technology goes beyond traditional mapping and spatial database management to new concepts and procedures for modeling the complex interrelations among spatial data of all kinds. Beyond Mapping is designed so the general user can read about broad issues then delve into more detail, even to the algorithm level.

Introduction **Overview of Basic Terminology —** There are some similarities, but many differences, between traditional and GIS maps. This section describes the conceptual differences and terminology used in vector and raster map formats and an overall organizational structure for GIS databases.

Topic 1 **Maps As Data and Data Structure Implications —** The full impact of numerical representation of spatial data in GIS is just beginning to be recognized. In this section the implications of vector and raster data models on encoding, storage, and analysis are discussed. The inherent statistical characterizations of mapped data and their implications in map analysis are described.

Topic 2 **Measuring Effective Distance and Connectivity —** Before GIS technology, the concept of distance was as simple and straightforward as a ruler. Now the traditional concept of distance is first extended to one of proximity, then to one of actual movement in geographic space, around and through barriers. Procedures and applications of optimal path analysis over continuous map surfaces also are presented.

Topic 3 **Roving Windows: Assessment of Neighborhood Characteristics —** Information surrounding a point often provides insight into spatial problem solving. Neighborhood summaries can be derived from surface configuration to produce slope, aspect and profile maps. Or, the summaries can relate to the context of the neighborhood for such procedures as spatial interpolation, smoothing, and diversity analysis. More than any other classes of operations, "roving windows" provide entirely new applications for map analysis.

Topic 4 **What GIS Is and Isn't: Spatial Data Mapping, Management, Modeling and More —** Most initial applications of GIS automate current cartographic practices. However, the greatest return on investment in GIS technology is realized through entirely new applications inspired by the new set of map analysis tools. This section develops an awareness of the considerations and conditions that move user perspective from computer mapping to spatial database management to application modeling and beyond.

Topic 5 **Assessing Variability, Shape, and Pattern of Map Features —** The shape and pattern of landscape features are readily apparent to the eye but historically difficult to quantify. This section describes several indices used in characterizing the configuration and arrangement of features.

Topic 6 Overlaying Maps and Characterizing Error Propagation — Overlaying maps is at the heart of most GIS applications. However, the propagation of errors needs to be characterized and included with the overlay results. This section describes approaches used in establishing map uncertainty and assessing error propagation.

Topic 7 Overlaying Maps and Summarizing the Results — In GIS overlaying maps goes beyond traditional procedures of "sandwiching" map sheets on a light-table. In this section, procedures for point-by-point, region-wide, and map-wide overlay summaries are described. Numerous applications and the underlying concepts are presented.

Topic 8 Scoping GIS: What to Consider — GIS technology is a radical departure from traditional map processing; therefore, assessing its potential within an organization needs to go beyond traditional cost-benefit analysis. This section describes the major organizational, social, and personal ramifications of implementing GIS.

Topic 9 Slope, Distance and Connectivity: Their Algorithms — At first encounter, many of the advanced GIS analytical operations are intimidating. However, a basic understanding of the computer's procedures is needed to assess the potential and limitations of the new tools. This section describes various approaches used in computing slope, effective distance, optimal paths and visual connectivity.

Topic 10 Cartographic and Spatial Modeling — Many GIS applications take the technology well beyond mapping and into the larger field of mathematical modeling. This section discusses command "macro" construction, the mathematical implications, and the use of GIS models in consensus building and conflict resolution.

Epilog The Evolution and Current Expression of GIS — We have been creating and using mapped for thousands of years. This section looks at GIS's history, current trends and probable future.