

types of cartographic analyses. A short review discusses differences between CAD, thematic mapping systems, AM/FM, and GIS and includes a summary of the characteristics and advantages of desktop-mapping systems.

The remaining 10 chapters present a variety of map-analysis scenarios; each has different information requirements and solutions. Examples include thematic mapping for determining store market potential and assessing the effect of air pollution. The final two chapters explore advanced applications for mapping the analysis of land suitability and the development of a system for automated permit notification. Tables and maps accompany the procedures outlined in each chapter. Chapters conclude with brief summaries of results, a discussion of the limitations of the procedures, and suggestions about how to design similar applications. The book includes two 5.25-inch diskettes that contain boundary and data files necessary for completing the exercises.

Several exercises help demonstrate how to exchange data between Strategic Mapping products and other PC-based software used in business and government, such as dBASE III PLUS (Ashton-Tate, Torrance, California), Lotus 1-2-3 Version 2.01 (Lotus Development Corporation, Cambridge, Massachusetts) and SPSS/PC+ (SPSS Incorporated, Chicago, Illinois).

The book's predominant — although relatively minor — shortcoming becomes evident when following the instructions for performing analyses. Simply stated, sometimes the text tells you to push the wrong key. An alert reader will catch these occasional errors. The authors also assume that readers working the advanced exercises are well-versed in programs such as dBASE III PLUS and Lotus 1-2-3. Despite such obstacles, the book is generally well organized and uses terms and procedures consistently.

This book is particularly useful considering the proliferation of personal computers in business and education and the absence of a textbook that fully addresses microcomputer mapping. The exercises guide the computer novice through powerful map-analysis procedures and impress the reader with the potential of maps to be attractive alternatives to tabular displays. The book is suitable for people in business and planning, as well as for geography in-

structors who wish to supplement their courses with mapping exercises from these two fields.

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GPS: A technical perspective

GPS Satellite Surveying. Alfred Leick.
John Wiley and Sons, New York, 1990.
352 pp., \$64.50.

Everything you ever wanted to know about GPS and much, much more can be found in Alfred Leick's new book *GPS Satellite Surveying*. The handheld black box no bigger than a cellular phone that costs a few thousand dollars and can determine your position on the earth's surface to the nearest 30 meters is only one manifestation of this incredibly versatile and powerful technology. GPS technology can be used for a range of applications, from emergency vehicle management to resource mapping; GPS also played an essential role in the Gulf War. Yet another application has been described in detail in the March 1991 issue of *Geo Info Systems* — "GPS and GIS Map the Nation's Highways" by John D. Bossler, et al. And one can find many more applications in that journal's sister publication, *GPS World*.

Leick's book is an abbreviated version of the University of Maine's courses on geodetic models, integrated geodesy, and satellite geodesy and adjustment computations — all of which will be of great interest to anyone wanting to use GPS at submeter accuracies. Leick focuses on using GPS for surveying and geodesy, which are among the most detailed, technical, and demanding uses of the system. It may be surprising to those who have used the handheld version that GPS is capable of detecting the monthly movement of the continents or the wobbles in the Earth's rotational axis — accuracies that give a whole new meaning to the concept of time-dependent data. But for nonsurveyors interested in GPS as a source of positioning information or management, at accuracies in the tens of meters, it will be a tough read.

For a topic of this density and breadth, the book is amazingly self-contained. Much of the material, particularly the sections on statistics and adjustment, is introduced from first principles. The treatment is necessarily technical and dry. The first paragraph of Chapter 5 describes the previous 70 pages of Chapter 4 on adjustment computations as "devoid of intuitive interpretation," which will be daunting to the nonspecialist looking for practical motivation. But the treatment is always rigorous and clear, and the book seems to have been extraordinarily well typeset and proofread, given its mathematical complexity.

Chapter 4 is essentially an entire course on adjustment, and there are similar levels of detail and rigor in the chapters on satellite orbital motion and the geodetic model. One demonstration of the completeness of the book's treatment is its comparative lack of references.

For the reader looking for a practical handbook of GIS applications, this book is far too technical and detailed. There is no coverage of applications beyond surveying and none of the information one might expect in a handbook, such as lists of vendors and surveys of products. Additionally, GPS is a rapidly developing field that engenders new rumors monthly about the future of selective availability, so it was disappointing to read about 1988 in the future tense in a book published in 1990.

This is not the GIS enthusiast's introduction to GPS. It is, however, an outstanding text on all of the geodetic and surveying theory relevant to the student of GPS and would be indispensable in an advanced survey engineering class. GPS "has the potential to revolutionize the practice of surveying" — as well as mapping, GIS, and all aspects of primary geographical data collection, for that matter. But it will be at least 10 years before we can see all of its effects. Meanwhile, Alfred Leick is to be congratulated for a magnificent treatment of the theory of GPS for surveying and geodesy.

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