Book Review

Geographic information systems and Science.

Second Edition. By P. A. Longley, M. F. Goodchild, D. J. Maguire and D. W. Rhind. John Wiley, Chichester, 2005.

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GI pioneers come back again

All those 'GIS practitioners' (quite a horrible term which persists throughout the whole book!) that have followed the way of GIS during the last twenty years have relied on massive textbooks written by pure pioneers in GI and correlated spatial and geographical tasks development (see, for example, Cressie, 1991; Burrough & McDonnel, 1998; Fotheringham et al., 2000; Haining, 2003). The book by Longley et al. is certainly one of these textbooks, considering the fascinating and explicit aim of the authors, which snakes throughout the whole book as: '*involve more and more people* [in] *thinking and acting geographically*'. In my opinion, they will brilliantly succeed.

This second edition presents a new five-part structure with an Epilogue chapter. Actually, this up-to-date version of the textbook is principally reorganised rather than really enlarged, even if a new 'Analysis' section appears to undertake a key and autonomous role within the text. New 'biographical boxes' extend the previous biography-dedicated parts of the book completing the picture of those GIScientists who have contributed to rapidly developing new GIS concepts (see, for example, Stuart Fotheringham, page 32, Gerard Heuvelink, page 147, Mike Worboys, page 238, Luc Anselin, page 351, Ronal Eastman, page 380, Josef Strobl, page 434, etc …).

In the first section ('Introduction'), Chapter 1 discusses the 'new' concepts related to GIScience, particularly focusing on the Varenius project (reminding Goodchild et al., 1999; see even www.ncgia.com). The impressive box on the September 11th event, even if it aids to really understand the role of GIS in managing and analysing spatial information, looks a little bit invasive. Chapter 2 discusses applied problem solving by examining case studies inherent various GIS related fields such as government, business, environment, etc… The '*One day of life with GIS*' subchapter appears to be a little bit trivial, reminding to those modern English grammar textbooks for children.

Within the second section ('Principles'), Chapter 3 straightforwardly deals with geographic representation. In particular, with regard to the '*objects vs. fields*' topic, this is one of the most comprehensive and explicating textbooks on this. Chapter 4 is one of the best chapters throughout the whole book, dealing with fascinating subjects such as spatial autocorrelation, scale and distance decay. Chapter 5, on '*georeferencing*', appears to be poor, without any hints on the issues related to the coordinate translation among reference systems. In particular, I am not so convinced that GIS are '*particularly powerful tools for converting between projections and coordinate systems*'. This sentence could create some confusion between coordinates transformation performed by rude (and commonly used) GISoftware tools and robust geodetic based calculations. Meanwhile, references to Geodesy-based books are given within the '*Further reading*' subchapter. Surprisingly, the citation of the great book by Sobel (1995) on longitude calculation is reminded (and students will certainly enjoy reading it). Chapter 6 on the uncertainty in geographic representation should be one of the key chapters when dealing with GIS. As far as I know, few GIS textbooks give rise to the matter (e.g. Burrough & McDonnell, 1998). Longley et al., on the contrary, have deeply delved into the uncertainty subject from different viewpoints: from fuzzy logic to measurement errors to model validation.

Within the third section ('Techniques'), Chapter 7 introduces the mostly used GIS software (such as ESRI and Intergraph products). Chapter 8 is concerned with GIS data modelling (involving vector and raster data models). While for vector data models a full presentation is given, but that for raster data is lacking. Particularly, the box related to raster data compression is not so comprehensible and exhaustive. On the contrary, the data collection chapter (Chapter 9) is very exhaustive (perhaps more than enough: is there someone who is still using a digitising table nowadays?). I totally agree with the authors that '*data collection is one of the most time-consuming and expensive, yet important, of GIS tasks*' (Chapter 9), considering the previously cited uncertainty related to input data (see even Chapter 6). Chapter 10 is related to another fundamental task (i.e. geographic databases). I guess that an whole textbook would be needed in order to analyse the whole matter. For this reason, unfortunately the chapter is a little bit weak, but some good reminders are given within the references. Chapter 11 on distributed GIS deals with mobile GIS and represents a straightforward presentation of metadata, geolibraries, virtual reality. An omission persists in the description of European and world standards used to build metadata, but this is not matter for students at all!

The 'Analysis' section contains both technical and analyti-

cal (i.e. quantitative-based) chapters. As an example Chapter 12 mainly deals with map composition and symbolisation which are in my opinion far from an 'analysis' framework (i.e. they should have been maintained within the 'Technique' section, as in the first edition of the book). On the contrary, Chapter 13 on geovisualisation and user interaction has been enriched with respect to the first edition, extending even on VRML, LIDAR data and DSM production. Query, measurement and transformation of geographic data are presented in Chapter 14. Even if SQL-based queries are only superficially mentioned, the part on measurement (distance among objects, shape of objects, field slope and aspect) and data transformation (buffering, point in polygon, polygon overlay) is properly treated. Spatial interpolation is only generally presented, but in a very clear and straightforward manner. Chapter 15 introduces very difficult arguments (i.e. descriptive stats summaries and statistical inference) in a fascinating way. An amazing presentation of spatial models is given in Chapter 16, giving particular attention to provide a solid base of the main modelling concepts. In my opinion, the last three chapters of the section represent a good reason for buying this book.

The 'Management and Policy' section deals with the GIS potentials on business. Chapter 17 on managing GIS investigates how to '*obtain and run a GIS*' in four principal stages, starting from the analysis of requirements and ending with the implementation of a GIS. Chapter 18 is based on knowledge economy, focusing on business drivers and user needs, passing from the importance of new technologies and their relation with GI. Law (i.e. copyright tasks) and its impact on GIS assets are discussed in the Chapter 19. Chapter 20 is dedicated to GIS partnerships and focuses on pitfalls of collaboration at local and global levels.

The Epilog chapter presents a sharp vision about the importance of GIS, by providing straightforward thoughts about the challenges that GIS will overwhelm in the near future. This '*excursion*' is then concluded by a final catchy thought: '*the future of GIS lies in the hands of GIS*', i.e. the '*Geographic Information Students*', who are claimed to be the future GIS developers, analysts, researchers, managers and hopefully to replace those brilliant minds of the '*biographical boxes*' in the future editions of this powerful textbook.

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(Please note titles with "*" have been, or are being reviewed and are not available for new review; title with "+" are new titles)

Atkinson, P.M., Foody, G.M., Darby, S.E., Wu, F. (eds.), 2005, *GeoDynamics*, CRC Press.

+Bukata, R.P., *Satellite Monitoring of Inland and Coastal Water Quality: Retrospection, Introspection, Future Directions*, Taylor & Francis.

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Lillesand, T.M., Kiefer, R.W. and Chipman, J.W., 2004, *Remote Sensing and Image Interpretation*, 5th Edition, John Wiley & Sons.
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