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Research resource reviews

Ningchuan Xiao, *GIS Algorithms*. London: SAGE Publications, 2015; 336 pp.: ISBN 9781446274323, £90.00 (hbk), ISBN 9781446274330, £34.99 (pbk)

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GIS Algorithms provides lecture material on the interface of GIS and computer science, best suited for GIS students or interested scholars who want to know more about the methodology behind GIS computations. As such, the book fills a gap in the range of GIS-related books currently available. The algorithms are presented both in text and with Python code. The latter is clearly separated in framed boxes, so the reader who does not like to read code can easily skip it.

The book is organized in three parts. The first deals with geometric algorithms, and consists of two substantial chapters. The chapter on basic geometric operations, such as computing the distance from a point to a line or deciding whether a point lies in a polygon, is fairly extensive and detailed. The second discusses polygon overlay with the plane sweep method. The reader more specifically interested in these types of methods should read a book on algorithms, such as *Introduction to Algorithms* by Cormen et al., or a book on geometric algorithms, such as *Computational Geometry: Algorithms and Applications* by de Berg et al. However, these books do target a more specialist computer science audience, unlike *GIS Algorithms*.

The second part of the book discusses spatial indexing, the suitable arranging of spatial data into search trees so that future queries can be answered fast. This section consists of four chapters. After a brief introduction into binary search trees, common data structures such as kd-trees, octrees, and R-trees are described. Such structures are essential to let GIS operate efficiently.

The third part covers spatial analysis and modelling and is twice as long as each of the previous parts, with five chapters. Topics include spatial interpolation, shortest paths on graphs and facility location problems. The last chapter is methodological and discusses heuristic search algorithms, of which simulated annealing is the only advanced type.

While it is easy to think of more topics that could have been added, the selection made for this book is good. The chosen topics are important and illustrate various important approaches to automated problem solving, which is what algorithms research is about. It is interesting to see that some chapters describe experiments and results on data, after explaining the methodology. This feature makes the study material more varied, which may help to keep students motivated.

All of the topics in this book are covered more extensively in other textbooks. Much of the material was discovered in the 1970s and this can be seen in the references. This is true for the algorithms covered as well as for the GIS topics. The main purpose of this book is to present a number of classics from geometric, graph and optimization algorithms and data structures in a comprehensive manner, without needing the knowledge from computer science 101 and 201. Knowledge of programming is still a

prerequisite, and one wonders whether the short description on binary search trees is enough for the reader unaware of their existence. While the book appears to be targeting course adoption, the number and quality of the exercises could be improved to make it more useful to students and instructors.

References

Cormen TH, Leiserson CE, Rivest RL, et al. (2009) *Introduction to Algorithms*. 3rd ed. Cambridge, MA: MIT Press.

de Berg M, Cheong O, van Kreveld M, et al. (2008) *Computational Geometry: Algorithms and Applications*. 3rd ed. Berlin: Springer-Verlag.

The environmental impacts of warfare have long been recognized, but despite repeated calls for tougher legislation and action on preventing, measuring, mitigating and remediating such impacts, arguably little progress has been made. This is now starting to change, partly because of technological advances and the availability of high-quality remotely sensed data that can be used to determine historic and current impacts as well as recovery, along with a proliferation of open-source data, but also because of increasing political will and debate, such as the United Nations International Law Commission's 2016 drafting of principles for enhancing the protection of the environment in relation to armed conflicts. At a time when the world is experiencing a situation of 'everywhere war' (Gregory, 2011), and the scientific community is increasingly aware of the complex consequences of environmental damage to socio-ecological systems, progress in this field is highly important.

The Toxic Remnants of War Project was set up in 2012 to study, in particular, the humanitarian and environmental impacts of military and war-related pollution. It maintains an interesting and insightful blog at <www.toxicremnantsofwar.info/category/blog/> and releases occasional publications on particular aspects of war and environment. The 2015 publication was *Environmental Mechanics: Re-imagining Post-conflict Environmental Assistance*, which is the culmination of several years of research based around extensive literature analysis, workshops, seminars, interviews and discussions. It aims to focus debate on issues related to wartime environmental damage, by examining principles of treaty regimes and how these may be applied broadly to a new system of post-conflict environmental and humanitarian assistance and protection. The report is largely successful in this, presenting compelling evidence and arguments for steps that should be taken and norms that should be adopted in a well-structured and readable text that is freely available.

The report opens with an acknowledgement that 'warfare and conflict' is such a large and complex topic that an attempt to address all aspects of it can easily lead to confusion and lack of progress and momentum; this helps to justify the focus on the humanitarian aspects of warfare-related environmental pollution, though the project outcomes have wider applicability. After a brief introduction, five key recommendations of the report are given, before the provision of six thematic questions that essentially structure the rest of the report. These are based around international assistance and co-operation, financing assistance, monitoring harm and access to information, community assistance,