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Book Reviews

Practical Algorithms for Image Analysis: Description, Examples, and Code, Edited by Michael Seul, Lawrence O'Gorman, and Michael J. Sammon, Cambridge University Press, Cambridge, 2000, 302 pp., $59.95. ISBN 0 521 66065 3

These days image analysis finds applications in a variety of areas and is becoming more and more important in many aspects of life. From bar code reading in shops, to CT scans in hospitals, we are all benefiting from this technology.

The book presents a collection of algorithms for manipulating digital images. This collection reflects the authors' rich experience as users and developers of image analysis algorithms and software. The authors introduce the algorithms in a way that keeps the technical contents to a minimum by concentrating on descriptions that show the practical value of each algorithm. As most of the algorithms could be described with the phrase "computer graphics", readers are not required to have a strong mathematical or statistical background to benefit from the book. Indeed, it is mainly intended for readers whose principal interest is in an informed 'how-to' approach, whether in a technical or non-technical setting.

The book comprises seven chapters and an appendix. In the introductory chapter the authors provide an overview of each section and offer general guidance for using the book. Chapter 2 contains algorithms for global image analysis. These algorithms treat all pixels in an image in an equivalent manner. The four classes of operations considered in this chapter are histogram transformations, combining images, geometric image transformations and color image transformations. Chapter 3 presents additional algorithms for the processing and analysis of gray-scale images. Most general image analysis methods, such as smoothing filters, noise reduction, edge and point detection, resizing, detection of object of known shape, and thresholding, are described in this chapter. Chapter 4 introduces techniques for binary image analysis. These include algorithms for binary noise removal, pattern recognition, line, boundary and shape detection, and thinning. More advanced methods based on Fourier descriptors and the Hough transform are also discussed. Chapters 5 and 6 present algorithms for the analysis of line images, and line and point patterns. Chapter 7 discusses algorithms for frequency domain analysis. In particular algorithms for Fourier transforms and filter transfer functions are described. In the appendix, the authors provide a quick reference to the relevant mathematical theory and to the essential properties of various analytical tools that are used throughout the book.

All chapters and sections are designed to be self-contained and readers can proceed directly to the section in which they are interested. Each section covers a single algorithm or a couple of algorithms. The section begins with a header that states typical applications of the algorithm, key words and a list of related procedures. Next a brief, more

technical description of the algorithm(s) is given, after which a particular implementation is presented. Finally, references for further reading and a description of the accompanying computer program(s) is provided.

The book is accompanied by a CD-ROM that contains C programs implementing the algorithms, together with illustrative examples. These examples are an integral part of the work. By comparing an original image with the image yielded by a particular algorithm, readers easily gain an understanding of the purpose and properties of the technique. All original and processed images are contained in the examples subfolder of each section folder on the CD-ROM. Images are given both in GIF and TIF format. Readers are encouraged to use these original images to experiment with the algorithms by setting different arguments and options in the accompanying programs. Doing this certainly stimulates the reader's interest and enhances his/her understanding of the algorithms. The programs will run on a Windows 95/98/NT or LINUX platform and require a C or C++ compiler.

The part of this publication that I found most useful was the program source code, contained in the accompanying CD-ROM. Advanced readers with a reasonable knowledge of C programming could modify this code to include their own ideas. However, before using the source code, the copyright notices on page 3 of the book and on the CD-ROM should be read.

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Self-organization and the City, by Juval Portugali. Springer Series in Synergetics, Springer-Verlag, Berlin, 2000, 352 pp., DM 169.00, $99.00, ISBN 3-540-65483-6.

The natural sciences have given us both a deep understanding of the natural world and a flourishing technology with which to manipulate it. The social sciences, in contrast, have given us – what? Relative to the natural sciences, not much. For the first two-thirds of the 20th century there was great hope that a true social science could be created, one that would permit us to understand and manipulate our social systems as powerfully and as subtly, and with as much assurance, as we are able to intervene in the physical and biological realms. But the results were disappointing, and the last third of the century saw a rejection of positivist social science in favour of a series of anti-scientific approaches, including, most recently, post-modernism. Unfortunately, the new approaches have little to say that is relevant to major policy and planning questions, so to many they seem increasingly irrelevant.

Economics, which has become ever more rigorously mathematical, is apparently the great exception, and economic theory has been appropriated as the foundation of the neoliberal ideology on which much policy is now based. And yet economic theory, as a theory of equilibrium, is static, and so largely irrelevant – or worse, misleading – with respect to our highly dynamic, rapidly evolving socio-economic system. In short, it would not be a wild exaggeration to say that the failure of the old project for a positivist social science has left us at the beginning of the 21st century with a choice between a collection of marginalized social anti-sciences on the one hand and a universally accepted, influential social pseudo-science on the other.

But readers of *DDNS* know that the situation is not so bleak. Under banners like self-organization, synergetics, complexity, and chaos, a new approach to the understanding of social systems is emerging which is both scientific and fruitful. Portugali, a geographer, is one of the creators of the new approach, and in *Self-organization and the City* he has made an ambitious but largely successful attempt to show what the approach can tell us about cities and how to manage them.

The core of the book is a series of chapters (4–10) written in collaboration with I. Benenson. These chapters present a series of urban simulation