

IAPR Newsletter

Volume 30, Number 3
July 2008

*** Calls for Papers on Page 2 ***

In this issue...

[Register now for ICPR 2008](#)..... Page 3

Early bird registration ends August 8th. Register now!!! See you in Tampa!

[From the ExCo](#)..... Page 4

Denis Laurendeau, IAPR Secretary, shares the latest news from the IAPR Executive Committee.

Books, Books, Books

Jason Dowling reviews [Numerical Recipes: The art of scientific computing, 3rd edition](#) by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery Page 5

Elisa H. Barney Smith reviews [Feature Extraction and Image Processing, 2nd ed.](#) by Mark Nixon and Alberto Aguado Page 8

Lawrence O’Gorman reviews [Digital Watermarking and Steganography: Fundamentals and Techniques](#) by Frank Y. Shih Page 10

Lawrence O’Gorman reviews [Springer Handbook of Speech Processing](#) by J. Benesty, M. M. Sondhi, Y Huang, eds. Page 12

Arjan Kuijper reviews [Digital Image Processing: an Algorithmic Introduction Using Java](#) by Wilhelm Burger & Mark James Burge Page 14

Mark Sugrue reviews [Bézier and Splines in Image Processing and Machine Vision](#) by Sambhunath Biswas and Brian C. Lovell..... Page 17

[Past Book Reviews](#) Page 19

[Conference and Workshop Reports: DGCI 2008 14th International Conference on Discrete Geometry for Computer Imagery](#)..... Page 20

[CIP 2008 1st IAPR Workshop on Cognitive Information Processing](#)..... Page 22

[Non-IAPR Workshop Report: 32nd Workshop of the Austrian Association for Pattern Recognition OAGM/AAPR 2008](#)..... Page 23

[Letters to the Editor](#) Page 25

[Conference Planner](#)..... Page 26
Chart of some upcoming IAPR and non-IAPR conferences of interest to the IAPR community.

Calls for Papers

[IVCNZ 2008](#)

*23rd International Conference on
Image and Vision Computing New Zealand*
Christchurch, New Zealand
Deadline: August 18, 2008
November 26-28, 2008

[ICB 2009](#)

3rd International Conference on Biometrics
Alghero, Italy
Deadline: November 1, 2008
June 2-5, 2009

[MVA 2009](#)

IAPR Conference on Machine Vision Applications
Yokohama, Japan
Deadline: November 7, 2008
May 20-22, 2009

[CCIW09](#)

2nd Computational Color Imaging Workshop
Saint Etienne, France
Deadline: December 1, 2008
March 26-27, 2009

[SCIA 2009](#)

16th Scandinavian Conference on Image Analysis
Oslo, Norway
Deadline: December 14, 2008
June 15-18, 2009

[ICDAR 2009](#)

*10th International Conference on
Document Analysis and Recognition*
Barcelona, Spain
Deadline: January 12, 2009
July 26-29, 2009

Call for Submissions

IAPR Newsletter

*Articles, announcements, book reviews,
conference and workshop reports*

Contact the editor: log@ieee.org

Deadline: September 30, 2008

The logo for the IAPR Newsletter. It features the acronym "IAPR" in a bold, purple, sans-serif font. To the right of "IAPR" is a circular icon containing a stylized, multi-colored spiral or globe. Below "IAPR" and the icon, the word "Newsletter" is written in a large, black, cursive script font.

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Linda J. O’Gorman

ICPR 2008

www.icpr2008.org/

Register now...early bird registration ends August 8, 2008.



ICPR 2008 will be an international forum for discussions on recent advances in the fields of
Computer vision
Pattern recognition (theory, methods and algorithms),
Image, speech and signal analysis,
Multimedia and video analysis,
Biometrics,
Document analysis, and
Bioinformatics and biomedical applications.

ICPR 2008 will be held at the Tampa Convention Center. With pristine beaches, numerous parks, arts and science museums, and vibrant night life, Tampa Bay is a popular destination for tourists

See you in Tampa!

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News from the IAPR EXECUTIVE COMMITTEE

By [Denis Laurendeau](#)

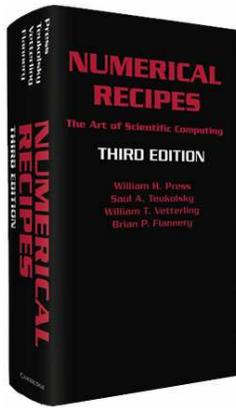
With [ICPR 2008](#) (see [related advertisement in this issue](#)) getting nearer, the ExCo is pleased to announce that, as approved by the GB in the budget, the IAPR will again offer a limited number of ICPR Travel Stipends in the amount of US\$700 to authors of accepted papers to encourage increased participation from those with very limited resources to pay for full conference travel expenses. The procedure for applying for the travel stipends will be included in the notification of acceptance message sent to authors of accepted papers.

The Technical Committee on Machine Learning and Data Mining (TC 17) has experienced various problems, and the Chair of the TC has recommended to the ExCo that the TC be cancelled. The ExCo has launched a GB consultation on this issue and, following this consultation, a GB ballot will be initiated. It is clear that no matter the result of the ballot, actions will need to be taken so that this topic remains in the spectrum of important fields covered by the IAPR.

On the topic of technical committees, the ExCo would like to call again for people interested in giving new life to the TC on Biomedical Image Analysis (TC9). A project on the creation of a TC on Video Surveillance has also recently been submitted to the ExCo. The information on this initiative will be communicated in the near future by IAPR Second Vice-President, Sergey Ablameyko. Members of the IAPR community interested in this field should get in touch with Dr. Ablameyko (abl@newman.bas-net.by).

The [IAPR Statement of Ethics](#) that was approved by the GB has been posted on the IAPR website and has come into force. The Conferences and Meetings Committee now sees that organizers seeking IAPR support must comply with the Statement of Ethics. It is hoped that this will help in improving the quality of contributions to future events.

BOOKSBOOKSBOOKS



Numerical Recipes: The art of scientific computing. 3rd edition

By William H. Press, Saul A. Teukolsky,
William T. Vetterling, and Brian P. Flannery
Cambridge University Press, 2007

Reviewed by
[Jason Dowling](#)

This book is the third edition of one of the most practical and interesting books I've used in my research and study. Written by a team of high profile academics, numerical recipes is bursting at the covers with a huge range of topics in 1235 pages consisting of 22 chapters. This new edition contains two entirely new chapters, 25 new sections, over a hundred new routines, and many other updates to the text. An older 2nd edition of the book in C is freely available on the web at www.nr.com/oldverswitcher.html.

In the following paragraphs I'll attempt to quickly summarize the contents of this book. Most of these chapters could be a textbook by themselves, so some of the coverage is fairly brief. Note that each of these topics mentioned is accompanied by code examples.

The first chapter of the book provides information on floating point representations in computers, round-off and truncation errors, and stability. This is followed by a brief overview of C and C++ programming concepts.

Chapter 2 focuses on solutions of linear algebraic equations and covers Gauss-Jordan elimination; Gaussian elimination with back-substitution; LU decomposition; tri-diagonal and band-diagonal systems of equations; iterative improvements to solutions; singular value decomposition, sparse linear systems, Vandermonde and Toeplitz

matrices; Cholesky and QR decomposition. The authors also briefly mention LAPACK here as well.

The third chapter moves on to interpolation and extrapolation (polynomial, cubic spline, rational functions and Laplacian). There is also a useful section on interpolation on a grid in multiple dimensions.

The next three chapters are concerned with functions and include topics on integration (from classical formulas and elementary algorithms through to multidimensional integrals) and evaluation (polynomials and rational functions, continued fractions, series and their convergence, recurrence relations, complex arithmetic, quadratic and cubic equations, numerical derivatives, topics relating to Chebyshev approximation, economization of power series, Padé approximants and evaluation by path integration). Finally there is a chapter containing a huge list of special functions, each with a clear description and associated code listings. These include the gamma and beta functions, factorials, Bessel functions, spherical harmonics, Fresnel, cosine and sine integrals, Jacobian elliptic functions and many useful statistical functions.

Chapter seven contains 78 pages on random numbers from basic pseudo-random number

(Continued on page 6)

(Continued from page 5)

generation to adaptive and recursive Monte Carlo methods. Of note in this chapter are the sections on hash tables and hash memories. The next chapter provides a review of sorting and searching algorithms (Quicksort, Heapsort, finding the Mth largest elements in an array, etc).

Root finding and nonlinear sets of equations are the topic of the next chapter, commencing with bracketing and bisection, secant, false positive, Ridders', Brent's, and Newton-Raphson methods. These are followed by sections on finding roots of polynomials using Newton-Raphson for nonlinear systems of equations and globally convergent methods. This leads into what I think is one of the most useful chapters in the book focussing on optimization in one dimension (golden search, parabolic interpolation, and one-dimensional search with first derivatives) and then multiple dimensions (downhill simplex, Powell's, conjugate gradient and quasi-Newton methods). This chapter then introduces linear programming and describes the simplex and interior point methods. Finally there are fairly brief sections on simulated annealing methods and dynamic programming.

Chapter eleven discusses eigensystems, from introductory topics to Jacobi transformations of symmetric matrices, eigenvalues and eigenvectors of tridiagonal matrices, Hermitian and real nonsymmetric matrices, and more.

The next two chapters move into the frequency domain with a good introduction to the Fourier transform and the fast Fourier transform (FFT) in one, two (e.g. for image processing) and three dimensions. This is followed by sections applying the FFT including: convolution/deconvolution, correlation and autocorrelation, Wiener filtering, power spectrum estimation, and computing Fourier integrals. An interesting section on wavelets and the discrete wavelet transform

(DWT) is also included.

The next three chapters of the book (178 pages) cover statistical description of data (moments various statistical tests, correlation, information, a good section on theoretic properties of distributions such as entropy and mutual information, and smoothing filters), then modelling of data (least squares as a maximum likelihood estimator, data fitting to a line, general linear least squares, nonlinear models, confidence limits on estimated model parameters, Markov Chain Monte Carlo, and Gaussian process regression), and finally classification and inference (Bayesian networks, Gaussian mixture models and k-means clustering, Viterbi decoding, Markov models and hidden Markov models, hierarchical clustering by Phylogenetic trees, and support vector machines).

The book returns to calculus in chapters 17-20. These chapters discuss the integration of ordinary differential equations, two-point boundary value problems, integral equations and inverse theory, and partial differential equations.

Chapter 21 targets useful topics in computational geometry including tree data structures for sets of points, nearest-neighbour problems, line segments, polygons, spheres, triangulation, Voronoi diagrams, and convex hulls.

The final chapter contains an eclectic selection of algorithms ranging from plotting simple PostScript® graphs, diagnosing machine parameters, gray codes, cyclic redundancy, data compression, arithmetic coding, and arithmetic at an arbitrary precision.

The layout of the book is consistent, with colour used to highlight program code. The header filename is shown in the margin next to each function. The index and general editing appear to

(Continued on page 7)

(Continued from page 6)

be excellent.

The CD-ROM (which does not come with the book by default) contains all of the source code. Index pages are provided listing the code by section, identifier, and filename. The CD-ROM also contains all code from the 1st and 2nd book editions and some historical libraries of code (mainly in C).

There is also a very good web site associated with the book at www.nr.com which includes an online version of the book (license required), extra information (e.g. a tutorial on using NRR to extend Matlab), active user forums (which amongst other topics contains a thread on alternates to the book such as www.netlib.org and www.gnu.org/software/gsl/gsl.html). The online dependencies tool at www.nr.com/dependencies/ is useful for working out which header files need to be included to use each function.

The license for the numerical recipes code has attracted some criticism. In a nutshell, purchasing the book only provides a single user license which allows the distribution of compiled code for non-commercial use only. However, in the book's defence, it does appear to be designed to teach a reader how to understand the solution to a numerical problem. As the authors

state in the preface (p. xx), readers are free to develop their own implementations of solutions and include them in commercial applications. This seems fair to me. Of interest to readers in developing countries is the recent announcement on www.nr.com that "*Numerical Recipes Third Edition* (on-line book and code) is now available by open access to users in developing countries. This free resource is hosted by ICTP, a UNESCO and IAEA organization".

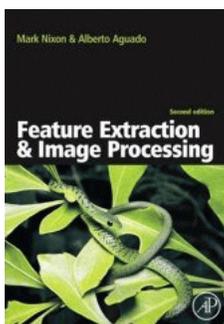
It's hard to fault such a classic book. I think in general the code could be made easier to understand by updating single letter variable names to something meaningful. The authors don't appear to make use of the C++ standard template library. Also, the 2nd edition of numerical recipes had example driver code for each class which might have been a useful addition on the CD-ROM.

In summary, I think this is an incredibly valuable book for both learning and reference, and I recommend it for any scientists or student in a numerate discipline who need to understand and/or program numerical algorithms.

Visit the
Numerical Recipes web site:

www.nr.com

BOOKSBOOKSBOOKS



Feature Extraction and Image Processing, 2nd edition

by Mark Nixon and Alberto Aguado
Academic Press, December 2007

Reviewed by
[Elisa H. Barney Smith](#)

This is a 400 page book with, as its title states, information about image processing and techniques to extract image features, particularly edges, shapes and textures. The book contains a broad overview of the field presented at a level of depth aimed at those who are new to the field.

One of the assets of this book is its large number of references. Image processing can be quite a broad field, and the book's authors cite an overwhelming and impressive number of books, conference, and journal articles on a broad range of topics. The citations are often accompanied by a description of how each reference can be beneficial and how it is related to the topic under discussion. This citation list would be beneficial for practitioners who are taking a sidestep to a new part of their field, for professors to provide articles for their students, or for students to follow subjects more deeply and independently.

Each chapter starts with a table listing the main topics of the chapter. These are listed both from an applications standpoint and from a technical component/algorithm standpoint. The book starts with an introduction of the requisite material on human vision systems and a few mind-eye tricks. Then it provides a very good overview of image processing software and web site resources.

Chapters 2 and 3 give the basic definitions of images and gray scale representations and introduce techniques such as the Fourier transform, image histograms and point

operations, convolution and other window based operations. Chapter 4 starts into feature extraction in the context of edge detection, edge curvature and corner detection, and then provides a short discussion of optical flow. Chapter 5 discusses shape matching both from a template standpoint and a Hough transform standpoint. The Hough transform discussion is expanded beyond the straight line discussion found in most image processing texts to circles, ellipses and the generalized Hough transform. Chapter 6 discusses snake and active contour techniques and includes a discussion of skeletonization (that doesn't seem to fit with the rest of the chapter contents). Chapter 7 covers object description. This includes boundary descriptors like chain codes and Fourier descriptors and region descriptors like moments.

Chapter 8 endeavors to bring the whole concept of feature extraction together with the feature of texture. There is a short discussion of how the various features that have been identified throughout the book could be used to do texture classification. As I associate "feature extraction" with "pattern recognition", given the title of the book, I felt this should have been done earlier and used throughout the book to indicate how the image processing is related to feature extraction.

There are four appendices in the book covering,

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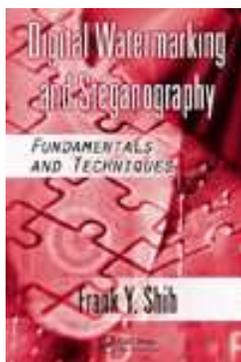
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Matlab and MathCAD worksheets, camera geometry models, least square analysis, and principal component analysis. There is a smattering of MathCAD and MATLAB code throughout the book. The Matlab code is written to be functional pseudo code rather than efficiently written Matlab code, as it used excessive for-loops instead of making use of Matlab's array based processing features. These would have to be rewritten to run at any reasonable speed, but if you are starting at the

beginning it is useful to have some functional code to test things out.

To accomplish its goal as an overview text, this book describes many different techniques for each task. For many topics, mathematical descriptions are provided – while still keeping the discussion at an overview level. This book could be used for an introductory course if the instructor supplements with material from his or her favorite sub-topics. The book can also be used as a good framework to facilitate a broad range of discussion topics through its content and

BOOKSBOOKSBOOKS



Digital Watermarking and Steganography: Fundamentals and Techniques

by Frank Y. Shih
CRC Press, 2008

Reviewed by: [Lawrence O'Gorman](#)

Watermarking is a field of signal processing and pattern recognition that has enjoyed accelerated interest since the mid-90s directly in parallel to the explosive growth of the Internet. The reason is that, although the Internet enables easy, global distribution of documents, this same advantage is a security disadvantage. How do you control distribution to only those who have legitimate access or who have purchased access rights? How do you prevent legitimate buyers of documents from reselling these illegitimately? How do you prevent a document from being re-authored, effectively misrepresented by a plagiarizer? Internet documents can be anything from text to audio, to image, to video. We know that there has been much concern from the respective industries (most publicly the music industry), and a rush to solutions by the technical community in the form of many watermarking techniques. This book focuses on image watermarking and describes the basics and more advanced methods of the field.

This is a relatively short book, which I consider an advantage. It is 180 pages, including index. However, it is densely packed with all the information that a student, researcher, or practitioner will need to start and to delve well into the fields of image watermarking and steganography. It is very well-illustrated with

example figures and tables that by my count averaged more than 3 per page. Each of the 12 chapters has a list of references of from 10 to 40 in number. The index looks thorough and the table of contents and lists of sections per chapters enables fast lookup of topics of interest.

Chapter 1 introduces the field and distinguishes watermarking from steganography. The latter term refers to information-hiding. Although a watermark is not always hidden in its resident document, it often is. The main feature that distinguishes steganography from watermarking is the following. For steganography, the embedded information is the one and only item of interest, and the document in which that information is embedded simply provides an entity for hiding. However, a watermark contains information specifically associated with the document into which it is embedded (e.g., copyright, authorship, buyer).

Chapter 2 provides watermarking classifications. There is sometimes some confusion in classifying watermarking techniques. This book addresses this by classifying first based on characteristics and second based on applications. Three characteristics classifications are: perceptible/imperceptible, robust/fragile, and spatial/frequency domain based. Two application

(Continued on page 11)

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classifications are: copyright protection, data authentication, and fingerprinting (identification of recipient of document).

Chapter 3 provides mathematical fundamentals, including cosine and wavelet transforms, random sequence generation, and error correction.

Chapter 4 provides watermarking fundamentals, including additive and multiplicative watermarking, spatial and frequency domain watermarking, fragile and robust watermarking—the latter by redundancy or spread spectrum approaches.

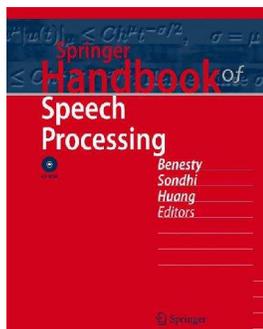
After these three chapters describing the watermarking basics, Chapter 5 introduces the reader to watermarking attacks, leaving the following four chapters to describe more sophisticated watermarking methods to counteract attacks or for other demands. The attacks discussed in Chapter 5 include: filtering, modulation, compression (JPEG), scaling, rotation, cryptographic, and protocol attacks. Chapter 6 describes combinatorial watermarking where a watermark is separated into spatial and frequency components and added to these respective domains of the same image. This can be advantageous in at least two ways: it can increase capacity at same level of perception or decrease potential for successful attack. Chapter 7 introduces watermarks created via a genetic algorithm, in this case to reduce error brought about by rounding of the watermark elements. Chapter 8 discusses adjusted-purpose watermarking, in which an appropriate choice is made analytically from the continuum of watermarking methods and from the parameters discussed up to this point in the book. Chapter 9

introduces the challenge of robust high-capacity watermarks that resist attacks.

The final two chapters, 10 and 11 are devoted to steganography. A short introduction in Chapter 10 concludes with short descriptions of four available steganographic software packages: S-Tools, StegoDos, EZStego, and JSTEG-JPEG. Chapter 11 covers steganalysis, that is steganography attacks. These two final chapters are short, but in concert with the preceding chapters devoted to watermarking, they provide a complete picture of the field and a basis for future work—including project work by a student in either watermarking or steganography.

One advantage of this book is that the author and his students have personally contributed to research on many of the techniques. This is evidenced by practical examples included in many of the chapters that, I conjecture, are part of one or more published papers. The author clearly has extensive and direct research experience with images. The general field of watermarking is also applied to other signal and document types, a relatively important one being music/audio and a smaller one being text. These are not covered in the text, so those interested in these applications would need to look elsewhere. A more specific title might have been *Digital Watermarking and Steganography for Images: Fundamentals and Techniques*. However, for anyone—students, researchers, or practitioners—wanting to learn about general watermarking, image watermarking is probably the most straightforward way to start (you can see pictures!), and this book is a concise and good place to begin this task.

BOOKSBOOKSBOOKS



Springer Handbook of Speech Processing

by J. Benesty, M. M. Sondhi, Y Huang, eds.
Springer, 2008

Reviewed by: [Lawrence O’Gorman](#)

This major textbook befits the mature status of the field of speech processing about 40 years into its digital lifetime. This book speaks “major” in many ways. It is 1176 pages long. There are 53 chapters, and these chapters are organized into 9 parts. The list of 83 contributing authors includes many who were involved originally in the field and many who are now at the forefront of research in the particular topic on which they contributed.

It is evident that books in the Springer Handbook series are meticulously formatted to function as efficiently as possible as a source that can be quickly accessed in many ways. Starting from the front inside flap, there are part summaries, along with each chapter title. The table of contents includes part title, chapter title, and titles of subsections. This table of contents runs 13 pages. Next there is an alphabetically ordered list of abbreviations, numbering over 500 entries. Following the book chapters is another table of contents, this one “detailed”, which includes subsections as well sections. Following this is the subject index. Although authors of the chapters are listed with their biographies, noticeably absent is an author index that would include not only contributors but entries for referenced papers. Finally, the back flap has a DVD-ROM containing full, searchable contents of the book.

Part A begins with the basics of human speech production. It is entitled “Production, Perception, and Modeling of Speech”. The four chapters cover the physiological basics of speech production, cochlear speech and sound perception, and subjective and objective speech quality assessment methods.

Part B introduces speech signal processing methods. These include: Wiener and adaptive filters, linear prediction, Kalman filter, homomorphic and cepstral processing, pitch determination, formant estimation, Fourier transform, and multichannel identification.

Part C describes speech coding. The chapters cover: principles, voice-over-IP, low bit rate coding, analysis by synthesis coding, and perceptual audio coding.

Part D covers text-to-speech synthesis. The chapters cover: principles, rule-based synthesis, corpus-based synthesis, linguistic processing, prosodic processing, voice transformation, and expressive/affective synthesis.

Part E is a large section covering speech recognition. Chapters here are: history of automatic speech recognition and natural language understanding, hidden Markov models, weighted finite-state transducers, machine learning, toward superhuman recognition,

(Continued on page 13)

(Continued from page 12)

natural language understanding, spontaneous speech recognition, environmental robustness, the business of speech technologies, and spoken dialogue systems.

Part F is on speaker recognition. Chapters are: overview, text-dependent and text independent recognition.

Part G elevates from signals to language recognition. The chapters cover: principles, spoken language characterization, spectral- and token-based approaches, and vector-based classification.

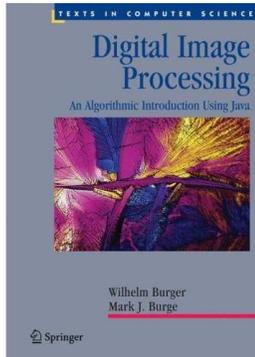
Part H describes speech enhancement techniques. The chapters here are: fundamentals of noise reduction, spectral enhancement,

adaptive echo cancellation, dereverberation, adaptive beamforming and postfiltering, feedback control in hearing aids, and active noise control.

Finally, Part I covers multichannel speech processing. The chapters are: microphone arrays, time delay estimation and source localization, convolutive blind source separation methods, and sound field reproduction.

This handbook provides a convenient way for anyone— graduate student, researcher, or practitioner—to own a single comprehensive reference book to begin in this field. Because of the breadth and depth, this book also offers non-beginners and speech experts deeper coverage of many topics. This book well-befits the large, technologically and commercially successful, and still progressing field of speech processing.

BOOKSBOOKSBOOKS



Digital Image Processing: An Algorithmic Introduction Using Java

by **Wilhelm Burger & Mark James Burge**
First English language edition, Springer, 2008

Reviewed by: [Arjan Kuijper](#)

Some time ago a colleague of mine explained to me the success of one of his papers in medical imaging. It was, of course, a good piece of work, but more importantly, he had developed a software plug-in and put it on line, free for download. He has counted over one thousand downloads and subsequently numerous references to his paper. The reason for his success: a program written in Java—ImageJ.

The book by Burger and Burge (an interesting combination from pattern recognition point of view!) focuses on introducing digital image processing using this programming language, ImageJ. This distinguishes the book from basically all other text books in imaging that I am aware of. The most well-known books avoid all programming aspects. Although this maintains the focus on the imaging aspect, problems often occur when one tries to implement things. At least in my experience it *never* works—well, only after several debugging attempts. I believe I am not alone in this.

On the other hand, there are text books that give an introduction—or description—of imaging in typical engineering or academic languages like C (and variants), Matlab, or Mathematica. The major problem encountered by the authors of these books is that often a certain level of programming skills and imaging knowledge is assumed. They would be a good source for courses in the second half of a Master program,

but *not* in the Bachelor program. Furthermore, Java has become more and more popular as a programming language in multimedia applications, especially in the non-engineering/non-computer science area.

Since digital imaging has become such a basic and ubiquitous part of multimedia education, the authors decided to write a book on this topic. After two successful German editions (which have found their way into several German and Austrian universities and applied universities), an English version has now been published. According to the preface, this is at the cost of 560 kWh of electric energy and 196 kg of carbon dioxide!

The book can be used for two semesters: one on image processing and one on image analysis. Alternatively, the choice of a fundamental and an advanced course can be taken. Many modern books are accompanied by a CD with (extra) contents. This book, however, is supported via the web site www.imagingbook.com on which all Java code can be found, as well as the images in uncompressed TIFF format (for tests) and in PGN format (for slides).

The general structure of the chapters is such that first the concept is discussed, then a program in pseudo code is given, thirdly the Java program is presented, and finally some exercises are given.

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The 17 chapters deal with various standard and not-so-standard topics. They start with defining an image and problems in storing images—giving rise to a (for me very interesting) discussion of various digital image types. This is followed by a short introduction of ImageJ.

Then they start with the real work: histograms and operations on them, like gamma correction. The chapter on filters doesn't only present a collection of filters, but also gives the relevant mathematical background on convolution, for instance the commutative, associative, and linear properties. The rationale behind this is that the students do not only need the *how* to do it (programming skills and pseudo code), but also need the fundamental understanding of *what* they are doing.

In “Edges and contours” the authors give an overview of most edge filters incorporated in imaging software and ways to use them for sharpening. After this, the next thing to discuss is corners. This is done in the next chapter by means of the Harris corner detector from concept to implementation.

A third of the way into the book, more advanced chapters start, discussing the Hough transform (lines, circles), morphological filters (dilation, erosion, opening, closing, gray scale), and regions in binary images (finding regions, contours, representations, and properties based on geometry, statistics, and moments).

The chapter dealing with colour was quite instructive to me as it discusses all different colour spaces “I had heard of but never dared to ask about”. Again all kinds of file types and their ways to handle colour are discussed.

Conversions from one colour space to the other

are given (RGB, HSV/HSB, HLS, YUV, YIQ, YCbCr., CMY, CMYK, CIE, L*a*b, sRGB)—well, actually I didn't know all of them. This chapter ends with a discussion of colour statistics and quantisation.

After two thirds of the book, the real advanced chapters begin: the spectral techniques (discrete) Fourier transform and Cosine transform. Again no compromise is made towards the mathematics. In a clear way complex numbers are introduced and the relations between original and transformed signal/image are given. Special attention is paid to aliasing effects, boundary conditions and windowing, all with clear visual examples.

The last two chapters deal with mappings. Firstly, geometric operations like scaling, rotation, projective transformation, and nonlinear distortion are discussed. Most of the time, such operations require a resampling of the image. For this purpose, an overview of interpolation methods is given (NN, linear, cubic, splines, Lanczos, ...). Instructive is the visualisation of all methods. The last chapter deals with comparing images and presents different measures for matching a reference image in a search image for both gray scale and binary images.

Having covered 450 pages of text by now in three stages, an additional 100 pages follow with “other” things, like the appendices with mathematical notation, Java notes, an ImageJ short reference, source code for longer programs, and references. The references contain a mixture of old and new papers (up to 2007), guaranteeing a book that is up-to-date and presents the basic principles as well. Finally, there is a complete index.

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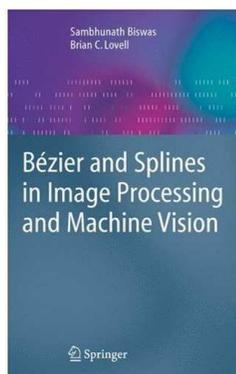
(Continued from page 15)

The colour printing and the quality of the paper are excellent. This makes browsing the book a pleasant experience. For me—having little experience with ImageJ and Java—the book is a worthy addition to the textbooks I have, as it explains the basics of digital image processing without avoiding the essential mathematical background. It is an extremely useful textbook for undergraduate digital imaging courses based on Java/ImageJ. For people familiar with Java and interested in imaging, it is worth double the money as a reference book.

*More information can
be found at:*

www.imagebook.com

BOOKSBOOKSBOOKS



Bézier and Splines in Image Processing and Machine Vision

by **Sambhunath Biswas and Brian C. Lovell**
Springer, December 2007

Reviewed by: [Mark Sugrue](#)

Splines, those piece-wise polynomial functions that take their name from an old shipwright's tool, are becoming the Swiss army knife of the image processing world, used in applications as diverse as image compression and object tracking in video. Biswas and Lovell's new book, *Bézier and Splines in Image Processing and Machine Vision*, therefore promises to be a useful addition to the bookshelf.

When I opened it, I was hoping for a book that would bring some order to the smorgasbord of various algorithms and terms that have multiplied under the banner of "splines". I was also hoping to come away with a clear understanding of which splines should be used for what applications, and why. This book does go some way towards satisfying my perhaps excessive demands, but it doesn't quite succeed on every score.

While it does contain a large amount of excellent information and useful derivations, I found the layout and organization were not ideal for quickly finding what I was looking for.

The book opens with a highly detailed and well written chapter on the Bézier-Bernstein spline. This is followed by a chapter on image segmentation and one on splines and graylevel coding. Both of these chapters contain sections on image compression, and these lead in to Chapter 4, titled "Image Compression".

Based on the title "Image Compression", I expected a general treatment of the use of spline in compression. The chapter discusses a single algorithm called Subimage based Lossy Image Compression or SLIC. This algorithm uses the Bézier-Bernstein polynomial and aims to extract regions of common texture within the image. While this is interesting, I believe the layout would have been greatly improved if the image compression content from Chapters 2 and 3 were moved to Chapter 4 to make this chapter more rounded.

The next lengthy chapter comprehensively covers the area of B-splines and their application in machine vision. Also excellent are the chapters on discrete splines and wavelet splines, which provide a strong mathematical foundation for these topics. I question the inclusion of a whole chapter on the area of Beta-splines, even though, as that chapter concludes, these have not been used in image processing and machine vision.

The final two chapters are by far the most accessible to the novice. Chapter 9 deals with snakes and active contours and begins with a well written guide to using energy minimisation functions to direct a snake. Dynamic programming techniques and the famous Viterbi algorithm are then well explained, with reference to numerous example images. Chapter 10, the final chapter, presents techniques using Global

(Continued on page 18)

(Continued from page 17)

Optimal Energy Minimization Techniques and reads like a case study for the application of snakes to the field of medical imagery. I would recommend that the novice reader consider starting with these chapters before moving onto the heavier early chapters.

In general, this book scores highly for content but could improve in organisation and presentation in my opinion. The preface describes splines as "effective, efficient, easy to implement, and [with] a strong and elegant mathematical background." I was hoping for a less mathematical and more 'hands-on' approach to the material with practical coding and implementation examples. A second edition could include more pseudo-code segments, which would clarify the practicality of the sometimes lengthy derivations sections. In summary, this is a mathematics book for the machine vision practitioner.

Book Reviews Published in the IAPR Newsletter

Numerical Recipes: The art of scientific computing, 3rd ed. by Press, Teukolsky, Vetterling and Flannery, review in this issue

Feature Extraction and Image Processing, 2nd ed. by Nixon and Aguado, review in this issue

Digital Watermarking and Steganography: Fundamentals and Techniques by Shih, review in this issue

Springer Handbook of Speech Processing by Benesty, Sondhi, and Huang, eds., review in this issue

Digital Image Processing: An Algorithmic Introduction Using Java by Burger and Burge, review in this issue

Bézier and Splines in Image Processing and Machine Vision by Biswas and Lovell, review in this issue

Practical Algorithms for Image Analysis, 2 ed. by O’Gorman, Sammon and Seul, Apr ‘08 issue

The Dissimilarity Representation for Pattern Recognition: Foundations and Applications by Pekalska and Duin, Apr ‘08 issue

Handbook of Biometrics by Jain, Flynn, and Ross (Editors), Apr ‘08 issue

Advances in Biometrics – Sensors, Algorithms, and Systems by Ratha and Govindaraju, (Editors) Apr ‘08 issue

Dynamic Vision for Perception and Control of Motion by Dickmanns, Jan ‘08 issue

Bioinformatics by Polanski and Kimmel, Jan ‘08 issue

Introduction to clustering large and high-dimensional data by Kogan, Jan ‘08 issue

The Text Mining Handbook by Feldman and Sanger, Jan ‘08 issue

Information Theory, Inference, and Learning Algorithms by Makay, Jan ‘08 issue

Geometric Tomography by Gardner, Oct ‘07 issue

“Foundations and Trends in Computer Graphics and Vision” Curless, Van Gool, and Szeliski., Editors, Oct ‘07 issue

Applied Combinatorics on Words by M. Lothaire, Jul ‘07 issue

Human Identification Based on Gait by Nixon, Tan and Chellappar, Apr ‘07issue

Mathematics of Digital Images by Stuart Hogan, Apr ‘07 issue

Advances in Image and Video Segmentation, Zhang, Editor, Jan ‘07 issue

Graph-Theoretic Techniques for Web Content Mining, by Schenker, Bunke, Last and Kandel, Jan ‘07 issue

Handbook of Mathematical Models in Computer Vision by Paragios, Chen, and Faugeras (Editors), Oct ‘06 issue

The Geometry of Information Retrieval by van Rijsbergen, Oct ‘06 issue

Biometric Inverse Problems by Yanushkevich, Stoica, Shmerko and Popel, Oct ‘06 issue

Correlation Pattern Recognition by Kumar, Mahalanobis, and Juday, Jul. ‘06 issue

Pattern Recognition 3rd Edition by Theodoridis and Koutroumbas, Jul. ‘06 issue

Dictionary of Computer Vision and Image Processing by R.B. Fisher, et. Al, Jan. ‘06 issue

Kernel Methods for Pattern Analysis by Shawe-Taylor and Cristianini, Oct. ‘05 issue

Machine Vision Books, Jul. ‘05 issue

CVonline: an overview, Apr. ‘05 issue

The Guide to Biometrics by Bolle, et al, Jan. ‘05 issue

Pattern Recognition Books, Jul. ‘04 issue

Conference Report: [DGCI 2008](#)

14th International Conference on Discrete Geometry for Computer Imagery

16-18 April 2008
Lyon, France

Report prepared by the DGCI 2008 Co-chairs:

[Isabelle Sivignon](#)

[David Coeurjolly](#)



DGCI is the main conference of the IAPR Technical Committee on Discrete Geometry ([TC18](#)) and is held approximately every 18th months. The 2008 edition was organized by the Multiresolution, Discrete, and Combinatorial Models (M2DisCo) team of the Laboratoire d'Informatique en Image et Systèmes d'Informations (LIRIS) of Lyon, France.

DGCI 2008 attracted many researchers from all around the world. Indeed, 76 papers were submitted, from 24 different countries (13 European and 11 non-European), confirming the international status of the conference. Once reviewed, 45 papers were accepted for publication in the present LNCS volume (see sidebar). There were 23 papers scheduled for oral presentation in single-track sessions, and 22 papers were presented as posters, with an additional very short

presentation in preliminary plenary sessions. The oral and poster session covered the topics: Models for Discrete Geometry, Discrete Shape Representation, Recognition & Analysis, Discrete and Combinatorial Tools for Image Segmentation and Analysis, Morphological Analysis, Discrete and Combinatorial Topology, Geometric Transforms, and Discrete Tomography.

Three invited speakers gave lectures on topics ranging from connected fields to the theoretical foundations of Discrete Geometry:

⇒ Pr. Jean-Pierre Reveilles (University of Auvergne, France) gave a talk on "Weak Rational Computing for Digital Geometry" coming back to the roots of digital geometry;

(Continued on page 21)

(Continued from page 20)

- ⇒ Pr. Ullrich Köthe (University of Heidelberg, Germany) asked us "What can we learn from discrete images about the Continuous World ?" highlighting the links between the continuous and discrete worlds;
- ⇒ Pr. Dinesh Manocha (University of North Carolina at Chapel Hill) gave a talk about "Digital Geometry Processing with Topological Guarantees", thus opening connections with the computer graphics research field.

Note that the slides and videos of the keynote talks are available online on DGCI 2008 webpage iris.cnrs.fr/dgci2008/postconference.html.

Proceedings of the conference have been published by Springer-Verlag in [Lecture Notes in Computer Science Series \(volume number 4992\)](#).

Following the conference, two special issues in the journals Pattern Recognition and Computers & Graphics are scheduled to appear in early 2009.

The conference brought together 98 participants from 18 countries. The conference was well-organized and the program ran smoothly. The conference hall and the material infrastructure (audio/video, internet connection) worked according to high standards.

The social program was appreciated as well. A guided tour of the Vieux Lyon (listed by UNESCO) was organized on the first evening, including a visit to inner courtyards and "traboules" (covered passageways). The gala dinner was held in Château des Ravatys, in the Beaujolais countryside. A wine degustation in caves was proposed and the dinner took place in the "Orangerie".

The next DGCI conference will be held in Montreal, Canada, October 7-9, 2009, organized by the Laboratoire de Combinatoire et d'Informatique Mathématique (LaCIM) and Université du Québec, with Srecko Brlek as General Chair. It will be the first edition of DGCI outside Europe.



**Proceedings
of the conference
have been
published by
Springer-Verlag
in the
Lecture Notes in
Computer Science
Series**

Volume4992.

IAPR TC18 web site:

www.cb.uu.se/~tc18/

Workshop Report: [CIP 2008](#)

1st IAPR Workshop on Cognitive Information Processing

9-10 June 2008
Santorini, Greece



Report prepared by the CIP 2008 Co-chairs:

[Simon Haykin](#)

[Sergios Theodoridis](#)



Round Table Discussion, Tuesday, June 10, 2008.

From left to right: Jose Principe, Ali Sayed, Simon Haykin, Bernhard Scholkopf, Timo Honkela, Tali Tishby

The event was very successful with 54 participants. The total number of submitted papers was 71 from 27 countries. Each paper was reviewed by three reviewers. 41 papers were accepted with an overall acceptance rate of 58% and 28% for the oral sessions.

The highlight of the workshop was the six plenary speakers: Prof. Simon Haykin, Prof. Timo Honkela, Prof. Jose Principe, Prof. Ali Sayed, Prof. Bernhard Shoelkopf and Prof. Naftali Tishby. The plenary talks were of a complementary nature, and they all raised interesting discussions.

The last day, a round-table discussion took place, concerning the nature and the future prospects of cognitive processing. All participants agreed that cognitive processing is here to stay and in the future more and more intelligence will be integrated into the development of any system.

The Proceedings of the workshop are freely (Open Access) available via the [EURASIP's site](#).

Visit the CIP 2008 web site's list of

[Authors and Papers](#)

to link to full-text versions of the papers.

Non-IAPR Workshop Report: OAGM/AAPR 2008

32nd Workshop of the Austrian Association for Pattern Recognition

26-27 May 2008
Bildungszentrum St. Magdalena, Linz

Report prepared by
[Arjan Kuijper](#), Chair



The annual workshop of the [Austrian Association for Pattern Recognition](#) (“Österreichische Arbeitsgemeinschaft für Mustererkennung”) provides a platform for bringing together researchers in the fields of image analysis, image processing, and pattern recognition to discuss relevant and important topics in the computer-vision discipline. It is organized in workshop form and presents the latest work of Austrian (Central European) and international institutes in the domain of computer vision and pattern recognition.

During the two-day meeting, nearly 50 participants from academia and industry met at the conference centre “over the rooftops of Linz”. The workshop was organised by Arjan Kuijper ([Johann Radon Institute for Computational and Applied Mathematics \(RICAM\)](#), Austrian Academy of Sciences, Linz) and Bettina Heise and Leila Muresan ([Fuzzy Logic Laboratory Linz FLLL](#)), Johannes Kepler University, Linz).

The call for papers resulted in 27 submissions, of which 19 were presented: an acceptance rate of 70%. The papers originated from eight different countries and were carefully reviewed by three members of the international program committee.

This year, special attention was paid to the theme “*Challenges in the Biosciences: Image Analysis and Pattern Recognition Aspects*”. Due to generous sponsoring of the [Software Competence Center Hagenberg](#) and the [Austrian Research Centers](#), four speakers could be invited.

Prof. [Lucas J. van Vliet](#) (Quantitative Imaging Group at Delft University of Technology, The Netherlands) presented the work done in his group on extremely small scales in “Quantitative microscopy: The role of image processing to study cells, sub-cellular constituents and individual molecules”.

(Continued on page 24)

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Prof. [Fred A. Hamprecht](#) (Robert-Bosch endowed Associate Professor for Multidimensional Image Processing at the University of Heidelberg, Germany) presented work on merging location and spectrum information in “Exploiting Spatial Context in the Classification of Magnetic Resonance Spectroscopic Images”.

Prof. [Wiro Niessen](#) (Biomedical Image Processing at the Erasmus Medical Centre, Rotterdam, The Netherlands) gave a presentation on objective gauges in image-guided medicine in “Advanced Image Analysis for developing Quantitative Imaging Biomarkers”.

Finally, Prof. [Gerhard J. Schütz](#) (Biophysics Institute at the Johannes Kepler University in Linz) presented challenging imaging and pattern recognition tasks in “Single Molecule Fluorescence Microscopy - Applications to Biology”.

Besides the invited presentations, two oral sessions and several posters were dedicated to this topic. Obviously, the OAGM workshop covers *all* computer vision aspects on pattern recognition and image analysis & processing that are relevant to the OAGM/AAPR community. So these topics were presented in the other oral

sessions and posters.

That both areas are important became nicely highlighted in the AAPR-sponsored best student award. Two presentations received the same points: *Cardiac 4D Image Sequence Registration Using Bridging Points*, by Alfredo Lopez (et al.), and *Kernel-based Tracking Using Spatial Structure*, by Nicole M. Artner (et al.). These papers showed a successful collaboration between academia and scientific partners as well.

Besides academic discussions, the participants enjoyed a traditional Austrian dinner with a traditional Austrian view. Impressions and more details on the program can be found on the [conference web site](#).

The next AAPR workshop will be organized by Peter M. Roth from the [Institute for Computer Graphics and Vision](#) in Graz and will be held in May 2009 in the area around Graz. Further details will be announced at the AAPR homepage: www.aapr.at/

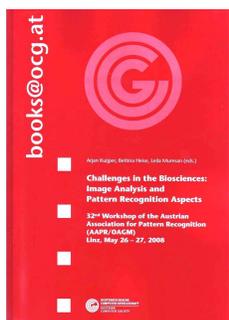
Conference Proceedings

Printed copies of the conference proceedings can be ordered from:
www.ocg.at/en/index.html

Arjan Kuijper, Bettina Heise, Leila Muresan (eds.)

*Challenges in the Biosciences: Image Analysis and Pattern Recognition Aspects
32nd Workshop of the Austrian Association for Pattern Recognition (AAPR/OAGM)*

Published by
Oesterreichische Computer Gesellschaft
ISBN 978-3-85403-232-8



To the editor...

In response to our feature article on [India's Center for Soft Computing Research](#) (*IAPR Newsletter*, Vol. 30 No. 2, April 2008 [\[html\]](#) [\[pdf\]](#)), we received a request to publish the names of the scientists. These are presented below.

~ [L. O'Gorman, ed.](#)

Investigators at India's Center for Soft Computing Research:

Principal Investigator:

[Prof. Sankar K. Pal](#)

Co-Principal Investigators

[Prof. Malay K. Kundu](#)

[Prof. C. A. Murthy](#)

[Prof. Bhargab B. Bhattacharya](#)

Co-Investigators

[Prof. Bhabatosh Chanda](#)

[Prof. Sushmita Mitra](#)

[Prof. Ashish Ghosh](#)

Conference Planner

NOTE: This is not an exhaustive list of conferences. It is a list of conferences sponsored or endorsed by IAPR plus additional conferences that have been brought to the attention of the editor (these non-IAPR events are denoted with an *). The [IAPR web site](#) has more up-to-date information about [IAPR conferences](#) and a link to USC's Institute for Robotics and Intelligent Systems list of [Computer Vision Conferences](#)

~ (L. O'Gorman, ed.)

Highlighting indicates that paper submission deadline has not yet passed.

2008

AND 2008	<i>2nd Workshop on Analytics for Noisy Unstructured Text Data</i>	Singapore	24 Jul 08
IWCF 2008	<i>2nd International Workshop on Computational Forensics</i>	Washington, D.C., USA	7-8 Aug 08
AGACSE 2008	<i>3rd International Conference on Applied Geometric Algebras in Computer Science and Engineering</i>	Leipzig, Germany	16-18 Aug 08
ICFHR 2008	<i>11th International Conference on Frontiers in Handwriting Recognition</i>	Montreal, Quebec, Canada	19-21 Aug 08
EVA VIENNA 2008	<i>IAPR-TC19 Workshop on Computer Vision for Cultural Heritage</i>	Vienna, Austria	25–28 Aug 8
CIARP 2008	<i>13th Iberoamerican Congress on Pattern Recognition</i>	Havana, Cuba	9–12 Sep 08
DAS 2008	<i>8th International Workshop on Document Analysis Systems</i>	Nara, Japan	16-19 Sep 08
PRIA-9-2008 *	<i>9th International Conference Pattern Recognition and Image Analysis: New Information Technologies</i>	Nizhny Novgorod, Russian Federation	14-20 Sep 08
BTAS 08 *	<i>IEEE Second Conference on Biometrics: Theory, Applications and Systems</i>	Washington, D.C.	29 Sep—1 Oct 08
PRIB 2008	<i>3rd IAPR International Conference on Pattern Recognition in Bioinformatics</i>	Melbourne, Australia	15–17 Oct 08
IVCNZ 2008	<i>23rd International Conference on Image and Vision Computing New Zealand</i>	Christchurch, New Zealand	26-28 Nov 08
DICTA 2008	<i>Digital Image Computing Techniques & Applications 2008</i>	Canberra, Australia	1-3 Dec 08
S+SSPR 2008	<i>Joint IAPR International Workshops on Structural and Syntactic Pattern Recognition and Statistical Techniques in Pattern Recognition</i>	Orlando, Florida, USA	4-6 Dec 08
PRRS 2008	<i>5th IAPR Workshop on Pattern Recognition in Remote Sensing</i>	Tampa, Florida, USA	7 Dec 08
ICPR 08	<i>19th International Conference on Pattern Recognition</i>	Tampa, Florida, USA	8-11 Dec 08

2009

CCIW09	<i>2nd Computational Color Imaging Workshop</i>	Saint Etienne, France	26-27 Mar 09
MVA 2009	<i>IAPR Conference on Machine Vision Applications</i>	Yokohama, Japan	20-22 May 09
ICB 2009	<i>3rd International Conference on Biometrics</i>	Alghero, Italy	2-5 Jun 09
SCIA 2009	<i>16th Scandinavian Conference on Image Analysis</i>	Oslo, Norway	15-18 Jun 09
ICDAR 2009	<i>10th International Conference on Document Analysis and Recognition</i>	Barcelona, Spain	July 26-29, 2009