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The QUARTERLY prints original papers in applied mathematics which have an intimate connection with applications. It is expected that each paper will be of a high scientific standard; that the presentation will be of such character that the paper can be easily read by those to whom it would be of interest; and that the mathematical argument, judged by the standard of the field of application, will be of an advanced character.

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SUGGESTIONS CONCERNING THE PREPARATION OF MANUSCRIPTS FOR THE QUARTERLY OF APPLIED MATHEMATICS

The editors will appreciate the authors' cooperation in taking note of the following directions for the preparation of manuscripts. These directions have been drawn up with a view toward eliminating unnecessary correspondence, avoiding the return of papers for changes, and reducing the charges made for "author's corrections."

Manuscripts: Manuscripts should be typewritten double-spaced on one side only. Marginal instructions to the typesetter should be written in pencil to distinguish them clearly from the body of the text. The author should keep a complete copy.

The papers should be submitted in final form. Only typographical errors should be corrected in proof; composition charges for any major deviations from the manuscript will be passed on to the author.

Titles: The title should be brief but express adequately the subject of the paper. The name and initials of the author should be written as he/she prefers; all titles and degrees or honors will be omitted. The name of the organization with which the author is associated should be given in a separate line following his/her name.

Mathematical Work: As far as possible, formulas should be typewritten; Greek letters and other symbols not available on the average typewriter should be inserted using either instant lettering or by careful insertion in ink. Manuscripts containing pencilled material other than marginal instructions to the typesetter will not be accepted.

The difference between capital and lower-case letters should be clearly shown; care should be taken to avoid confusion between zero (0) and the letter O, between the numeral one (1), the letter l and the prime ($'$), between alpha and a, kappa and k, mu and u, nu and v, eta and n.

The level of subscripts, exponents, subscripts to subscripts, and exponents to exponents should be clearly indicated.

Single embellishments over individual letters are allowed; the only embellishment allowed above groups of letters is the overbar.

Double embellishments are not allowed. These may be replaced by superscripts following the symbols.

Complicated exponents and subscripts should be avoided. Any complicated expression that recurs frequently should be represented by a special symbol.

For exponentials with lengthy or complicated exponents the symbol exp should be used, particularly if such exponentials appear in the body of the text. Thus,

$$\exp[(a^2 + b^2)^{1/2}] \text{ is preferable to } e^{[a^2+b^2]^{1/2}}.$$

Fractions in the body of the text and fractions occurring in the numerators or denominators of fractions should be written with the solidus. Thus,

$$\frac{\cos(x/2b)}{\cos(a/2b)} \text{ is preferable to } \frac{\cos\frac{x}{2b}}{\cos\frac{a}{2b}}.$$

In many instances the use of negative exponents permits saving of space. Thus,

$$\int u^{-1}\sin u\,du \text{ is preferable to } \int \frac{\sin u}{u}\,du.$$

Whereas the intended grouping of symbols in handwritten formulas can be made clear by slight variations in spacing, this procedure is not acceptable in typeset formulas. To avoid misunderstanding, the order of symbols should therefore be carefully considered. Thus,

$$(a + bx)\cos t \text{ is preferable to } \cos t(a + bx).$$

Figures: Figures should be drawn in black ink with clean, unbroken lines; do not use ball point pen. The paper should be of a nonabsorbant quality so that the ink does not spread and produce fuzzy lines. If the figures are intended for reduction, they should be drawn with heavy enough lines so that they do not become flimsy at the desired reduction. The notation should be of professional quality and in proportion for the expected reduction size. Figures which are unsuitable for reproduction will be returned to the author for redrawing. Legends accompanying figures should be written on a separate sheet.

Bibliography: References should be grouped together in a Bibliography at the end of the manuscript. References in text to the Bibliography should be made by numerals between square brackets.

The following examples show the desired arrangements: (*for books*—S. Timoshenko, *Strength of materials*, vol. 2, Macmillan and Co., London, 1931, p. 237; *for periodicals*—Lord Rayleigh, *On the flow of viscous liquids, especially in three dimensions*, Phil. Mag. (5) 36, 354-372 (1893)). Note that the number of the series is not separated by commas from the name of the periodical or the number of the volume.

Authors' initials should precede their names rather than follow them.

In quoted titles of books or papers, capital letters should be used only where the language requires this. Thus, *On the flow of viscous fluids* is preferable to *On the Flow of Viscous Fluids*, but the corresponding German title would have to be rendered as *Über die Stromung zaher Flüssigkeiten*.

Titles of books or papers should be quoted in the original language (with an English translation added in parentheses, if this seems desirable), but only English abbreviations should be used for bibliographical details such as ed., vol., no., chap., p.

Footnotes: As far as possible, footnotes should be avoided. Footnotes containing mathematical formulas are not acceptable.

Abbreviations: Much space can be saved by the use of standard abbreviations such as Eq., Eqs., Fig., Sec., Art., etc. These should be used, however, only if they are followed by a reference number. Thus, "Eq. (25)" is acceptable but not "the preceding Eq." Moreover, if any one of these terms occurs as the first word of a sentence, it should be spelled out.

Special abbreviations should be avoided. Thus "boundary conditions" should always be spelled out and not be abbreviated as "b.c." even if this special abbreviation is defined somewhere in the text.

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0033-569X(199503)53:1;1-P

Dynamical Issues in Combustion Theory. Edited by Paul C. Fife, Amable Liñán, and Forman Williams. Springer-Verlag, 1991. xiii+257 pp., $39.00.

This is volume 35 in *The IMA Volumes in Mathematics and its Applications.* It is based on the proceedings of a workshop which was an integral part of the 1989–90 IMA program on "Dynamical Systems and their Applications". The ten papers in the volume describe how the mathematical challenges offered by the world of combustion phenomena have been met for particular examples within a number of common combustion scenarios: reactive shocks, low Mach number premixed reactive flow, nonpremixed phenomena, and solid propellants. The types of phenomena examined include the stability of steady structures, the long-time dynamics of evolving solutions, properties of interfaces and shocks, including curvature effects, and spatio-temporal patterns.

Kalman Filtering with Real-Time Applications. Second Edition. By C. K. Chui and G. Chen. Springer-Verlag, 1991. xvi+195 pp., $39.50.

This is the second edition of volume 17 in the *Springer Series in Information Sciences*, first published in 1987. In addition to making a number of minor corrections and updating the references, the authors expanded the section on real-time system identification. A brief introduction to wavelet analysis is now included. The text continues to present a thorough discussion of the mathematical theory of Kalman filtering and applications to various elementary real-time problems.

Experiments in the Machine Interpretation of Visual Motion. By David W. Murray and Bernard F. Buxton. The MIT Press, 1990. 236 pp., $37.50.

This book describes experimental advances made in the interpretation of visual motion over the last few years that have moved researchers closer to emulating the way in which we recover information about the surrounding world. It describes algorithms that form a complete, implemented and tested system of measure two-dimensional motion in an image sequence, then to compute three-dimensional structure and motion, and finally to recognize the moving objects.

Integral Equations—A Practical Treatment, from Spectral Theory to Applications. By David Porter and David S. G. Stirling. Cambridge University Press, 1990. xi+372 pp., $69.50 (cloth), $27.95 (paper).

This is a volume in the series *Cambridge Texts in Applied Mathematics.* The authors offer, in this text, a middle road between the approaches of a pure and an applied mathematician, developing rigorously the general structures associated with the problems that arise in application areas, but not pursuing the structural results to the ultimate generality where this would have no bearing on the study of integral equations. They aim at an approach that is both rigorous and also accessible and useful in the study of concrete problems. Chapter headings: 1. Classification and examples of integral equations; 2. Second order ordinary differential equations and integral equations; 3. Integral equations of the second kind; 4. Compact operators; 5. The spectrum of a compact self-adjoint operator; 6. Positive operators; 7. Approximation methods for eigenvalues and eigenvectors of self-adjoint operators; 8. Approximation methods for inhomogeneous integral equations; 9. Some singular integral equations.

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Fractals—Non-Integral Dimensions and Applications. Edited by G. Cherbit, translated by F. Jellett, foreword by J.-P. Kahane. John Wiley & Sons, 1991. xv+249 pp., $69.95.

The 21 chapters in this book, originally published by Masson, Paris, in 1987, are based on the monthly "Hausdorff seminars on the notion of non-integral dimension and its applications", held by the Membrane Biophysics Research Group, University of Paris VII, whose goal was to show how to tackle practical scientific problems in the field.

Compstat 1990. Edited by K. Momirovic and V. Mildner. Springer-Verlag, 1990. xi+336 pp., $69.00.

These are the Proceedings of the 9th Symposium in Computational Statistics held at Dubrovnik, Yugoslavia, in June 1990. The 49 contributions are grouped into ten topics: classification, algorithms and statistical software, expert systems in statistics, multivariate data analysis and model building, optimization techniques and nonlinear models, computing for robust statistics, statistics and database management, time dependent models, analysis of spatial data, computational inference.

Control Theory and Dynamic Games in Economic Policy Analysis. By Maria Luisa Petit. Cambridge University Press, 1991. xiv+338 pp., $49.50.

This book deals with the stabilization and control of an economic system in a dynamic setting. It is addressed mainly to economists, rather than to mathematicians, since it aims to fill a gap between very specialized mathematical books and traditional books on economic policy. It covers both theoretical and applied policy analysis, considering deterministic economic models and mathematical methods specified in continuous time. Chapter headings: 1. Introduction; 2. Mathematical preliminaries: the state space; 3. Static and dynamic controllability; 4. Different approaches to dynamic policy analysis; 5. Optimal control; 6. The objective function; 7. Applications of optimal control; 8. Decentralized decisions and differential games; 9. Applications of differential games; 10. Optimal policies and expectations.

Interactive System Identification: Prospects and Pitfalls. By Torsten Bohlin. Springer-Verlag, 1991. xii+365 pp., $98.00.

This is a volume in the series *Communications and Control Engineering.* It deals with the fundamental problems and possibilities of making a mathematical model of a physical object and introduces principles and general approaches to model design, illuminating the pitfalls. Its purpose is twofold, aiming to be both a textbook and a monograph, viz., to serve as a textbook for the designer of stochastic dynamic models, in particular for the user of interactive identification software, and secondly to lay a basis for the construction of operator's-guide functions for identification packages. The results of the analysis of the interactive model-making process are presented in such detail that it should be possible to use it as a basis for writing an operator's guide.

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Probability, Statistical Optics, and Data Testing—A Problem Solving Approach. Second Edition. By B. R. Frieden. Springer-Verlag, 1991.

This is volume 10 in the *Springer Series in Information Sciences.* This edition, like the first (published in 1982) is intended to be first and foremost an introductory text on probability and statistics. It differs from standard such texts in that virtually all the illustrative examples and applications of the theory are from image science and other fields of optics, although prior formal education in optics is not strictly needed, since for the most part the optical phenomena treated are developed in the text or in the exercises. Some of the remaining applications are from information theory, a concept complementing image science. No solutions, though some hints, are given for most of the exercises. The main addition to this edition is chapter 17 on the theory of estimation (likelihood and Bayesian theory, Fisher information). The wide scope of the text is evident from the chapter headings: 1. Introduction; 2. The axiomatic approach; 3. Continuous random variables; 4. Fourier methods in probability; 5. Functions of a random variable; 6. Bernoulli trials and limiting cases; 7. The Monte Carlo calculation; 8. Stochastic processes; 9. Introduction to statistical methods; estimating the mean, median, variance, signal-to-noise ratio, and simple probability; 10. Estimating a probability law; 11. The chi-square law of significance; 12. The Student t-test on the mean; 13. The F-test on variance; 14. Least-squares curve fitting—regression analysis; 15. Principal component analysis; 16. The controversy between Bayesians and classicists; 17. Introduction to estimation methods.

High-Speed Semiconductor Devices. Edited by S. M. Sze, John Wiley & Sons, 1990. xii+643 pp., $59.95.

This text began as a set of lecture notes for two short courses and two invited lectures given at the 1988 International Electron Devices and Materials Symposium held at the National Sun Yat-sen University, Kaohsiung, Taiwan, R.O.C. They have been expanded and updated. The ten chapters are divided into three groups: I. Materials, technologies, and device building blocks; II. Field-effect and potential effect devices; III. Quantum-effect, microwave, and photonic devices.

Advanced Mathematical Methods. By Adam Ostaszewski. Cambridge University Press, 1991. xiii+545 pp., $99.50 (cloth), $34.50 (paper).

This text is divided into two parts (which can stand alone as teaching tools): advanced linear algebra, and advanced calculus. The material has been taught to second and third year students at the London School of Economics.

Theory and Design for Mechanical Measurements. By Richard S. Figliola and Donald E. Beasley. John Wiley & Sons, 1991. xii+516 pp., $54.95.

The objectives of this text are: 1. To provide a fundamental background in the theory of engineering measurements and measurement system performance; 2. To convey the principles and practice for the design of measurement systems, including the role of statistics and uncertainty analysis in design; 3. To establish the physical principles and practical techniques used to measure those quantities most important for engineering applications.

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Mathematics of Linear and Nonlinear Systems—An Introduction for Engineers and Applied Scientists. By D. J. Bell. Oxford University Press, 1990. xiii+304 pp.

This book, which can be used both as a textbook and as a reference book, aims to fill the gap between, on the one hand, books for mathematicians with little motivation for application of the material, and, on the other hand, books on dynamical systems written for the nonmathematician which avoid discussing the background mathematics in any depth. It is written primarily for graduate engineers and applied scientists working in the area of linear and nonlinear dynamical systems. The first six chapters on algebraic topics contain the background mathematics for linear systems theory, and the remaining five chapters contain topics from mathematical analysis, leading to the idea of a Lie algebra, important in the study of nonlinear systems. Chapter headings: 1. Introduction to dynamical systems; 2. Aspects of set theory; 3. Mappings; 4. Semigroups and groups; 5. Rings and fields; 6. Vector spaces and modules; 7. Metric and normed spaces; 8. Limits, convergence, and boundedness; 9. Sets, convexity, and topology; 10. Continuity and differentiability; 11. Manifolds and Lie algebras.

Fundamentals of Measurable Dynamics—Ergodic Theory on Lebesgue Spaces. By Daniel J. Rudolph. Oxford University Press, 1990. x+168 pp., $59.95.

The author's intention in this text—which grew out of a course given at the University of Maryland—is to give an elementary technical treatment of the fundamental concepts of the measure-preserving dynamics of a Lebesgue probability space. Chapter 1 presents the fundamental concepts of measure-preserving dynamics. Chapter 2 is a basic and technical treatment of the structure of Lebesgue probability spaces. Chapter 3 presents the ergodic theorems and ergodic decomposition: the von Neumann L^2-ergodic theorem and the Garsia-Halmos proof of the Birkhoff ergodic theorem. Chapter 4 covers the hierarchy of mixing properties, presenting the circle of definitions of weakly mixing and ending with the definition of a Kolmogorov automorphism. This leads to the theory of entropy in chapter 5. In chapter 6 the author introduces the concept of a joining and disjointness, and in chapter 7 presents the Burton-Rothstein proof of Krieger's generator theorem and Ornstein's isomorphism theorem. Many exercises are presented throughout the text.

Graph Decompositions—A Study in Infinite Graph Theory. By Reinhard Diestel. Oxford University Press, 1990. xviii+221 pp., $49.95.

This book pursues two aims: the first aim is to present the theory of simplicial decomposition of graphs, a branch of graph theory that goes back to 1937 (and introduced originally for the study of the 4-colour problem), and the second aim is to bring out the high degree of coherence, relative to its size, of that theory. Chapter headings: 1. Fundamental facts and concepts; 2. Separating simplices and the existence of prime decompositions; 3. Simplicial minors and the existence of prime decompositions; 4. The uniqueness of prime decompositions; 5. Decompositions into small factors; 6. Applications of simplicial decompositions.

Theory of Operators. By V. A. Sadovnichii, translated from the Russian by Roger Cooke. Plenum Publishing Corporation, 1991. xi+396 pp., $95.00.

This translation is of the second Russian edition. Its scope is apparent from the table of contents: 1. Metric and topological spaces; 2. Vector spaces; 3. Measure theory. Measurable functions and integration; 4. The geometry of Hilbert space. The spectral theory of operators. 5. The trace of an operator; 6. Distributions. The Fourier transform.

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Latent Variable Path Modeling with Partial Least Squares. By Jan-Bernd Lohmöller. Springer-Verlag, 1990. 283 pp.

This monograph takes its inspiration from Herman Wold's Partial Least Squares (PLS) modeling method. Its core (chapter 3) is devoted to the statistical foundation of the PLS method, which is extended to contingency tables (chapter 4) and three-mode data cubes (chapter 6). In chapter 5, the differences between PLS and ML (maximum likelihood) estimates are presented and explained. Chapter headings: 1. Basic principles of model building; 2. The basic and the extended PLS method; 3. Foundations of Partial Least Squares; 4. Mixed measurement level multivariate data; 5. Predictive vs. structural modeling: PLS vs. ML; 6. Latent variables three-mode path analysis; 7. PLS programs and applications.

Paths, Flows, and VLSI-Layout. Edited by Bernhard Korte, László Lovász, Hans Jürgen Prömel, and Alexander Schrijver. Springer-Verlag, 1990. xxii+383 pp., $69.00.

This is volume 9 in the series *Algorithms and Combinatorics.* It is based on the proceedings of a scientific meeting held from June 20 to July 1, 1988, at the University of Bonn in the shape of a *Summer School and Workshop.* The speakers were asked to formalize and extend their lectures into written surveys, giving a more complete account of the topics present. This book presents twelve such surveys.

The Scientific Letters and Papers of James Clerk Maxwell. Volume I, 1846–1862. Edited by P. M. Harman. Cambridge University Press. xxvii+748 pp., $195.00.

This magisterial and beautifully produced book is the first of three volumes, which will be the first comprehensive gathering of Maxwell's manuscripts, many printed for the first time. It opens with his first contribution to science in 1846 when he was a schoolboy of 14, a paper on the mechanical description of Cartesian ovals. The volume concludes early in 1862 following his announcement of the first version of his electromagnetic theory of light. The editor's biographical and historical introduction and learned commentary on the manuscripts is structured into the following sections, each referring to the manuscripts under discussion: Edinburgh—education and early scientific interests; Cambridge—the mathematical tripos; Electricity and magnetism—Faraday's lines of force; Colour vision and optics; Marischal College, Aberdeen; Saturn's rings; The kinetic theory of gases; From Marischal College to King's College, London—the Royal Society paper on colour vision; Electricity and magnetism—molecular vortices, electromagnetism and light.

Numerical Treatment of Eigenvalue Problems, Vol. 5. Edited by J. Albrecht, L. Collatz, P. Hagedorn, and W. Velte. Birkhäuser-Verlag, 1991. ix+243 pp., $81.00.

This is volume 96 in the *International Series of Numerical Mathematics*, and the Proceedings of a Workshop held in Oberwolfach, February 25–March 3, 1990. There are 18 papers, the first group concerning various methods for reaching eigenvalue boundaries in the case of general eigenvalue problems for partial differential equations, including those of rational approximation, approximation with finite elements and domain composition. A second group of papers draws on concrete eigenvalue problems in engineering and the natural sciences. A third area is devoted to the numerics of eigenvalue problems for large, sparse matrices, and more specifically, how they arise from discretization problems in partial differential equations.

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Nonlinear Waves, Solitons and Chaos. By Eryk Infeld and George Rowlands. Cambridge University Press, 1990. xi+423 pp., $85.00 (cloth), $29.95 (paper).

This book is concerned with the propagation of waves and nonlinear instabilities, first reviewing linear waves and instabilities, largely in fluids and plasmas, in chapters 2 and 3, after an introductory first chapter. Chapter 4 on surface waves first treats these phenomena linearly and then opens the field of nonlinear waves and instabilities. Chapter 5 covers weakly nonlinear theory and small amplitude waves and solitons. Chapters 6 and 7 give a wide review of exact methods for finding both nonlinear wave and soliton structures in one and two space dimensions. Chapter 8 treats the one- and higher-dimensional stability of initially one-dimensional nonlinear waves and solitons, and chapter 9 covers cylindrical and spherical solitons in plasmas and other media. Chapter 10 introduces non-coherent phenomena. The main aim of the book is to cover a wide range of nonlinear wave phenomena, of which a few examples are: treatment of both surface and volume wave phenomena, including recent results (e.g. instabilities and their pictorial representation, period doubling, wave dynamics in three dimensions, splitting of signals observed experimentally, the universal theory of wave envelope dynamics); new developments in soliton studies (e.g. many soliton experiments in rectangular, cylindrical, and spherical devices and their theory); and a bringing together of theoretical and numerical results on various scenarios for reaching chaos. Some unsolved problems are indicated. References are extensive (the bibliography takes 21 pages). Little previous knowledge is assumed.

Combinatorial Designs. By W. D. Wallis. Marcel Dekker, Inc., 1990. vii+329 pp., $89.75.

This is volume 126 in the series *Pure and Applied Mathematics: A Program of Monographs and Textbooks.* Design theory began with Euler's invention of the Latin square 200 years ago. There followed interest in the balanced incomplete block design and, in particular, the finite projective and affine planes, fanned by the statistical interpretation of designs and by the geometrical nature of planes. In the last 10 to 15 years, combinatorial researchers have discussed a wider range of designs: one-factorizations, Room squares, and other designs based on unordered pairs, various tournament designs, nested designs, etc. The present book is intended for use as a text in a course on experimental designs, giving a good groundwork in the classical areas of design theory (block designs, finite geometries, Latin squares) and introducing some modern extensions.

How to Write Parallel Programs—A First Course. By Nicholas Carriero and David Gelernter. The MIT Press, 1990. 232 pp., $29.95.

This tutorial focuses on programming techniques for general purpose asynchronous or MIMD machines. It outlines the basic parallel algorithm classes and the three basic programming paradigms, takes up the implementation techniques for these paradigms, and presents a series of case studies explaining code and discussing its measured performance. The authors use C and Linda (a language they developed) as a combination that can be simply and efficiently implemented on a wide range of machines. Chapter headings: 1. Introduction; 2. Basic paradigms for coordination; 3. Basic data structures; 4. Performance measurement and debugging; 5. Putting the details together; 6. Databases: starting with agenda; 7. Matrices: starting with result; 8. Networks: starting with specialist; 9. Coordinated programming.