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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 that 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 Strömung zäher 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.

CONTENTS

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0033-569X(200309)61:3;1-8

Perturbation Methods for Differential Equations. By Bhimsen K. Shivamoggi, Birkhäuser, 2002, xiv + 354 pp., $59.95

The book is devoted to the subject of seeking nonlinear solutions in the neighborhood (or as a perturbation about) a known linear solution. It adopts a straightforward intuitive approach and pays more attention to the procedures and the underlying ideas than to mathematical rigour. Thus, theoretical aspects such as error estimates and formal proofs are largely avoided. Chapter headings: 1. Asymptotic series and expansions; 2. Regular perturbation methods; 3. The method of strained coordinates/parameters; 4. The method of averaging; 5. The method of matched asymptotic expansions; 6. Method of multiple scales; 7. Miscellaneous perturbation methods.

Data Mining—Concepts, Methods, and Algorithms. By Mehmed Kantardzic, Wiley, 2003, xii + 343 pp., $59.95

The book reviews state-of-the-art techniques for analyzing enormous quantities of raw data in high-dimensional data spaces to extract new information useful to the decision-making process. One of its main goals is to concentrate on systematic and balanced approaches to all phases of the data mining process, and present them with illustrative examples. The author believes that a deeper understanding of methods and models, how they behave, and why, is a prerequisite for efficient and successful application of data mining technology. Chapter headings: 1. Data mining concepts; 2. Preparing the data; 3. Data reduction; 4. Learning from data; 5. Statistical methods; 6. Cluster analysis; 7. Decision trees and decision rules; 8. Association rules; 9. Artificial neural networks; 10. Genetic algorithms; 11. Fuzzy sets and fuzzy logic; 12. Visualization methods; 13. References. There are two appendices: A. Data-mining tools (lists of available programming systems, and of web sites); B. Data-mining applications (data mining for financial data analysis, for the telecommunications industry, for the retail industry, in healthcare and biomedical research, in science and engineering; and pitfalls of data mining).

Linear Water Waves—A Mathematical Approach. By N. Kuznetsov, V. Maz′ya, and B. Vainberg, Cambridge University Press, 2002, vii + 513 pp., $100.00

The aim of the book, essentially a research monograph in applied mathematics, is to give a self-contained and up-to-date account of mathematical results in the linear theory of water waves, and is by far the most complete such account available in book form. It reviews in detail previous contributions to the subject, which goes back to Euler, Lagrange, Cauchy, Poisson, Stokes, Lord Kelvin, Kirchhoff, and Lamb, with 20th century contributions by Havelock, Kochin, Sretenky, Stoker, John, and many others. However, a substantial part of the book is based on the authors' contributions to the theory. The presentation is mathematically rigorous, although a more or less informal style is often adopted to make the material less forbidding. The book is arranged in three parts, each treating one of the main themes: time-harmonic waves, waves caused by the uniform forward motion of body on calm water, and unsteady waves. Also, there is an introductory chapter on the basic theory of surface waves, concerned with governing equations obtained on the basis of the general dynamics of an inviscid incompressible fluid (such as water), and linearized problems. Part I is divided into five chapters. Chapter 1 gives an account of Green's functions in two and three dimensions. Chapter 2 is concerned with those cases in which the free surface coincides with the whole horizontal plane. In chapter 3, semisubmerged bodies are allowed in a manner that leaves no bounded components of the free surfaces. Chapter 4 deals with the case in which isolated portions of the free surface are present. A survey of results obtained in the extensive field of trapped waves periodic in a horizontal direction is given in chapter 5. Part 2, on ship waves, consists of three chapters. Chapter 6 deals with the two- and three-dimensional Green's function for the Neumann-Kelvin problem. Chapters 7 and 8 are mainly concerned with the simpler two-dimensional Neumann-Kelvin problems for totally submerged and surface-piercing bodies, respectively. In part 3, which consists of two chapters, the authors investigate unsteady wave motions that develop in time under various disturbances applied either to the free surface or beneath it. Such problems arise in oceanography and in ship research. Results on the uniqueness, existence, and smoothness of solutions are presented in chapter 9. Chapter 10 is concerned with problems describing waves caused by rapidly stabilizing and high-frequency disturbances that are motionless relative to the water. Chapter headings: Part I. Time-Harmonic Waves. 1. Green's functions; 2. Submerged obstacles; 3. and 4. Semisubmerged bodies I and II; 5. Horizontally periodic trapped waves. Part II. Ship Waves on Calm Water. 6. Green's functions; 7. The Neumann-Kelvin problem for a submerged body; 8. Two-dimensional problem for a surface-piercing body. Part III. Unsteady Waves. 9. Submerged obstacles: existence and properties; 10. Waves caused by rapidly stabilizing and high-frequency disturbances. There follows a bibliography of 370 items.

Introduction to Numerical Analysis. By J. Stoer and R. Bulirsch, translated by R. Bartels, W. Gautschi, and C. Witzgall, Springer, 2002, xv + 744 pp., $69.95

This is the third edition of volume 12 in the series Texts in Applied Mathematics, first published in 1980, with the second edition in 1993. This new edition of a text written for advanced undergraduates/beginning graduate students has been considerably enlarged. It features an expanded presentation of Hermite interpolation and B-splines, with a new section on multiresolution methods and B-splines. There are also new sections on solving differential equations in the presence of discontinuities whose locations are not known at the outset, on sensitivity analyses for small changes in an equation's parameters, on multiple shooting methods, and on Krylov space methods. Chapter headings: 1. Error analysis; 2. Interpolation; 3. Topics in integration; 4. Systems of linear equations; 5. Finding zeros and minimum points by iterative methods; 6. Eigenvalue problems; 7. Ordinary differential equations; 8. Iterative methods for the solution of large systems of linear equations. Additional methods.

Small Area Estimation. By J. N. K. Rao, Wiley, 2003, xxiii + 313 pp., $99.95

This is a volume in the Wiley Series in Survey Methodology. It is an authoritative and comprehensive account of methods for producing small area estimates by using not conventional direct estimates, but indirect, model-dependent estimates. Such estimates have several advantages, most importantly increased precision; they employ explicit small area linking models that borrow strength in making an estimate for one small area from sample survey data collected in other small areas or at other time periods. Such models allow the derivation of optimal estimates and associated measures of variability, as well as the validation of models from the survey data. Chapter 1 introduces some basic terminology related to small area estimation. Chapter 2 contains a brief account of direct estimation. Traditional demographic methods that employ indirect estimates based on implicit linking models are studied in chapter 3. Chapter 4 gives a detailed account of traditional indirect estimation based on implicit linking models and studies the James-Stein method of composite estimation in the context of sample surveys. Explicit small area models that account for between area variation are presented in chapter 5, including linear and generalized linear mixed models. Chapters 6–8 study in more detail linear mixed models involving fixed and random effects. General results on empirical best linear unbiased prediction (EBLUP) under the frequentist approach are presented in chapter 6. In chapter 7, these EBLUP results are applied to a basic area level model and a basic unit level model. Various extensions of the basic models are considered in chapter 8. Chapter 9 presents empirical Bayes (EB) estimation, which is more generally applicable than the EBLUP method. Chapter 10 presents a self-contained account of hierarchical Bayes (HB) estimation, by assuming prior distributions on the model parameters. Both chapters include actual applications with real data sets. The book is intended as a research monograph or as a text for a graduate level course on small area estimation. A prior course on mathematical statistics is essential and one on linear mixed models desirable. There is a bibliography containing 331 items.

Linear Regression Analysis. By George A. F. Seber and Alan J. Lee, Wiley, 2003, xvi + 557 pp., $94.95

This is the second edition of a volume in the Wiley Series in Probability and Statistics, first published in 1977. It has been largely rewritten to reflect current thinking, such as the major advances in computing during the past 25 years. For instance, topics such as the analysis of covariance which, in the past, required various algebraic techniques can now be treated as a special case of multiple linear regression using an appropriate package. However, the theoretical approach of the first edition has been maintained. Among major changes are: more emphasis on generating functions (ch. 1); a different approach to the multivariate normal distribution (ch. 2); less focus on the dichotomy of full-rank and less-than-full-rank models and more on Bayesian and robust methods (ch. 3); update of simultaneous confidence intervals (ch. 5); more emphasis on modeling and piecewise fitting (ch. 6); new techniques of smoothing, such as splines and loess (ch. 6 and 7); update on ANOVA and analysis of covariance, including the two-way unbalanced model (ch. 8). Chapter 11 is a major update on the computational aspects. Chapter headings: 1. Vectors of random variables; 2. Multivariate normal distribution; 3. Linear regression: estimation and distribution theory; 4. Hypothesis testing; 5. Confidence intervals and regions; 6. Straight-line regression; 7. Polynomial regression; 8. Analysis of variance; 9. Departures from underlying assumptions; 10. Departures from assumptions: diagnosis and remedies; 11. Computational algorithms for fitting a regression; 12. Prediction and model selection.

Statistical Design and Analysis of Experiments, with Applications to Engineering and Science. By Robert L. Mason, Richard F. Gunst, and James L. Hess, Wiley, 2003, xix + 728 pp., $94.95

This is the second, significantly revised, edition of a volume in the Wiley Series in Probability and Statistics. It is designed to be a practitioner's guide to statistical methods for designing and analyzing experiments, with emphasis on the strategy of experimentation, data analysis, and the interpretation of experimental results. A key feature of the book is the depth and concentration of experimental design coverage, with equivalent but separate emphasis on the analysis of data from the various designs. In this edition, in contrast to the previous one, chapters on the analysis of designed experiments have been placed immediately following the corresponding chapters on the respective designs, a feature particularly useful for classroom use. Throughout the analysis chapters in Parts II and III, confidence-interval and hypothesis-testing procedures are detailed for single-factor and multifactor experiments. The nineteen chapters are divided into three parts: Part I. Fundamental statistical concepts: 1. Statistics in engineering and science; 2. Fundamentals of statistical inference; 3. Inferences on means and standard deviations; Part II. Design and analysis with factorial structure: 4. Statistical principles in experimental design; 5. Factorial experiments in completely randomized designs; 6. Analysis of completely randomized designs; 7. Fractional factorial experiments; 8. Analysis of fractional factorial designs; Part III. Design and analysis with random effects: 9. Experiments in randomized block designs; 10. Analysis of designs with random factor levels; 11. Nested designs; 12. Special designs for process improvement; 13. Analysis of nested designs and designs for process improvement; Part IV. Design and analysis with quantitative predictors and factors: 14. Linear regression with one predictor variable; 15. Linear regression with several predictor variables; 16. Linear regression with factors and covariates as predictors; 17. Designs and analyses for fitting response surfaces; 18. Model assessment; 19. Variable selection techniques.

Current Topics in Computational Molecular Biology. Edited by Tao Jiang, Ying Xu, and Michael Q. Zhang, MIT Press, 2002, xiii + 542 pp., $55.00

Computational molecular biology, or bioinformatics, draws on the disciplines of biology, mathematics, statistics, physics, chemistry, computer science, and engineering. It provides the computational support for functional genomics, which links the behaviour of cells, organisms, and populations to the information encoded in the genomes, as well as for structural genomics. This survey of the field covers most of the important topics in computational molecular biology, ranging from traditional ones such as protein structure modeling and sequence alignment, to the recently emerged ones such as expression data analysis and comparative genomics. The book also contains an introductory chapter and a chapter on general statistical modeling and computational techniques in molecular biology. Each chapter is a self-contained review of a particular subject, typically starting with a brief overview of the specific subject, then describing in detail the computational techniques used and results generated, and ends with open challenges. The book should be useful to a broad readership, including students, nonprofessionals, and bioinformatics experts who want to brush up on topics related to their own research areas. The nineteen chapters are divided into four parts: Part I, devoted to the introductory chapter: The challenge facing genomic informatics, by Temple F. Smith; Part II, Comparative sequence and genome analysis (six chapters); Part III, Data mining and pattern discovery (six chapters); Part IV, Computational structural biology (six chapters).

Introduction to Symmetry Analysis. By Brian J. Cantwell, Cambridge University Press, 2002, xli + 611 pp., $130.00 (hardback), $50.00 (paperback)

Symmetry analysis based on Lie group theory is the most important analytic method for solving nonlinear problems. The book presents a broad, self-contained introduction to the basic concepts of this method, which can be used to find the symmetries of almost any system of differential equations, and the knowledge of these symmetries can be used to simplify the analysis of physical problems governed by the equations. *Mathematica*-based software for finding the Lie point symmetries and Lie-Bäcklund symmetries of differential equations is included on a CD, along with more than sixty sample notebooks illustrating applications ranging from simple, low-order ordinary differential equations to complex systems of partial differential equations, all carefully coordinated with the examples and exercises in the text. There is also a fascinating historical preface, with sections entitled: Rise of the academies; Abel and Galois; Lie and Klein; 1870; Lie's arrest; Gauss, Riemann and the new geometry; The Erlangen program; Lie's career at Leipzig; A falling out; Lie's final return to Norway; After 1900; The Ariadne thread; Suggested reading. Chapter headings: 1. Introduction to symmetry; 2. Dimensional analysis; 3. Systems of ODE's and first order PDE's; state space analysis; 4. Classical dynamics; 5. Introduction to one-parameter Lie groups; 6. First order ODE's; 7. Differential functions and notation; 8. ODE's; 9. PDE's; 10. Laminar boundary layers; 11. Incompressible flow; 12. Compressible flow; 13. Similarity rules for turbulent shear flows; 14. Lie-Bäcklund transformations; 15. Variational symmetries and conservation laws; 16. Bäcklund transformations and nonlocal groups. There are four appendices: 1. Review of calculus and the theory of contact; 2. Invariance of the contact conditions under Lie point transformation groups; 3. Infinite-order structure of Lie-Bäcklund transformations; 4. Symmetry analysis software.

Finite-Dimensional Variational Inequalities and Complementary Problems, Volumes I and II. By Francisco Facchinei and Jong-Shi Pang, Springer, 2003, xxxii + 1234 pp., $89.95 each volume

The finite-dimensional nonlinear complementary problem (NCP) is a system of nonlinear inequalities in nonnegative variables along with a special equation. This equation expresses the complementary relationship between the variables and corresponding inequalities, is the key feature distinguishing the NCP from a general inequality system, lies at the heart of all constrained optimization problems, and provides a powerful framework for the modeling of equilibria of many kinds. The finite-dimensional variational inequality (VI), which is a generalization of the NCP, provides a broad unifying setting for the study of optimization and equilibrium problems; it serves as the main computational framework for the practical solution of many continuum problems in the mathematical sciences. This two-volume monograph, written for novice and expert researchers and advanced graduate students in a wide range of disciplines, presents a comprehensive, state-of-the-art treatment of the finite-dimensional variational inequality and complementary problem, covering the basic theory (in volume I), iterative algorithms and important applications (in volume II). It includes every major aspect of the VI/CP, beginning with the fundamental question of existence and uniqueness of solutions, presenting the latest algorithms and results, extending into selected neighbouring topics, summarizing many classical source problems, and including novel application domains. It starts with a historical overview (a "Bird's-Eye View of the Subject"), tracing the history of the field to the seminal work of Guido Stampacchia in the early 1960's, and a synopsis of the work. Volume I offers a bibliography of 914 items, and Volume II one of 659 items. Chapter headings of Volume I: 1. Introduction; 2. and 3. Solution analysis I and II; 4. The Euclidean projector and piecewise functions; 5. Sensitivity and stability; 6. Theory of error bounds. Chapter headings of Volume II: 7. Local methods for nonsmooth equations; 8. Global methods for nonsmooth equations; 9. Equation-based algorithms for CPs; 10. Algorithms for VIs; 11. Interior and smoothing methods; 12. Methods for monotone problems. There is also an index of definitions, results, and algorithms.