

## BOOK REPORTS

The Book Reports section is a regular feature of *Computers & Mathematics with Applications*. It is an unconventional section. The Editors decided to break with the longstanding custom of publishing either lengthy and discursive reviews of a few books, or just a brief listing of titles. Instead, we decided to publish every important material detail concerning those books submitted to us by publishers, which we judge to be of potential interest to our readers. Hence, breaking with custom, we also publish a complete table of contents for each such book, but no review of it as such. We welcome our readers' comments concerning this enterprise. Publishers should submit books intended for review to the Editor-in-Chief,

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*Mathematica for the Sciences*. By Richard E. Crandall. Addison-Wesley Publishing Company, Redwood City, CA. (1991). 300 pages. \$35.50.

Contents:

I. Epistemology. 1. The purpose of this book. 2. *Mathematica* for education and research. 3. Book presentation. II. NeXT interfaces and projects. 1. Standard NextStep interface. 2. Example applications that talk *Mathematica*. 3. Automated messaging. III. The interplay of 2D and 3D graphics. 2. The importance of resolution. 3. Insight via the contour option. 4. 3D animation of rigid structures. 5. When  $y$  is not a function of  $x$ . 6. 3D parametric plots. IV. Mathematical examples. 1. Identities and expansions. 2. Real and complex analysis. 3. Factorization and primality testing algorithms. 4. Fast algorithms. V. Physics. 1. Classical mechanics. 2. Quantum mechanics. 3. Relativity. VI. Linear and non-linear systems. 1. Linear oscillations. 2. Solitons. 3. Chaos and fractals. VII. Chemistry and biology. 1. Reactions. 2. Quantum chemistry. 3. Genetics and population biology. 4. Neurobiology. VIII. Electronics and signal processing. 1. Electronic circuits. 2. Applications of the FFT. 3. Digital filters. 4. Image processing. IX. Great problems of history. 1. Problems solved and unsolved. 2. Fermat's "Last Theorem." 3. The Reimann zeta function and prime numbers. 4. Theories of gravitation.

*Linear Multivariable Control: Algebraic Analysis and Synthesis Methods*. By A.I.G. Vardulakis. John Wiley & Sons, Chichester, England and New York, NY. (1991). 369 pages. \$125.00.

Contents:

1. Real rational vector spaces and rational matrices. 2. Polynomial matrix models of linear multivariable systems. 3. Pole and zero structure of rational matrices at infinity. 4. Dynamics of polynomial matrix models. 5. Proper and  $\Omega$ -stable rational functions and matrices. 6. Feedback system stability and stabilization. 7. Some algebraic design problems.

*Simulated Annealing and Boltzmann Machines: A Stochastic Approach to Combinatorial Optimization and Neural Computing*. By Emile Aarts and Jan Korst. John Wiley & Sons, Chichester, England and New York, NY. (1990). 272 pages. \$71.95.

Contents:

I. Simulated annealing. 1. Combinatorial optimization. 2. Simulated annealing. 3. Asymptotic convergence. 4. Finite-time approximation. 5. Simulated annealing in practice. 6. Parallel simulated annealing algorithms. II. Boltzmann machines. 7. Neural computing. 8. Boltzmann machines. 9. Combinatorial optimization and Boltzmann machines. 10. Classification and Boltzmann machines. 11. Learning and Boltzmann machines.

Typeset by  $\text{\AA}M\text{\S}-\text{\TeX}$

*Logic Programming: Proceedings of the 1991 International Symposium.* Edited by Vijay Saraswat and Kazunori Ueda. MIT Press, Cambridge, MA and London, England. (1991). 740 pages. \$85.00.

Contents:

I. Programming environments 1. Temporal debugging and its visual animation. 2. Abstract view of prolog executions in opium. II. Non-horn programs. 3. A complete top-down interpreter for first order programs. 4. An alternative characterization of disjunctive logic programs. III. Non-monotonicity, I. 5. Well-founded semantics, generalized. 6. Stable theories for logic programs. IV. Reasoning about programs, I. 7. Automatic generation of simplification lemmas for inductive proofs. 8. A general criterion for avoiding infinite unfolding during partial deduction of logic programs. V. Concurrency and parallelism, I. 9. A simulation study of or- and independent and-parallelism. 10. Idiom: Integrating dependent and-, independent and-, and or-parallelism. 11. Programming paradigms of the andorra kernel language. VI. Types and rewriting. 12. Typed features structures: A generalization of first-order terms. 13. Typed prolog: A semantic reconstruction of the Mycroft-O'Keefe type system. VII. Non-classical logics, I. 14. A clausal logic for deontic action specification (extended abstract). 15. A modal reconstruction of blocks and modules in logic. VIII. Warren abstract machine. 16. A new scheme for unification in WAM. 17. Extending the Warren abstract machine to polymorphic order-sorted resolution. IX. Non-classical logic, II. 18. Higher-order horn logic programming. 19. The uniform proof-theoretic foundation of linear logic. X. Bottom-up evaluation. 20. Top-down vs. bottom-up revisited. 21. Magic sets and bottom-up evaluation of well-founded models. XI. Language constructs. 22. Using dynamic predicate in an or-parallel prolog system. 23. A declarative alternative to "assert" in logic programming. 24. Semantics of logic programs with aggregates. XII. Constraints, I. 25. Intelligent backtracking for CLP languages: An application to CLP( $R$ ). 26. Some global compile-time optimizations for CLP( $R$ ). 27. Abstract interpretation of constraints on order-sorted domains. XIII. Concurrency and parallelism, II. 28. Copy avoidance through compile-time analysis and local reuse. 29. A static load partitioning method based on execution profile for committed choice languages. 30. Reforming compilation of logic programs. XIV. Reasoning about programs, II. 31. Automatic termination proofs for prolog programs operating on nonground terms. 32. A termination test for logic programs. 33. NSTO programs (not subject to occur-check). XV. Non-monotonicity, II. 34. Relating Dempster-Shafer theory to stable semantics. 35. Counterfactual reasoning based on revising assumptions. XVI. Applications. 36. Experiences from a large industrial circuit design application. 37. Prolog testing of C modules. XVII. Program transformation and synthesis. 38. Derivation of efficient logic programs by synthesizing new predicates. 39. Program transformation under the principle of proof as program. 40. Synthesis of a family of recursive sorting procedures. XVIII. Constraints, II. 41. Temporal logic programming and its relation to constraint logic programming. 42. Integrating numerical and qualitative models within constraint logic programming. 43. True-concurrency in concurrent constraint programming. XIX. Invited talks. 44. Reasoning and programming: Analogies between logic and computation. 45. Fifth generation computer project: Towards large-scale knowledge information processing. XX. Advanced tutorials. 46. Non-monotonic reasoning and logic programming. 47. Using compositional programming to write portable, high-performance parallel programs. Author index.

*Foundational Issues in Natural Language Processing.* Edited by Peter Sells, Stuart M. Shieber and Thomas Wasow. MIT Press, Cambridge, MA and London, England. (1991). 232 pages. \$32.50.

Contents:

1. The relevance of computational complexity theory to natural language processing. (William C. Rounds). 2. The convergence of mildly context-sensitive grammar formalisms. (Aravind K. Joshi *et al.*) 3. Sentence processing and the mental grammar. (Janet Dean Fodor). 4. Principle-based parsing. (Robert C. Berwick).

*Programming as if People Mattered: Friendly Programs, Software Engineering, and Other Noble Delusions.* By Nathaniel S. Borenstein. Princeton University Press, Princeton, NJ. (1991). 186 pages. \$29.95, £22.50.

Contents:

I. The journey to the East: Can software engineers build user interfaces? 1. The hostile beast. II. The dark night of the soul: The state of the art in user-interface design. 2. Who are all these people? 3. Stopwatches, videotapes, and human nature. 4. That reminds me of the time. 5. The quest for the perfect line editor. 6. The men in suits. 7. Information wants to be free. III. The ten commandments: Principles for user-interface design. 8. Never underestimate your users. 9. Pretend that small is beautiful, but don't believe it. 10. Tune defaults to the novice. 11. Don't neglect the experts. 12. Your program stinks, and so do you. 13. Listen to your users, but ignore what they say. 14. Lie to your managers. 15. Cut corners proudly. 16. Remember your ignorance. 17. Dabble in mysticism. 18. Break all the rules. IV. The golden path: The road to human-oriented software engineering. 19. The tools of the trade. 20. The ivory tower. 21. People are perverse: Designing for the fickle user. Epilogue: Programming, humility and the eclipse of the self.

*Cellular Automata: Theory and Experiment.* Edited by Howard Gutowitz. MIT Press, Cambridge, MA and London, England. (1991). 483 pages. \$37.50.

Contents:

1. Mathematical analysis of cellular automata. 2. Structure of the space of cellular automata. 3. Learning rules with specified properties. 4. Cellular automata and the natural sciences: Biology; physics and chemistry. 5. Computation theory of cellular automata. 6. Generalizations of cellular automata.

*A Minitab Companion with Macros.* By Peter W. Zehna. Addison-Wesley Publishing Company, Reading, MA. (1991) 352 pages, 1 diskette. \$24.95.

Contents:

1. Using this book.
2. Descriptive statistics.
3. Probability applications.
4. Discrete random variables.
5. Continuous random variables.
6. Bivariate distributions.
7. Parameter estimation.
8. Testing hypotheses.
9. Inference for two populations.
10. Inference for proportions.
11. Analysis of variance.
12. Regression analysis.
13. Miscellaneous procedures. Appendix A. Answers to problems.

*System Design Modeling and Metamodeling.* By John P. van Gigch. Plenum Press, New York, NY and London, England. (1991). 453 pages. \$79.50.

Contents:

- I. The nature of reality. 1. The modern view of reality. 2. The system approach: Introduction and examples. 3. The system approach: Applied system theory. II. Modeling 4. Decision making and the system paradigm. 5. Modeling. 6. Model types. 7. Complexity. 8. Control and regulation. III. Metamodeling. 9. The metamodeling paradigm: Metamodeling design. 10. Abstraction. 11. Metamodeling. 12. Metamodeling: More applications. 13. Diagnosis and metamodeling of system failures. IV. Metamodeling and organizational decision making. 14. The metamodeling approach to organizational decision making. 15. The metamodeling, rationalities and information. 16. Rationalities and metarationalities in organizational decision making. 17. The metamodeling paradigm: Applications. 18. The morality of system design.

*Lazy Functional Languages: Abstract Interpretation and Compilation.* By Geoffrey Burn. MIT Press, Cambridge, MA and London, England. (1991). 238 pages. \$32.95.

Contents:

1. Introduction.
2. Operational and denotational semantics of the typed lambda calculus.
3. A framework for the abstract interpretation of functional languages.
4. Some example abstract interpretations.
5. Evaluation transformers.
6. Implementing functional languages on sequential and parallel machines.
7. Relationship to other work.
8. Epilogue: A. Proofs omitted in earlier chapters. B. The spineless G-machine.

*Categories, Types and Structures: An Introduction to Category Theory for the Working Computer Scientist.* By Andrea Asperti and Giuseppe Longo. MIT Press, Cambridge, MA and London, England. (1991). 306 pages. \$32.50.

Contents:

- I. Categories and structures. 1. Categories. 2. Constructions. 3. Functors and natural transformations. 4. Categories derived from functors and natural transformations. 5. Universal arrows and adjunctions. 6. Cones and limits. 7. Indexed and internal categories. II. Types as objects. 8. Formulae, types, and objects. 9. Reflexive objects and the type-free lambda calculus. 10. Recursive domain equations. 11. Second order lambda calculus. 12. Examples of internal modes.

*Topics in Advanced Language Implementation.* Edited by Peter Lee. MIT Press, Cambridge, MA and London, England. (1991). 401 pages. \$40.00.

Contents:

- I. Advanced implementation techniques. 1. The implementation of tags and run-time type checking. 2. Advanced register allocation. 3. Data-flow analysis and type recovery in Scheme. 4. Garbage collection. 5. Concurrent garbage collection C++. II. Practice and experience with advanced implementations. 6. Design considerations for CMU common Lisp. 7. Compilation issues in the Scheme implementation for the 88000. 8. The implementation of Oakdisp. III. Languages for parallel and distributed systems. 9. Futures. 10. An experimental implementation of connection machine Lisp. 11. Inheritance of synchronization and recovery properties in Avalon/C++. IV. New and unconventional languages and techniques. 12. A semi-functional implementation of a higher-order logic. 13. The architecture of PRL: A mathematical medium. 14. A simple system for object storage in common Lisp. 15. Architectural considerations for combinator graph reduction.

*Systems Thinking in Europe.* Edited by M.C. Jackson, G.J. Mansell, R.L. Flood, R.B. Blackham and S.V.E. Probert. Plenum Press, New York, NY and London, England. (1991). 612 pages. \$115.00.

Contents:

1. Plenary papers.
2. Applications of systems thinking.
3. Applications of methodology (both hard and soft).
4. Problem structuring and critical systems thinking.
5. Information systems.
6. Information systems development.

*Lattice Gas Methods: Theory, Applications, and Hardware.* Edited by Gary Doolen. MIT Press, Cambridge, MA and London, England. (1991). 338 pages. \$37.50.

Contents:

1. Overviews and frontiers.
2. Viscosity and hydrodynamic modes.
3. Multiphase and porous media.
4. Reactions and diffusion.
5. Basic relations and long-time correlations.
6. Lattice Boltzmann.
7. Computer hardware.
8. Applications.

*Nonlinear Optimization*. By Stephen A. Vavasis. Oxford University Press, New York, NY. (1991). 165 pages. \$39.95.

Contents:

1. Optimization and convexity. 2. Complexity theory. 3. Convex quadratic programming. 4. Nonconvex quadratic programming. 5. Local optimization. 6. Complexity in the black-box model.

*Cyberspace: First Steps*. Edited by Michael Benedikt. MIT Press, Cambridge, MA and London, England. (1991). 436 pages. \$24.95.

Contents:

1. Introduction 2. Academy leader. 3. Old rituals for new space: Rites de passage and William Gibson's cultural model of cyberspace. 4. Mind is a leaking rainbow. 5. The erotic ontology of cyberspace. 6. Will the real body please stand up?: Boundary stories about virtual cultures. 7. Cyberspace: Some proposals. 8. Liquid architecture in cyberspace. 9. Giving meaning to place: Semantic spaces. 10. The lessons of Lucasfilm's habitat. 11. Collaborative engines for multiparticipant cyberspaces. 12. Notes on the structure of cyberspace and the ballistic actors model. 13. Virtual worlds: No interface to design. 14. Corporate virtual workspace. 15. Making reality a cyberspace. Contributors.

*Fractal Geometry and Analysis*. Edited by Jacques Belair and Serge Dubuc. Kluwer Academic Publishers, Dordrecht, The Netherlands. (1991). 472 pages. Dfl. 240.00, \$129.00, £82.00.

Contents:

1. Applications of dynamical systems theory to fractals—A study of cookie-cutter Cantor sets. 2. Complex dynamics: An informal discussion. 3. Substitutions, branching processes and fractal sets. 4. Interpolation fractale. 5. Dimensions—their determination and properties. 6. Topological aspects of self-similar sets and singular functions. 7. Produits de poids aléatoires indépendants et applications. 8. The Planck constant of a curve. 9. Rectifiable and fractal sets. 10. Iterated function systems: Theory, applications and the inverse problem.

*The Cubic Algorithm for Optimization and Control*. By Efim A. Galperin. NP Research Publication, Montreal, Canada. (1990). 319 pages. \$116.00.

Contents:

1. Introduction. 2. The cubic algorithm. 3. Two alternatives for the cubic algorithm. 4. Precision, complexity and computational schemes of the cubic algorithm. 5. Modifications of the cubic algorithm. 6. The beta-algorithm. 7. Generalized full global optimization via beta-algorithm. 8. Multicriteria global optimization via beta-algorithm. 9. The rolling matrix algorithm for linear programming. 10. The delta-algorithm for global optimal control. 11. Selected applications. 12. Appendix: Limits, sets, functions and continuity.

*New Theory of Continuous Games*. By Efim A. Galperin and Quan Zheng. NP Research Publication, Montreal, Canada. (1990). 84 pages. \$40.00.

Contents:

1. Introduction. 2. Deterministic finite cover method. 3. Random version of the finite cover method. 4. Finite cover method for Lipschitzian games. 5. Games with uncertainties. 6. Examples. 7. Level sets in the solution of nonlinear games. 8. Topological structures and measures. 9. The variable set method. 10. Application to the solution of the N-person non-cooperative game.

*Global Solutions in Optimal Control and Games*. By Efim A. Galperin and Quan Zheng. NP Research Publication, Montreal, Canada. (1991). 281 pages. \$105.

Contents:

1. Introduction I. Global optimization in functional spaces. 2. Elementary variation-free methods for global optimal control. 3. Integral approach to global optimal control. II. Finite cover methods for global solution of continuous games. 4. Preliminary notions. 5. Finite cover methods. 6. Application to games with uncertainties. 7. Examples. III. The variable set method for global solution of continuous games. 8. Level sets, topological structures and measures. 9. The variable set method. 10. Application to the solution of the N-person noncooperative games. IV. Global differential games. 11. Formulation of a differential game. 12. Control set specification. 13. The  $Q$ -measure spaces for differential games. 14. Global minimax and maximin criteria. 15. Algorithm for global minimax solution of differential games.

*A Beginner's Guide to VAX/VMS Utilities and Applications*. By Ronald M. Sawey and Troy T. Stokes. Digital Press, Bedford, MA. (1991). 399 pages. \$19.95.

Contents:

Introduction. 1. Fundamental VMS operating system commands. 2. The EVE screen editor program. 3. The DECspell spelling checker program. 4. The WPS-PLUS word processor program. 5. Micro communication with VAX/VMS systems. 6. Electronic communications programs on VAX/VMS systems. 7. The DATATRIEVE database management program. 8. The DECcalc spreadsheet program. 9. Some notes on VAX BASIC. Appendixes.