

The Art of Prolog

Leon Sterling and Ehud Shapiro (MIT Press; Cambridge, Mass., 1986, 427 pp., \$22.95, hardcover)

Several introductory Prolog texts are available, but very little has been written for the second level of sophistication. *The Art of Prolog* addresses that level. Written for graduate or advanced undergraduate logic programming students, the text is well suited for readers wishing to increase their understanding of Prolog.

Programmers in other languages should also find this work valuable, since its insight into new methods and approaches to problems may be applicable in languages other than Prolog. Certain techniques may be more obvious in

Prolog but, once seen, these new ideas can often be employed to advantage elsewhere. Cross-fertilization creates potent hybrids.

The book is divided into four major sections: an introduction to logic programming, an extensive discussion of Prolog, advanced techniques, and medium-scale applications. Brief example programs are liberally sprinkled throughout, and the book's syntax resembles canonical Edinburgh Prolog. A background section concludes each chapter with helpful pointers to other references.

The introduction presents fundamental precepts in a well-organized manner. A reader new to the field might find the treatment too succinct for easy understanding—such readers would be better served by a text such as *Program-*

ming in Prolog by Clocksin and Mellish, (Springer-Verlag; New York, N.Y., 1984, \$17.95). More experienced readers can skim through these early chapters, pausing only on points of individual interest such as recursive programming and the theoretical underpinnings of logic programs and implementations.

Section Two moves from logic programming in general to Prolog in particular. Sterling and Shapiro outline how Prolog differs from pure logic, commenting on alternative approaches to implementing logic as a programming language, and discussing Prolog extensively. Metalogical predicates, system predicates, cuts, and negation—topics often treated lightly in other works—are given considerable coverage. Abundant examples effectively illustrate what may be unfamiliar territory to some readers.

Literature

Magazines. *IEEE Network*, the IEEE Communication Society's new quarterly magazine launched last month, deals exclusively with issues in computer communications. Focusing on topics such as network control, protocol design, and local area networks, *IEEE Network* will cost IEEE society members \$10 annually. For more information, contact *IEEE Network: The Magazine of Computer Communications*, 345 E. 47th St., New York, NY 10017; (212) 705-7018.

AT&T Bell Laboratories is now publishing *AT&T Technology*, a fledgling technical magazine that consolidates information regarding all AT&T products, systems, and services. Intended for select technical managers and to be published six times a year, the new magazine is available on a subscription basis to anyone needing to know more about computers and telecommunications equipment and services. The inaugural issue featured articles about the first all-digital integrated services network for the US DoD, advanced 800 service to British telecom customers, and AT&T's design for a customer computing environment. Future issues will report on light wave systems, quality assurance, and data networking. The annual subscription fee is \$35. AT&T Technology, Circulation Manager, AT&T Bell Laboratories, Room 1L-404, 101 John F. Kennedy Pkwy, Short Hills, NJ 07078; (201) 564-4099. For single issue purchases, call (1-800) 432-6600.

Journals. In addition to its quarterly *Journal of Robotic Systems* (annual subscription, \$120), Wiley is publishing two new quarterly journals—its *International Journal of Intelligent Systems* (annual subscription, \$120) and *Design Computing* (annual subscription, \$100). While the first of these new publica-

tions presents research articles on the spectrum of intelligent computer systems, the second focuses on computer methods in the design professions—architecture, urban design, landscape, interiors, industrial design, and relevant engineering areas. John Wiley & Sons, Dept. 092-6258, 605 Third Ave., New York, NY 10158; for orders only (1-800) 526-5368 or (201) 342-6707.

The quarterly *PC AI*—its first issue scheduled out this spring—will address users, programmers, and managers interested in AI applications for PCs. It plans coverage of all popular PCs and will introduce emerging AI technology and applications. The yearly subscription rate is \$28, with overseas delivery costing an additional \$9. Knowledge Technology, 3310 West Bell Rd., Ste. 119, Phoenix, AZ 85023; (602) 439-3253.

A monthly newsletter for managers and developers of expert systems, *Expert Systems Strategies* entered its second year of publication last fall. Following a basic format that reports on applications, tools, and new products, the annual subscription rate is \$247US for single subscriptions in the US and Canada, and \$307 for foreign subscriptions. *Expert Systems Strategies*, 1100 Massachusetts Ave., Arlington, MA 02174; (617) 648-8700.

Reports. The *Stanford University Knowledge Systems Laboratory Artificial Intelligence Reports, 1977-1984* are now available for \$1825. The 235 papers in this collection, of special interest to the medical community, include reports by Shortliffe on MYCIN (for infectious disease diagnosis), and by Feigenbaum on MolGen (concerning molecular

biology). A hardcopy catalogue is included with abstracts for each report, author and title indices, and an in-depth subject guide to the reports. Scientific DataLink, 150 E. 52nd St., New York, NY 10022; (1-800) 422-4735 or (212) 838-7200.

The Japan Computer Technology and Applications Abstracts—an English language abstract and document translation service covering current Japanese computer R & D—is published monthly (with monthly, quarterly, and yearly indexes by key word and author affiliation). It divides abstracts into four major sections: Applications, Peripherals, Hardware, and Programming. The annual subscription rate is \$425. University Publications of America, Dept. B-JCT1086, 44 N. Market St., Frederick, MD 21701; (1-800) 692-6300.

Books. *Tutorial: Digital Image Processing and Analysis Volume 1: Digital Image Processing* by Rama Chellappa and Alexander A. Sawchuk (1985, \$66, 736 pp.—Computer Society member price \$36) is the first of two volumes concerned primarily with conventional optical images represented as digitized values of gray levels on a discrete lattice. This first volume, dealing with the processing of images, contains sections on image transforms, image models, image data compression, image enhancement, and image restoration. *Tutorial: Digital Image Processing and Analysis Volume 2: Digital Image Analysis*, (1985, \$66, 680 pp.—Computer Society member price \$36) by the same authors, concentrates on the analysis of images. It contains sections on feature extraction and boundary analysis, region analysis, image sequence analysis, and multiresolution image analysis. *Tutorial: Robotics* (second edition) by C.S. George Lee, R.C. Gonzalez,

The authors intended their third section—advanced programming techniques—to be the book's highlight. Topics covered include nondeterministic programming, incomplete data structures, definite clause grammars, second-order programming, search techniques, and meta-interpreters. While the examples and explanations clearly address Prolog programmers, programmers in other languages can acquire new insights into algorithms useful elsewhere. For instance, nondeterminism is widely employed in simulations—particularly generate-and-test simulations. Incomplete data structures are important in operating system design, and meta-interpreters are often used to develop software for new computer architectures. An algorithm, once seen, can be a joy forever.

Large Prolog examples constitute the final section, which presents in detail several games, an expert system, an equation solver, and a compiler. The examples provide a firm foundation for expansion and modification. An appendix gives details of the Prolog interpreter used for the book's example programs—an essential addition, considering the extremely wide variability of syntax and system primitives found among Prolog implementations. A diskette containing code for the examples can be obtained from the publisher for \$15.95, and the interpreter for \$95. References and an index conclude the book.

On the negative side, while the book's typography is generally pleasant, example programs sometimes seem to blend into the text or are not juxtaposed with

the pertinent discussion; this interrupts the otherwise easy narrative flow (red and green cuts were discussed for 12 pages before they were defined). The book contains a few typographical errors; fortunately, I did not find any in the example programs. Finally, sentence structures are occasionally choppy, requiring rereading to grasp meanings.

On balance, this book should serve its stated purpose well. I recommend it for those wishing to advance in logic programming beyond the introductory level. In fact, I wish more books were this helpful.

—Randy Garrett
SAIC
5400 Jeffery Ave.
West Palm Beach, FL 33047

and K.S. Fu (1986, \$70, 744 pp.—Computer Society member price \$39) gives an up-to-date summary of the fundamental concepts and theories of robotics. It includes concepts and theories at a mathematical level requiring a good background in vectors, matrices, kinematics, and dynamics of rigid bodies. It contains sections on robot arm kinematics, robot arm dynamics, planning of manipulator trajectories, servo control for manipulators, force sensing and control, robot vision systems, robot programming languages, machine intelligence, and robot planning. For a complete publications catalog or more information, write Computer Society, 10662 Los Vaqueros Circle, Los Alamitos, CA 90720-2578; 1-800-CS-BOOKS, or (714) 821-8380.

In software engineering, AI techniques are being applied to a new generation of programming tools with potential for dramatic improvements in programmer productivity. *Readings in Artificial Intelligence and Software Engineering*, edited by Charles Rich and Richard C. Waters (1986, \$26.95, softcover, 602 pp.) provides convenient access to literature for students, researchers, and system developers in both communities. *Intention-Based Diagnosis of Errors in Novice Programs* (1986, \$24.95, softcover, 333 pp.) by W. Lewis Johnson presents a technique for identifying and diagnosing bugs in novice programs. The technique involves determining a program's intended function and structure and comparing them to its actual structure. *Empirical Analysis for Expert Systems* by Peter Politakis (1985, \$22.95, softcover, 187 pp.) describes Seek, an AI system designed specifically to improve development of expert systems for classification-type problems. Seek techniques are used to develop a comprehensive diagnostic consultant for rheumatology. *A Critiqu-*

ing Approach to Expert Computer Advice: Attending (1984, \$19.95, softcover, 112 pp.) by Perry L. Miller describes Attending, a computer system that critiques a physician's plan for anesthetic management and gives physicians feedback to help evaluate or refine their approach to patient management. *Design Problem Solving: Knowledge Structures and Control Strategies* (1986, \$22.95, softcover, 200 pp.) by David Brown and B. Chandrasekaran provides a perspective on design problem solving in the context of expert systems, outlining a general theory of knowledge-based reasoning. *Machine Learning: An Artificial Intelligence Approach, Volume 2* edited by Ryszard S. Michalski (1986, \$39.95, hardcover, 738 pp.) reflects the rapid expansion of machine learning research through presentation of recent advances by leading scientists in the field. Morgan Kaufmann Publishers, Order Fulfillment Dept., PO Box 50490, Palo Alto, CA 94303; (415) 965-4081.

Addison-Wesley's 1987 publications list includes new AI titles as well as some classics. New offerings include Volumes 1-2 by Barr and Feigenbaum and Volume 3 by Cohen and Feigenbaum (all three volumes available both hardcover and softbound) of *The Handbook of Artificial Intelligence* (1986, Vol. 1 \$27.95, 409 pages—Vol. 2 \$28.95, 450 pages—Vol. 3 \$32.95, 650 pages, softbound); *Intelligence: The Eye, The Brain, and The Computer* by Martin A. Fischler and Oscar Firschein (1986, \$27.95, 400 pages, hardcover); and Peter Jackson's *Introduction to Expert Systems* (1986, \$21.95, 246 pages, softcover). Addison-Wesley, Reading, MA 01867; (617) 944-3700.

New publications from North-Holland include *Recent Trends in Robotics: Model-*

ing, Control, and Education edited by M. Jamshidi, J.Y.S. Luh, and M. Shahinpoor (1986, \$75., hardcover, 550 pp.); *Machine Intelligence* (the proceedings of the Second International Conference in London) edited by A. Pugh (Nov. 1985, \$101.75, 420 pp.); *Artificial Intelligence and Information—Control Systems of Robots* (proceedings of the Third International Conference in Smolenice) edited by I. Plander (1984, \$55.50, 430 pp.). Elsevier Science Publishing Co., PO Box 1663, Grand Central Station, New York, NY 10163 in the USA and Canada; elsewhere, Elsevier Science Publishers, PO Box 211, 1000 AE Amsterdam, The Netherlands.

Among other recent titles are

Knowledge Acquisition for Expert Systems by Anna Hart (1986, \$28.95, 180 pp.), available from the McGraw Hill Book Company, 1221 Avenue of the Americas, New York, NY 10020; and

Artificial Intelligence Programming (second edition) by Eugene Charniak, Christopher Riesbeck, Drew McDermott, and James Meehan (scheduled early 1987); *Knowledge Structures* edited by James A. Galambos (1986, \$27.50 prepaid, 296 pp.); *Experience, Memory, and Reasoning* edited by Janet L. Kolodner and Christopher K. Riesbeck (1986, \$29.95, 272 pp.); *Analyzing Language in Restricted Domains* edited by Ralph Grishman and Richard Kit-tredge (1986, \$29.95, 264 pp.); *Explanation Patterns: Understanding Mechanically and Creatively* by Roger Schank (1986, \$24.50, 256 pp.), all five available from Lawrence Erlbaum Associates, 365 Broadway, Hillsdale, NJ 07642—or LEA Ltd., 319 City Rd., London EC1V 1LJ, England.